WOLF, MOOSE, MUSKOXEN AND GRIZZLY BEAR OBSERVATIONS ON THE YUKON NORTH SLOPE, JUNE 1986

PROGRESS REPORT

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N. Barichello, Wildlife Biologist 11
December, 1986

Yukon
Renewable Resources

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Yukon Fish and Wildlife Branch
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Government of the Yukon
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ACKNOWLEDGEMENTS

J. Buerge of Aerokon Aviation, Whitehorse, flew safe and efficient survey flights. We thank A. Baer, D. Larsen, D. Mossop and C. Smits for reviewing this manuscript.

INTRODUCTION

As part of the implementation process pursuant to the aboriginal Inuvialuit Settlement Agreement, the development of a sound wildlife harvest strategy on the Yukon's North Slope was considered a high priority. Such a strategy is based on a sustainable yield principle, which guarantees a limited annual harvest of animals, with the total number set to ensure harvest removal does not contribute to a decline in herd size. Essential to the development of a sustained harvest strategy are an assessment of standing crop (inventory) and an understanding of the factors and processes that limit population growth (demography).

Four ungulate species inhabit the Yukon's North Slope: caribou (Rangifer tarandus granti) , moose (Alces alces) , Dall's sheep (Ovis dalli) , and muskoxen (Ovibos moschatus moschatus). Much is known of the status and demography of the Porcupine caribou herd, and Dall's sheep distribution and demography is currently under study (Barichello, in prep.). Moose and muskoxen numbers, distribution and population dynamics are only generally understood.

Wolves (Canis lupus) , and grizzly bears (Ursus arctos) , although perhaps of limited importance to hunters, may play important roles in the dynamics of North Slope ungulates. Knowledge of large predator populations is critical to a complete understanding of ungulate population dynamics.

The purpose of this paper is to report on the abundance and distribution of wolves, muskoxen, moose and grizzly bears observed on the Yukon's North Slope in late spring (June).

BACKGROUND

WOLVES

Probably the least understood mammal on the North Slope is the wolf. Prior to this report, no systematic wolf studies had been carried out in the northern Yukon. In Alaska, recent wolf studies in the Arctic National Wildlife Refuge (ANWR) investigated denning ecology (Haugen 1985), seasonal movements and prey relationships (Weiler et al. 1985). Incidental wolf observations have been collected over the years in relation to Porcupine caribou research (Jackimchuk et al. 1974, Doll 1974, Yukon Fish and Wildl. Br. files) , but lit-

tle is known regarding the abundance, distribution, denning characteristics, prey relationships, and demography of the Yukon's North Slope wolves.

The North Slope wolf population may be regulated by unique ecological factors. In recent years, observations made by caribou researchers (R. Farnell and D. Russell, pers. comm.) suggest wolf numbers were low on the North Slope during caribou calving and post-calving periods compared to the more numerous wolf observations of the 1970's (Doll 1974, Jackimchuk et al. 1974). In the ANWR on the Alaskan North Slope, significant numbers of Dall's sheep and moose, in addition to migratory Porcupine caribou, provide prey for denning wolves (Weiler, pers. comm.). Except for seasonal use by Porcupine caribou, most drainages of the Yukon North Slope do not support large ungulate numbers. Dall's sheep are not found east of the Firth River in the Barn Mountains, and moose are likely at low densities throughout North Slope drainages. Relative to Alaska, the low wolf densities may be due to denning habitat restrictions. Wolf denning locations are likely restricted to certain drainages where sufficient summer prey are available to supply denning wolves.

Rabies appears to be an important mortality factor in Alaskan wolves. Chapman (1978) identified rabies as the cause of the decimation of a denning pack on the Alaska North Slope, and Weiler (pers. comm.) determined rabies to be the cause of death of 6 radio-instrumented wolves in 1984. It appears that rabid wolf occurrences may be related to cyclic epizootics of the disease in the arctic fox (Alopex lagopus) (Chapman 1978).

Finally, illegal aerial hunting may be an important mortality factor for northern Yukon wolves. In recent years, unverified reports have been made of persons illegally hunting Yukon wolves from aircraft. The absence of winter enforcement activities in the northern Yukon would have made the area attractive to illegal hunting, especially since increased enforcement efforts have been made in northern Alaska in recent years (Nowlin, Alaska Department of Fish and Game, pers. comm.). The apparent decline in wolf numbers in the northern Yukon could be partly due to excessive illegal harvest in recent years.

Based on low mortality rates of radio-instrumented caribou calves and yearlings, Whitten et al. (1985) suggested the Porcupine caribou herd may be increasing in response to lower initial calf mortality. The relationship between increasing caribou numbers and wolf demography is unknown, largely because wolf population data is absent. To clearly understand the ecological mechanisms that allowed the Porcupine caribou herd to grow, we need to know how wolf population dynamics may have affected the herd. While ANWR

wolves are mainly territorial, using the relatively rich and diverse resident ungulate prey in the northern Brooks Range, Yukon wolves may be seasonally migratory; their distribution being dependent on annual ungulate movements over the northern Yukon.

The role of wolf predation in regulating or limiting the growth of northern ungulate herds has been a highly controversial subject in Alaska, Yukon and British Columbia. In most cases, wildlife managers were placed in positions of reacting to a declining ungulate population, with little or no a priori collection of predation data to assess its importance in limiting herds. The initiation of wolf studies in the northern Yukon will provide managers with baseline wolf-ungulate data to better understand the wolf-prey system that presently exists in the North Slope.

