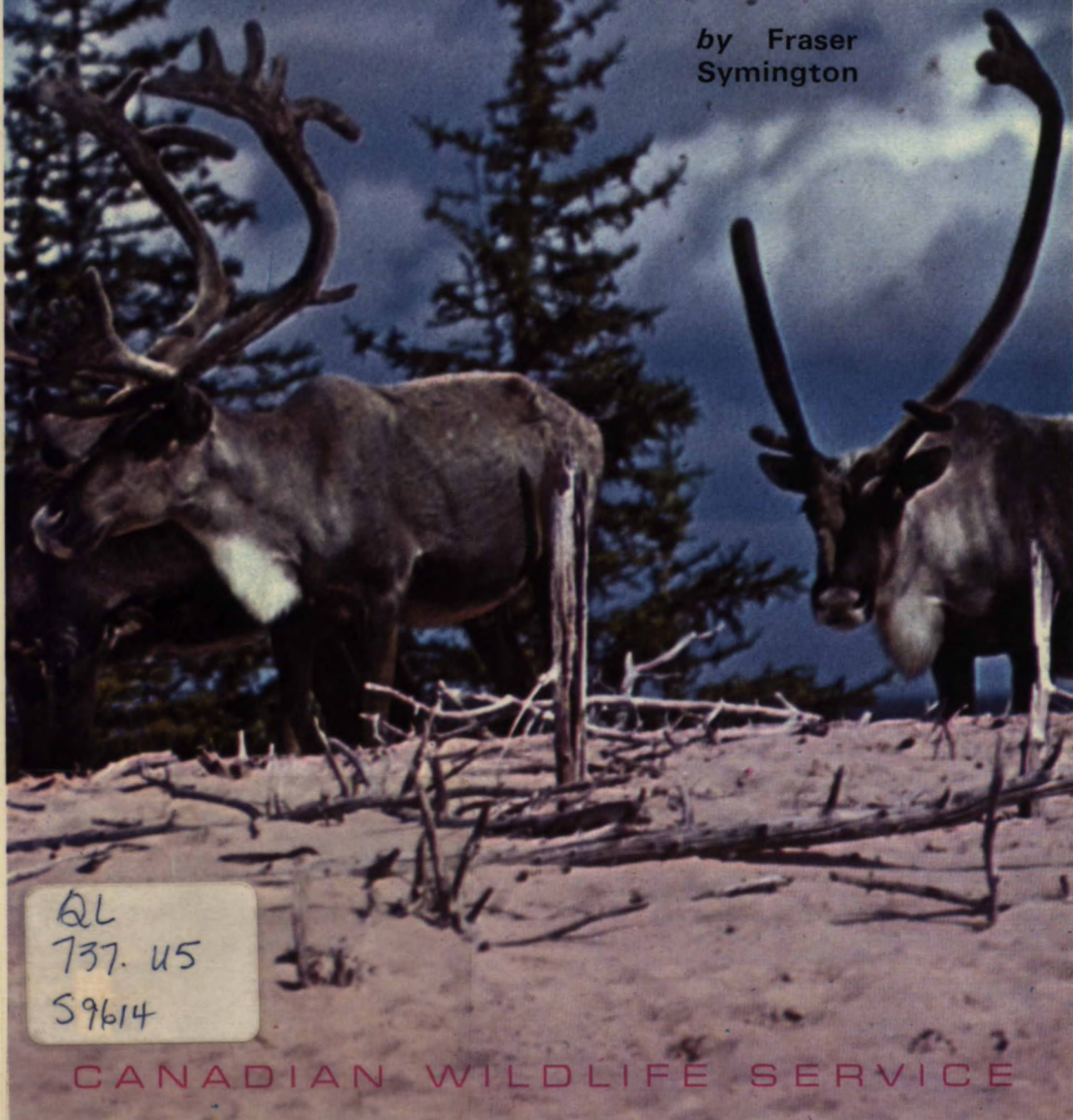


TUKTU

a question of survival

by Fraser
Symington



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CANADIAN WILDLIFE SERVICE

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The barren-ground caribou roams the tundra and taiga. It is a vast, sparsely populated land of muskeg, sand plains, lakes and rivers, rugged granite outcrops, and scrub forests. Temperatures range from a summer high of 90°F to a winter low of -60°F. Snowfall is generally lighter than in Southern Canada.

Great herds of caribou, such as this one near the Thelon River, could disappear from the arctic mainland. In 1900 there were 2 to 3 million caribou, but now there are only about 200,000. (Donald Thomas)





Fear and curiosity mingle in this small herd at the approach of a human. (Robert Ruttan)

A meandering water course shows the poor drainage characteristic of the tundra. Caribou trails made by generations of migrating herds are visible beyond the stream. (Robert Ruttan)



The barren-ground caribou spends the summer months in the wide-open tundra north of the tree line. As cold weather approaches in September or October the animals start to migrate south and west over the rugged terrain.