MUSKOXEN

Muskoxen formerly occurred along the entire Yukon coastal plain, as evidenced by skeletal records and reports from Indians on the MacKenzie River Delta (Youngman 1975). The decline of muskoxen on the North Slope coincided with a general decline throughout the arctic in the late 1800s and early 1900s. Originally, the decline was due to excessive harvest by whalers and explorers, followed by a commercial trade in hides which gained popularity after the decline of American bison (Bison bison) (Dehn, in progress). The Hudson's Bay Company alone traded over 15,000 hides between 1862 and 1916 (Tener 1965).

As a result of these declines, the Canadian Government banned all muskox hunting in 1917, and in 1960 declared the muskoxen in danger of becoming extinct (Freeman 1971). During the past few decades, populations have grown in parts of their former range. Numbers increased in the Northwest Territories and hunting quotas were re-established in 1969, with an allowable take of 2,289 animals in 1982 (Urquhart 1982).

Since 1969, numerous observations have been made of solitary animals or small groups (less than 5 animals) on the Yukon's North Slope, as far east as the MacKenzie River. These recent sightings are likely muskoxen which have dispersed from nearby Barter Island, Alaska, 150 miles west of the Yukon border. The original Barter Island herd was composed of 51 animals transplanted from Nunivak Island in April 1969. An additional 13 animals were released at the mouth of the Kavik River (130 km west of Barter Island) in June 1970 (Gunn 1983).

The Barter Island population was established slowly. Lent (1971) observed no animals successfully reproducing between

1969 and 1971, and he believed that less than 23 of the original 51 animals were alive in 1971. In 1972, the first calves were observed and high productivity was recorded between 1978 and 1982, when observations were made of subsequent years breeding by individuals, 2-year olds nursing calves of the year, and a ratio of 17 calves/15 cows (Jingfors and Klein 1982). In November, 1984, a total of 384 were counted in the ANWR and Reynolds et al. (1985) estimated the herd had been expanding at an annual rate of 14-23% between 1982-1984. While dispersion of animals has likely occurred since 1969 (Youngman 1975), emmigrants to the Yukon North Slope have never been numerous. Until 1986, less than five animals were observed annually.

MOOSE

No systematic studies of moose have been conducted on the North Slope. Incidental observations of moose were collected in the early 1970's as part of other wildlife studies (Ruttan and Wooley 1974, Doll 1974, Jackimchuk et al. 1974, Ruttan 1974), but almost nothing is known of the population size, seasonal movements, and demography of these arctic moose.

OBJECTIVES

The objectives of 1986 North Slope wildlife studies were:

1. to record late spring distribution and general abundance of moose, muskoxen and grizzly bear on Yukon North Slope drainages.

2. to visit historic wolf den sites, determine wolf use in 1986 and search for new den locations.

3. to radio-instrument a sample of denning wolves.

STUDY AREA

The 1986 North Slope Wildlife Study Area (Figure 1) included the Malcolm, Firth, Trail and Babbage River drainages. The study area was estimated to represent about 25-30% of the Yukon's North Slope area. The physiography of the study area is variable, composed of the rugged British Mountain Range (Oswald and Senyk 1977) and the Arctic coastal plain that spans the Yukon north coast. Most of the terrain is treeless and lies within the tundra region. Some protected valleys, particularly along the Firth River drainage, support open stands of black spruce (Picea mariana), white spruce (Picea glauca), and balsam poplar (Populus

balsamifera) (Oswald and Senyk 1977). Precipitation is low in the study area, ranging from 380 mm in the British Mountains to 125 mm along the arctic coast (Oswald and Senyk 1977). By early June, most snow cover has disappeared except along the coast, where the moderating effects of the Arctic Ocean icesheet slows snowmelt.

METHODS

Fixed wing aerial surveys were conducted from a PA-18 Supercub from June 9 to June 20, 1986. Flight lines followed the centre of most drainages to include most riparian shrub communities; the habitat in which moose and muskoxen were expected to occur most frequently, and where wolves were most likely to den (Weiler, pers. comm.). Also, all previously known North Slope wolf dens were visited and activity recorded.

Moose were classified into adult, yearling and calf age classes, and adults were sexed whenever possible. In addition to actual moose observations, the presence of cast antlers was noted to delineate areas of potentially important moose winter range on the North Slope. In our view, the timing of our surveys was ideal for locating moose. Shrubs had not yet leafed out and moose were visible up to a kilometer away. This, coupled with the restricted riparian shrub communities and the limited tree cover, leads us to expect that the majority of moose that were overflown were seen. For each grizzly bear seen, the colour, size and presence of young bears were noted. Muskoxen were classified by body size and horn configuration.

Immobilized wolves were administered an intramuscular injection of Ketamine Hydrochloride (Parke-Davis) and Xylazine (Rompun, Cutter Laboratories) from a Capchur darting gun (Palmer Chemical and Equipment Co.). Drugs were mixed to give a dosage of 12-13 mg ketamine/kg of wolf, based on an average wolf weight of 42 kg (100 lbs.).

RESULTS

WOLVES

A total of 34 hours of fixed wing time was flown to survey drainages. Figure 1 shows the areas surveyed and the locations of the 10 dens studied in 1986. The absence of snowcover from all areas but the Yukon coastal plain made new den searches difficult.

Table 1. Occupancy and productivity data from 10 wolf dens visited.