Long ago the caribou were killed from large migrating herds with primitive weapons at close range, and the animal was not at a great disadvantage.

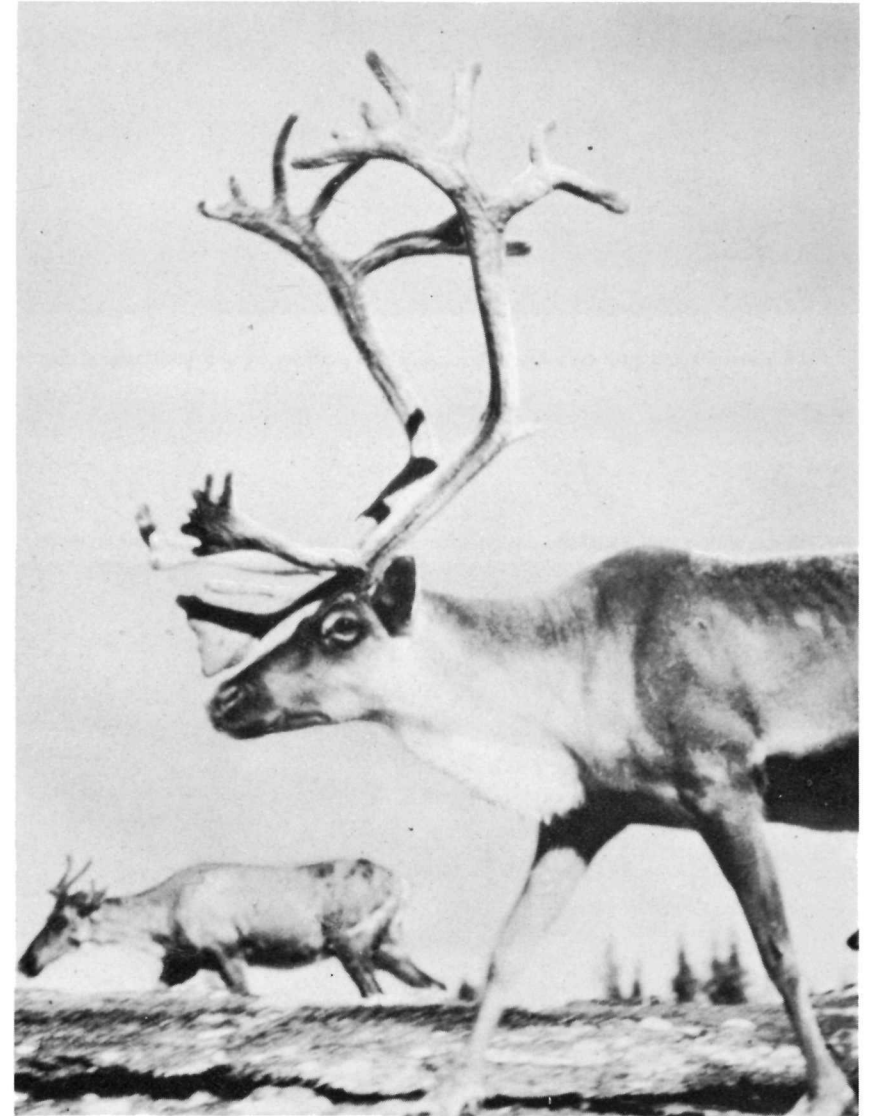
The barren-ground caribou has several names, including "Tuktu", "Ethan", and "Deer" (short for reindeer). The caribou runs with long strides and head held high, and the foot bones make an audible clicking sound when the animal is running.

The caribou is adapted to its rugged environment, but several factors, both natural and man-made, have endangered its survival. Man's carelessness has caused fires that destroy the lichens that caribou eat during the winter months when they migrate south of the tree line. And the lichens can take up to 100 years to grow back. Caribou can't live in recently burned-over areas and must move away to find food elsewhere.

These four large bulls are running from flies. (Donald Thomas)



A massive rack of antlers in the final stage of velvet is borne by a bull in good early summer condition. (Donald Thomas)



On migration the great herds flow over the rugged terrain and cross even rivers and lakes in their path.

In the old days hunters erected drift fences that led the caribou to lakes or rivers. Women and children would scare the caribou into the water where they were speared by hunters in kayaks or canoes. Other fences led caribou past places where hidden hunters killed the animals with bows and arrows. Fences were built in the forest too, and hunters arranged snares across openings to catch the migrating caribou.