Den#	Location	# Visits	Occupancy*	Productivity**
1	Malcolm R.	2	3	4-5
2	Aspen Ck.	2	1	0
3	Babbage	a probable but unverified den		
4	Trout Lake	3	0	0
5.	Babbage R.	den location probably mismapped.		
6	Ladas Ck	no den found		
7	Deep Ck.	2	0	0
8	Caribou Ck.	no den found		
9.	Rapid Ck.	no den found		
10	Rapid Ck.	no den found		

* represents the number of full-grown wolves seen.
** represents the number of pups seen.

Of the 10 dens visited, only one was verified to be active and productive (Table 1). Den #1, located on the Malcolm River (Figure 1), was occupied in 1985 by a pair of radio-collared wolves that were captured in the ANWR. Five pups were raised in that year (Weiler, pers. comm.). On June 10, 1986, we located the same radio-instrumented alpha female (152.120) and a new, uncollared black-grey male attending four pups at the den. Three pups were grey-tan coloured and one was black-grey. Additional summer observations by G. Weiler (pers. comm.) of the ANWR indicate a minimum of five pups were born. Compared to a photograph of the 1985 den, it was evident the denning area had been expanded in 1986. This pack's movements and predation habits are presently under study by ANWR researchers (Weiler, pers. comm.).

Den #2, on Aspen Creek, was a previously unknown den site located June 14. A single, light-cream coloured wolf was observed at the den. Following a ground-check of the site on June 19, we determined the site was not productive in 1986. The denning area was located on a south facing hill covered with low willows. Five separate excavations were found, but there was no evidence that pups were raised here. Caribou prey remains were scattered along the top of the site, and about a dozen adult-size scats were found in the immediate area.

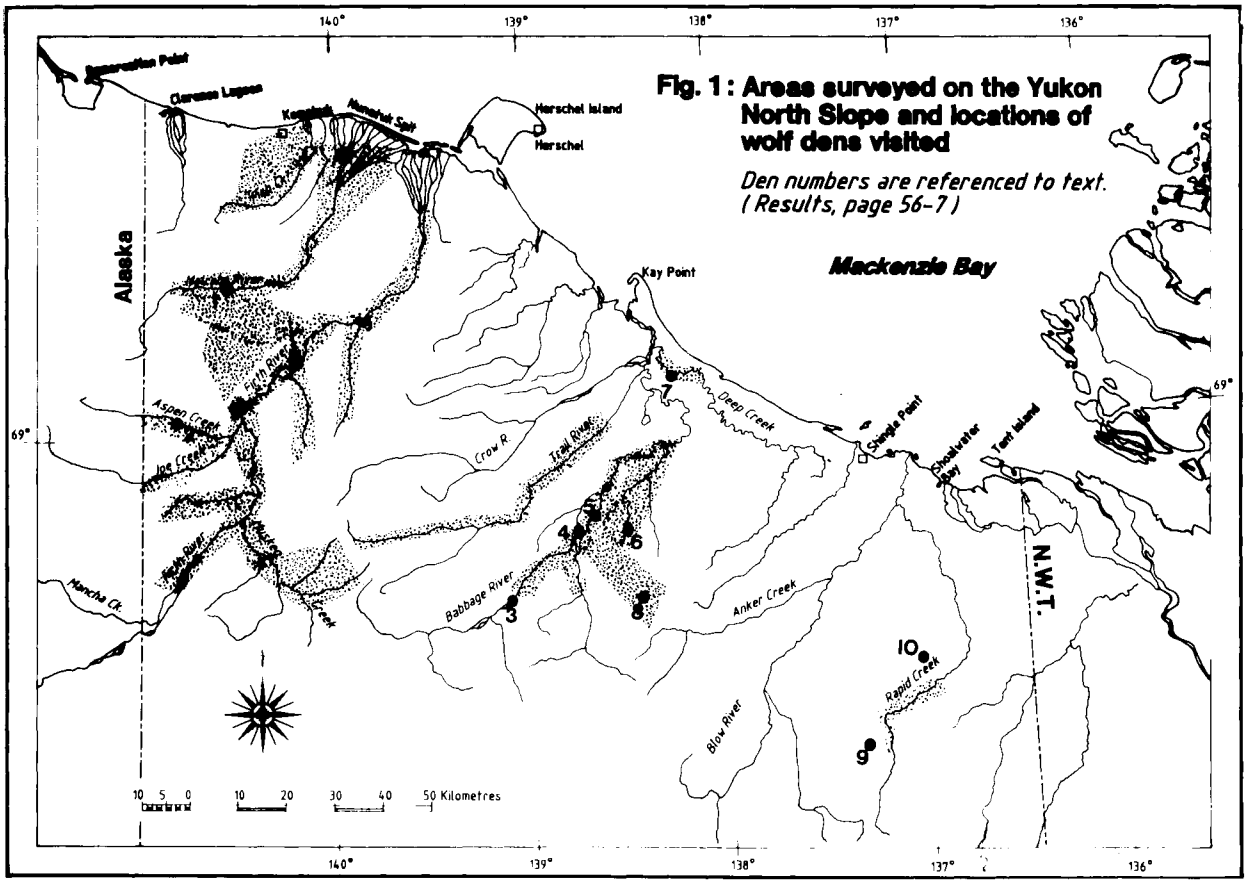

Fig. 1: Areas surveyed on the Yukon North Slope and locations of wolf dens visited

Den numbers are referenced to text. (Results, page 56-7)

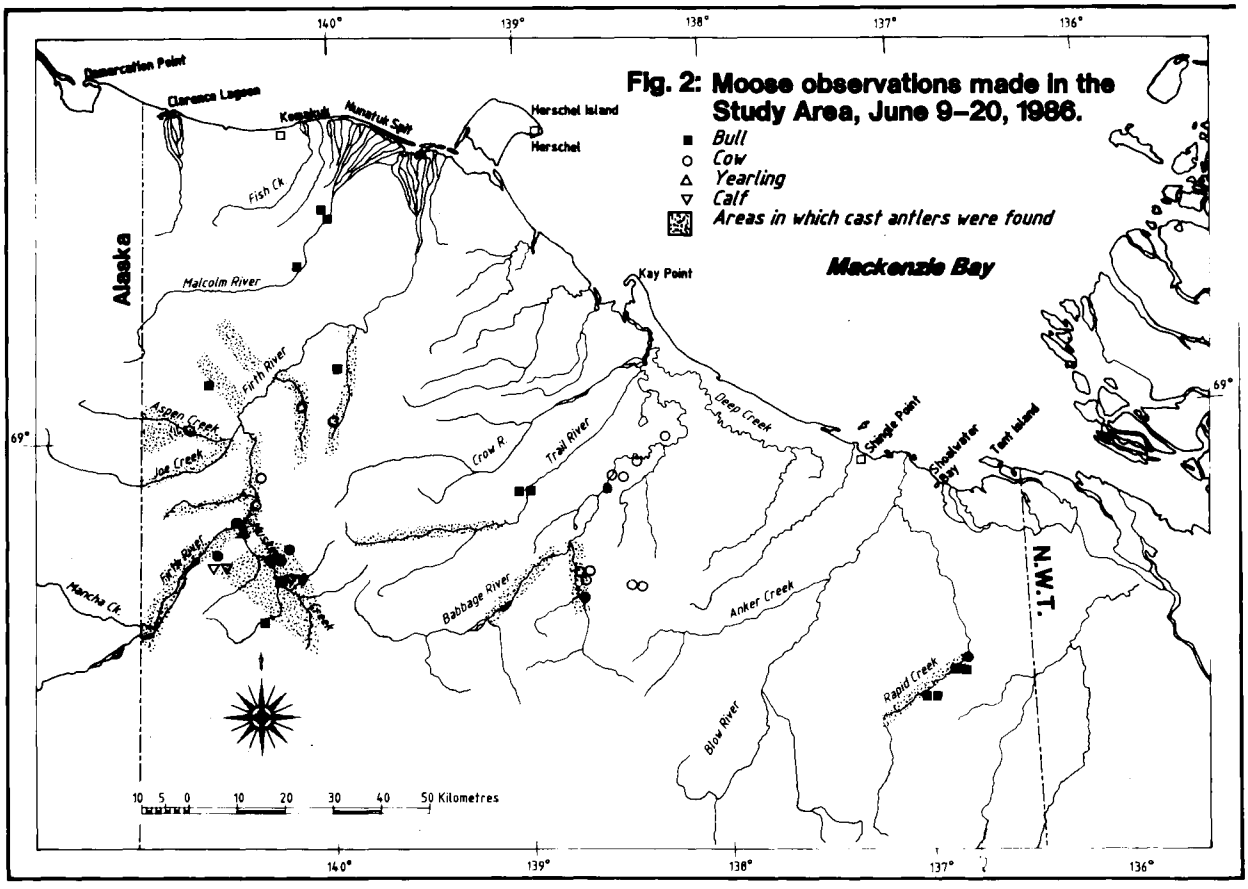

Fig. 2: Moose observations made in the Study Area, June 9–20, 1986.

- ■ *Bull*
- ○ *Cow*
- △ *Yearling*
- ▽ *Calf*
- ▨ *Areas in which cast antlers were found*

Den #3, a possible new wolf den, was located by D.Russell and W. Nixon of the Canadian Wildlife Service (pers. comm.) on July 23. Numerous wolf-size scats were observed by Russell and Nixon on a large willow flat near the west shore of the aufeis complex above Babbage Falls. On the same day, two grey-tan wolves were observed in the immediate area and it is possible the site was an active wolf den. The site was not revisited and productivity was not verified.

Dens #4 and #7 (Figure 1) were two historically active sites that were not occupied in 1986. Den #4, the Trout Lake den, was located on the west bank of the Babbage River, about 3 kilometers from Trout Lake. Three separate denning sites were located in this area. This den was active and productive in 1975, 1976, 1977 (Mossop, pers. comm.) and 1981 (Hayes and Mossop, in prep.). Occupancy status was unknown between 1978 and 1980. Den #7, located on Deep Creek (Figure 2), was active from 1973-1976, except 1975 when no wolves were observed here (Mossop, pers. comm.).

The remaining historical den sites were not located in the areas mapped by previous researchers. It is possible the dens were not mapped correctly, or the dens had disintegrated since the early 1970's.

Two wolves were radio-instrumented in the study area in 1986. At the Malcolm den, a yearling grey-tan female was captured and instrumented (152.770) on June 19, and the alpha female (152.120) was recollared (152.101) on July 29 by AWNR staff (Weiler, pers. comm.). Also a yearling male was collared (153.079) on June 18 by the authors at the Kongakut den about 15 miles west of the Yukon-Alaska border in the ANWR. Due to unknown capture-related complications, this wolf died at the capture site (Weiler, pers. comm.). We made an attempt to radio-instrument wolves at the Aspen Creek den on June 19, but no wolves were located.