Buoyed by body fat and dense, light pelage, caribou ride high in the water as they cross Beverly Lake.
(Donald Thomas)

An Eskimo with a typical inland caribou-skin kayak tows a speared caribou to shore. *(National Film Board)*





Typical Eskimo mukluks of the western arctic with caribou-skin legs and moose-hide soles. (Alan Loughrey)

An Eskimo winter tent of caribou skins at Bathurst Inlet. (Alan Loughrey)

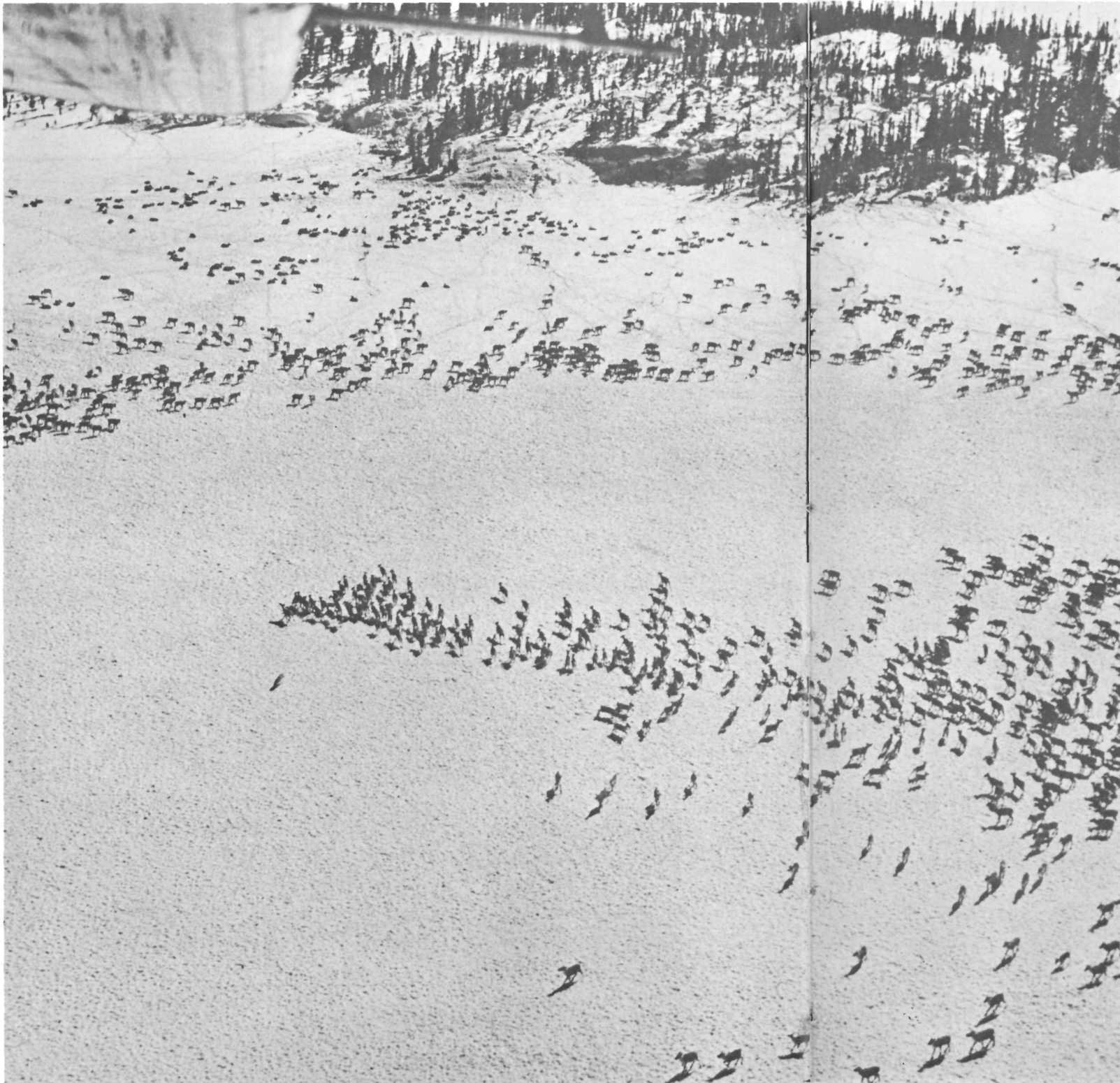


The barren-ground caribou once provided northern people with almost everything they needed to live. Bones were used to make needles and utensils; antlers became sled runners or tools; melted fat was burned for fuel and light; and the skin was made into clothing, tents, and kayaks. Even today, the caribou's flesh is needed for food; the skin for light, warm clothing; and the sinew for thread.

Once the caribou had to fill the requirements of only a few hunters and their families, but today there are many more people living in the North. Because there are more children and because people live longer, more food is needed. But there are now fewer caribou to hunt.