MOOSE

Except for caribou, moose were the most frequently observed mammal during surveys. Forty moose were recorded in the study (Figure 2), including 12 bulls, 8 cows, 14 unclassified adults, 2 yearlings and 4 calves. While moose were seen over most of the study area, the majority were observed in the the upper Firth River drainages and the Babbage River. No surveys were flown in the Blow River-Shoalwater Bay drainages, and judging from the relatively rich willow communities in the eastern North Slope, it is likely moose density is greater there than in the central and western drainages, where shrubs appear less abundant.

Table 2. Details of muskoxen sightings made on the North Slope, June 1986.

Map code*	Date	No.	Composition	Location
A	June 18	1	unknown	Craig Ck.
B	June 14	10	5 females/5 yrl.	Komakuk
C	June 09	2	unknown	Malcolm Delta
D	June 09	5	3 males/2 females	Firth Delta
E	June 16	3	unknown	Babbage Delta
F	June 17	1	male (150.091)**	Conglomerate Ck.
G	June 17	1	male (150.110)**	Babbage River

* refers to figure 3.
** denotes radio frequency of individual.

Observations of moose calves were rare during the study period. Only 4 (10%) observed moose were calves; all seen in the upper Firth drainage.

Potential early winter moose range was assessed by documenting the presence of cast moose antlers. Figure 2 shows the drainages where antlers were recorded. Again, similar to summer distribution of moose, the Firth and Babbage Rivers appear to be used by moose in early winter. Areas where wintering moose have been previously recorded include the Upper Firth, Babbage, and Crow Rivers, Strangle Woman and Muskeg Creeks, and Mt. Davies Gilbert (Doll 1974, Ruttan 1974, Jackimchuk et al. 1974). We also found cast antlers in the upper Trail River, Joe Creek, Mountain Creek and unnamed eastern tributaries of the Firth River (Figure 2).

MUSKOXEN

From June 9-18, 1986, a total of 23 muskoxen were seen on the Yukon North Slope (Table 2). Two were radio-instrumented bulls that had dispersed from the ANWR (Mauer, pers. comm.). Groups were scattered over most areas of the coastal plain, with most concentrated near the Malcolm-Firth Delta complex (Figure 3). Composition consisted of an estimated 11 males, 7 females and 5 yearlings. In total, seven groups were observed, ranging from 1-10 individuals. All muskoxen were observed in riparian areas on the coastal plain and the

Table 3. Details of grizzly bears observed between June 11-20, 1986.

Map code*	Date	No.**	Size	Colour	No. of Young
A	June 18	1	unk	unk	0
B	June 19	1	large	chocol.	0
C	June 18	1	large	blonde	1 coy
D	June 15	1	small	chocol.	0
D	June 17	1	small	chocol.	0
E	June 20	1	med	blonde	0
F	June 14	1	large	brown	0
G	June 16	1	med	chocol.	0
H	June 16	1	med	blonde	1 coy
I	June 17	1	med	brown	0
J	June 14	1	med	brown	0
K	June 11	2	med (both)	brown	0
L	June 11	2	med	blonde	0
			large	brown	0
M	June 11	1	med	chocol.	0
N	June 11	1	small	brown	0
O	June 11	1	large	brown	0

* refers to figure 4
** includes number of adult-size bears

foothills of the British Mountains, generally in association with major drainages.

GRIZZLY BEAR

A total of 17 adult-sized grizzly bears were seen, including two sows with single cubs of the year (coy) and 2 pairs of adults (Table 3, Figure 4). Nine bears were seen in the British Mountain ranges near the Yukon's western coast- the same area where the majority of Porcupine caribou herd calving occurred in 1986. Jackimchuk et al. (1974) also recorded more bears near the calving area than elsewhere. Our aerial activities were more concentrated in the calving grounds, as we expect Jackimchuk et al.'s were, and the higher frequency of observations were, in part, due to more intensive coverage of this area.

The Babbage River was the other concentration area. In a single flight along the river we observed 7 grizzly bears. While this area did support some caribou at the time, most of the herd was further west. Five of the 7 bears on the Babbage were observed foraging on Carex /forb communities on cliff tops above the river, one was apparently stalking a cow and yearling moose, and the remaining bear was observed walking along a riparian willow thicket. The bears did not appear to be attracted to caribou in the valley, and the vegetation was likely the major attraction to the bears we observed.

DISCUSSION

WOLVES

Our initial impressions of the Yukon North Slope wolf population are similar to caribou researchers (Farnell and Russell, pers. comm.) studying the Porcupine herd in the 1970's and 1980's. Wolf density appears to be low over the entire area surveyed, but may be particularly low east of the Firth River. Prey distribution may be limiting wolf numbers east of the Firth, where no resident sheep, and only few moose seem to occur. Wolves denning in this region would have to subsist largely on caribou when available, and perhaps small mammals or ptarmigan (Lagopus sp.).

During our surveys we encountered only one wolf that was not radio-instrumented or associated with other marked wolves. This compares with 19 grizzly bears in the same period. While bears may be marginally more visible from the air due to their larger size, the open tundra terrain should allow us to observe wolves reasonably well. In conjunction with the the low frequency of wolf observations was an apparent decline in denning activities compared to the 1970's. Of eight previously known dens, seven were not active in 1986, suggesting wolves moved to unknown denning areas, or a major decline in denning activities has occurred on the North Slope over the last decade. The low denning rate may be related to a rabies-induced wolf population decline on the North Slope. Chapman's (1978), and more recently, Weiler's (pers. comm.) observations of Alaskan North Slope wolf mortalities caused by rabies may also apply to the Yukon North Slope. Possibly, Yukon wolves may be more exposed to the virus than ANWR wolves if their movements are more dependent on caribou, which traditionally use the coastal plain and where wolf/fox contacts are more likely to occur.

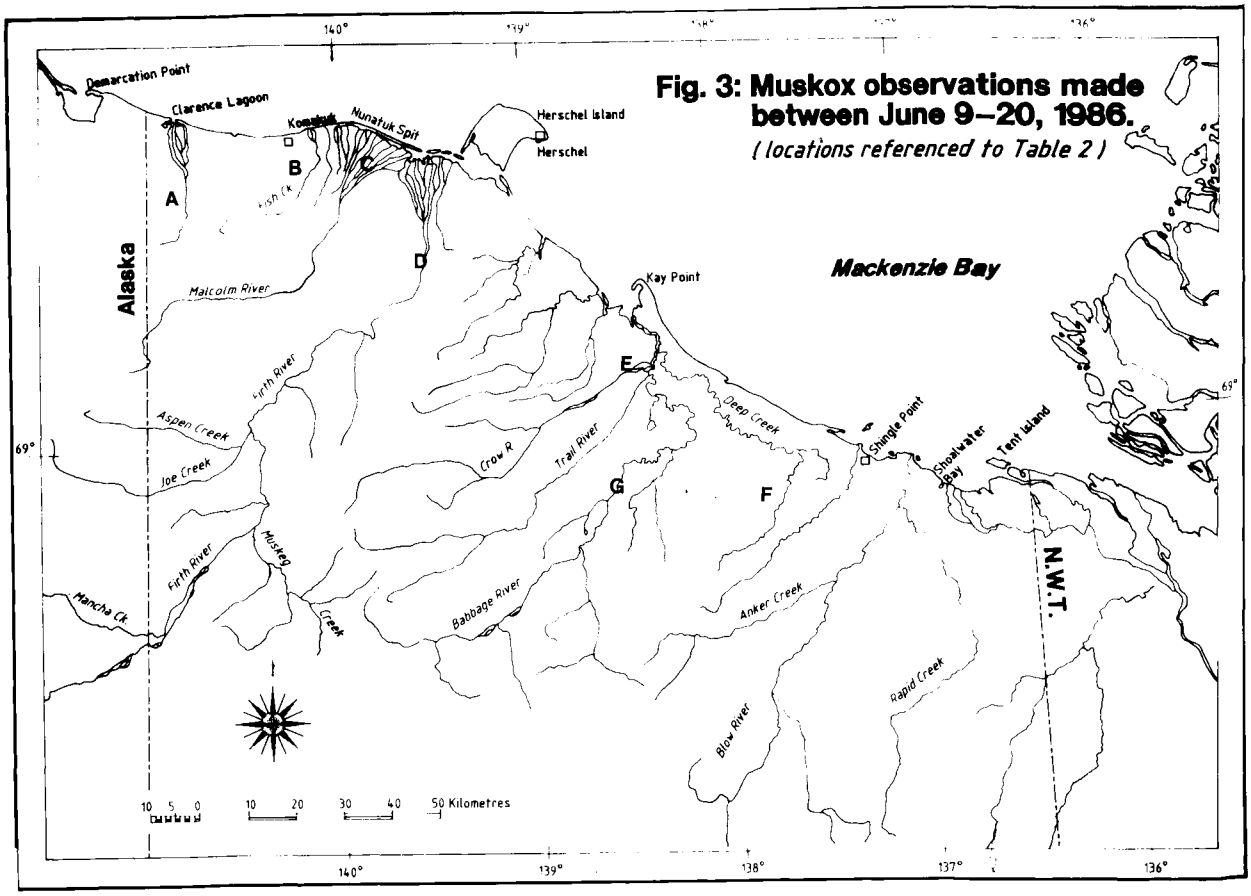

Fig. 3: Muskox observations made between June 9–20, 1986.

(locations referenced to Table 2)

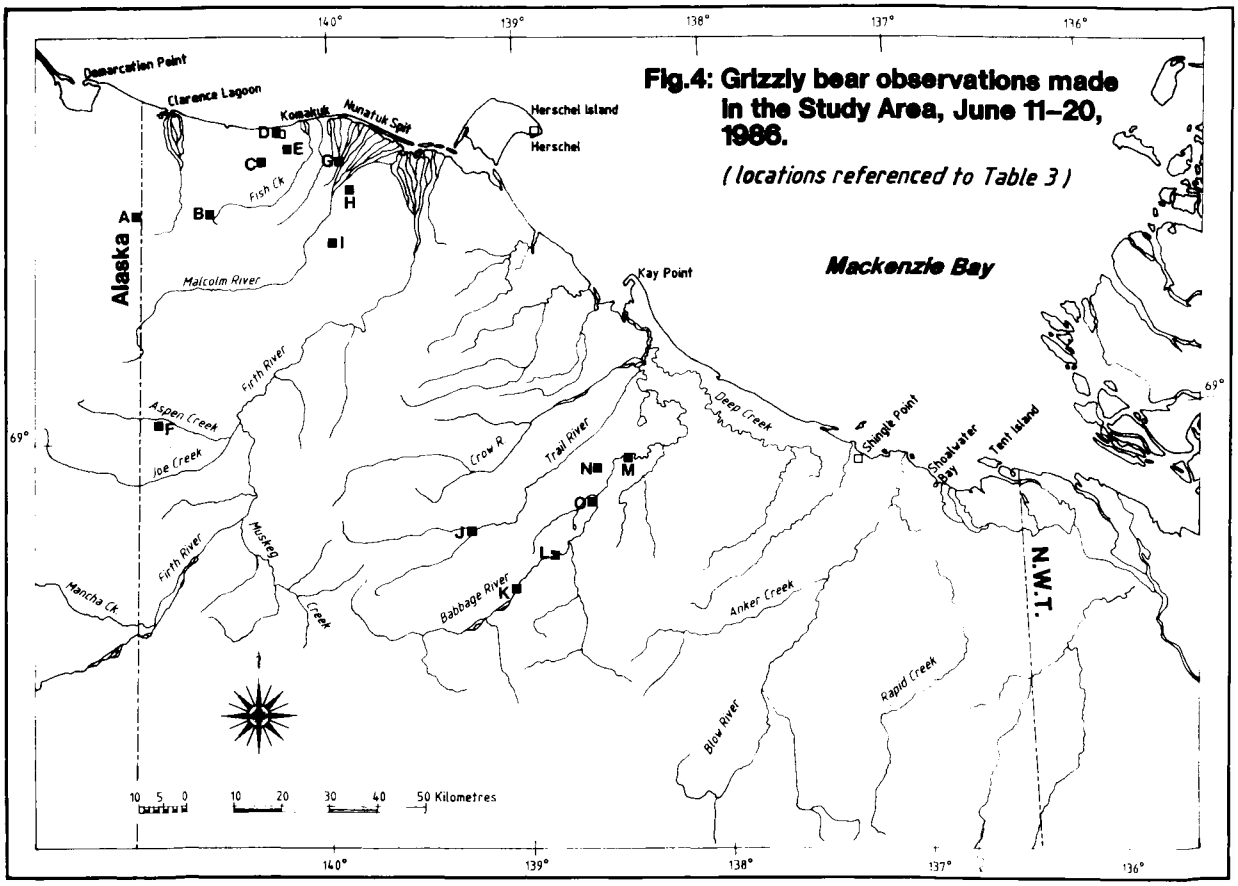

Fig.4: Grizzly bear observations made in the Study Area, June 11–20, 1986.

(locations referenced to Table 3)

On the Alaskan side of our study area, natives apparently remove many wolves from the eastern North Slope. Whitten (1986, progress report) attributes high wolf harvest rates to the high local demand for pelts, the ease of travel by snowmachine, the long spring daylight, and the good snow conditions of April for trailing wolves. Presently, we know virtually nothing about the the harvest of Yukon's North Slope wolves.

MOOSE

From our limited observations and from general impressions of other wildlife researchers (Doll 1974, Jackimchuck et al. 1974, Ruttan 1974, Russell pers. comm.), moose on the North Slope appear to be few and scattered. In most years, calves were infrequently recorded. In 1971, Jackimchuk et al. (1974) found calves represented 10% of moose observed during summer (11 of 112); similar to our findings, and Jackimchuk et al. (1974) and Ruttan and Wooley (1974) noted low moose calf/female ratios (27-30 /100) during summer. In 1972, however, Ruttan (1974) found a ratio of 58 calves/100 cows. Mossop (1975) found high calf production on the Old Crow Flats where 73 calves/100 cows and 28.5% calf proportion (our calculations) were recorded in summer. Calf production or survival apparently fell in 1976 (Mossop 1976), when only 19% of moose classified in September were calves. Compared to the Old Crow Flats, North Slope moose calving habitat is, at best, marginal with limited escape habitat (ie. lakes or ponds), cover, and shrub forage. It is possible moose productivity is equally high on the North Slope, but calf survival is lower due to bear predation or other unknown mortality agents.

Assuming all moose were seen in surveyed drainages and moose distribution was evenly spread over all North Slope drainages, we tentatively estimate that the Arctic drainages support less than 200 moose during summer.

The seasonal distribution of moose may be one of the most important components of moose ecology that needs to be understood for moose management in the northern Yukon. From moose transect counts, Mossop (1975) estimated 768 moose were on the Old Crow Flats in September, 1975. Mossop (personal files) flew the same transects for moose on 19 April 1977, concluding that few moose were present on the Flats during late winter, which supported earlier findings (Doll 1974). Moose migration from Alaska and the Firth River to the Flats in the spring was suggested by Doll (1974) and Mossop (pers. comm.), based on an annual pattern of moose distribution on the Flats in May and June. There is also evidence that cows precede bulls in order to reach suitable calving areas in the central Flats area (Mossop 1975, 1976) in time for calving in early June.

No surveys have been conducted in winter on the North Slope drainages, but from casual observations of the area in summer, it is unlikely that a significant number of moose winter there. It is possible that the Old Crow Flats and North Slope moose are 'migratory', sharing a common wintering area on the eastern slopes of the Brooks Range in Alaska. It is also possible a portion of the North Slope moose are a peripheral component of a larger population which uses the Old Crow Flats as a centre for summer habitation.

MUSKOXEN

The small scattered groups of muskoxen on the Yukon coastal plain appears to be the core of a colonizing population. Previous sighting of muskoxen in the Yukon have been uncommon, and in all cases only males were recorded. Our current sightings have located larger groups, one being a nursery group that may be the first indication of a potential breeding population.

At one time, muskoxen were viewed as a species with a low intrinsic rate of increase (Tener 1965). Since then, significant population growth has been observed in a number of herds (Spencer and Lensink 1970, Jingfors and Klein 1982, Uruquart 1982), suggesting that muskoxen may be more fecund that previously thought. Successive years calving, pregnant yearlings and 2 year olds, and in a few cases twinning, have been reported (Jingfors and Klein 1982, Dinneford and Anderson 1984), contrary to Tener's (1965) earlier observations.

On Nunivak Island, Alaska, a transplanted herd of muskoxen increased from 1947 to 1968, at an annual rate of 16.2.% with average annual calf production estimated at 19% (from Gunn 1983). Similar growth was observed on Alaska's Seward Peninsula, Nelson Island, and Greenland (Gunn 1983), and recently in the Barter Island herd (14-23%, Reynolds et al. 1985). Annual growth in the Nelson Island herd reached a high of 23% in 1981. The increase in numbers of muskoxen on Banks Island and Queen Maud Gulf, Northwest Territories, and recent reports of a high proportion of yearlings on southeast Victoria Island and Great Bear Lake also support the notion of high rates of muskoxen population growth (Gunn 1983).

Population growth has been attributed to high fecundity and low calf mortality, facilitated by good forage conditions and long growing season (Gunn 1983). The Yukon's North Slope appears biophysically similar to the adjacent coastal plain in Alaska. Assuming muskox in the Yukon experience similar conditions to those near Barter Island, and that conditions which have enhanced population growth in Alaska

also prevail in the Yukon, we can expect to see intrinsic growth in the Yukon's small resident population, and increased emmigration from the Barter Island herd.

Historically, muskoxen have been of limited importance to subsistence economies. In the last few decades, however, the animal has gained popularity. Muskoxen have always represented an important source of red meat to aboriginal peoples -particularly when caribou were scarce. Also, muskoxen were an important source of raw material for clothes, shelter and tools (Burch 1977). Later, muskoxen became an important, if not vital, food source to explorers and whalers in the Arctic. They were easily slaughtered and provided fresh meat at a period when provisioning for long expeditions was difficult. Complimenting their value as a staple food source, their hides became increasingly more popular and valuable with the decline of bison in continental North America.

For 50 years, the Hudson's Bay Company actively traded in muskox hides (Hone 1934). Additionally, scientific expeditions profited from the sale of live animals (Hone 1934). More recently, muskoxen have become a valuable resource for carving, wool, sport hunting, viewing, and for providing breeding stock to game farms and zoos.

Currently, muskoxen are commercially harvested from Banks Island, and there is an increasing demand for meat to supply specialty restaurants in the south and in Europe. In 1981, the Inuvialuit Development Corporation began a test marketing study for muskox meat retailed in Inuvik, Northwest Territories (Urquhart 1982). Also, there has been increasing attention to marketing muskoxen wool (Qiviut), a wool that ranks with Vicuna wool in high quality. The value for Qiviut has escalated to about $160/pound and has provided initiative to domesticate and farm muskoxen (Young and Greer 1975). Also, the promise of commercially raising breeding stock has escalated the value of live animals. The Northwest Territories Government has set a price of $5000 per captured calf. Captive stock from zoos and game farms retail for about $15 000 per animal.

The hide and horns of muskox have become desireable to trophy hunters. Currently, there is a limited sport harvest in the Northwest Territories (Urquhart 1982). In 1981, revenues collected from 60 sport hunters was $400,000.

With the increasing interest in tourist lodges and wilderness trips in the north, muskox has become an important asset in tourism promotion. Finally, the muskoxen has become important in providing raw material to a growing industry of Inuit arts and crafts.

From our limited observations of North Slope muskoxen, there appears to be a good potential for the growth and

maintainance of a viable, and economically important muskoxen herd in the northern Yukon.

RECOMMENDATIONS FOR FURTHER STUDIES.

WOLVES

1. Future wolf inventories in the spring should be conducted during late April and early May when snowcover is present. This would allow for tracking surveys to be used to locate wolves and their activity areas.

2. Wolves should be radio-instrumented during the same period to assist in the location of denning sites.

3. A winter live-snaring program should be initiated in the Old Crow region, utilizing District Wildlife Branch staff to radio-instrument a sample of Porcupine River wolves. Information collected will allow us to determine the territorial nature of northern Yukon wolves that winter in the Porcupine River drainages, adjacent to the North Slope.

4. Wolf dens should be visited to collect summer prey remains.

5. The northern Yukon wolf harvest trends should be determined. The communities of the MacKenzie delta and Old Crow should be surveyed; natives and non-natives included.

6. The minimum period of wolf studies should be 3 years to allow for sufficient collection of ecological and harvest data.

MOOSE

1. Spring and early winter moose surveys should be carried out in the northern Yukon. Judging from our experience with the Supercub aircraft, we recommend that aerial census can be efficiently conducted with this aircraft type, for minimal expense (< $10,000/survey). Spring surveys should be conducted in early-mid June, prior to shrub foliation.

2. A cross-section of various moose age and sex classes should be radio-instrumented to determine seasonal movements, productivity, calf survivorship, habitat requirements, and areas of potential harvest pressure.

MUSKOXEN

1. Annual spring censuses should be conducted to determine population trends. Composition counts should be a priority to document sex ratio, productivity and calf survival rates.

2. A number of Yukon muskoxen should be radio-instrumented to determine seasonal range use patterns and reproduction rates, and to assist in determining herd distribution.

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