A Chipewyan woman in northern Manitoba dries a supply of caribou meat. Sometimes the meat is smoked; sometimes a form of pemmican is made by pulverizing dried meat and adding heated fat. (Manitoba Game Branch)





Some hunters kill more caribou than they can take home, or they cache caribou meat and then forget to use it. Others use only part of the carcass and feed dogs with caribou meat, instead of fat seal meat, fish, or dog meal.

Wolves follow the barren-ground caribou wherever they go and kill them when they can. Herring gulls, ravens, bears, and foxes feed on the carcasses of dead caribou.

Wolves chase the caribou in relays, but usually only the stragglers are taken. Caribou can move quite quickly.

A caribou herd reacts typically to a pursuing wolf. Those nearest the wolf are retreating at a gallop; others are changing route, nervous but not panicky; and farther away the animals move quite casually. (Frank Banfield)

A frightened herd of cows and yearlings on the dead run through powder snow. (David A. Munro)

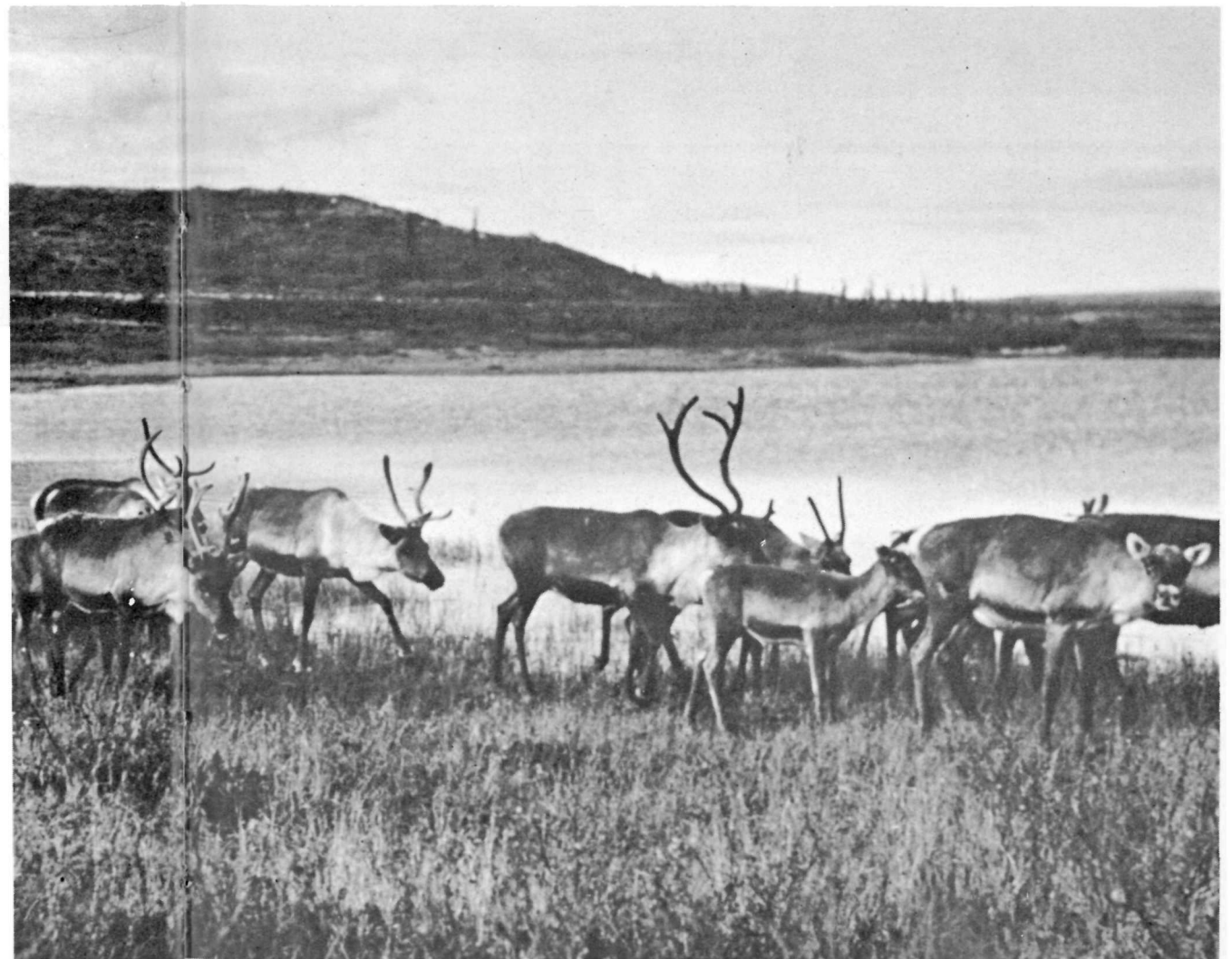
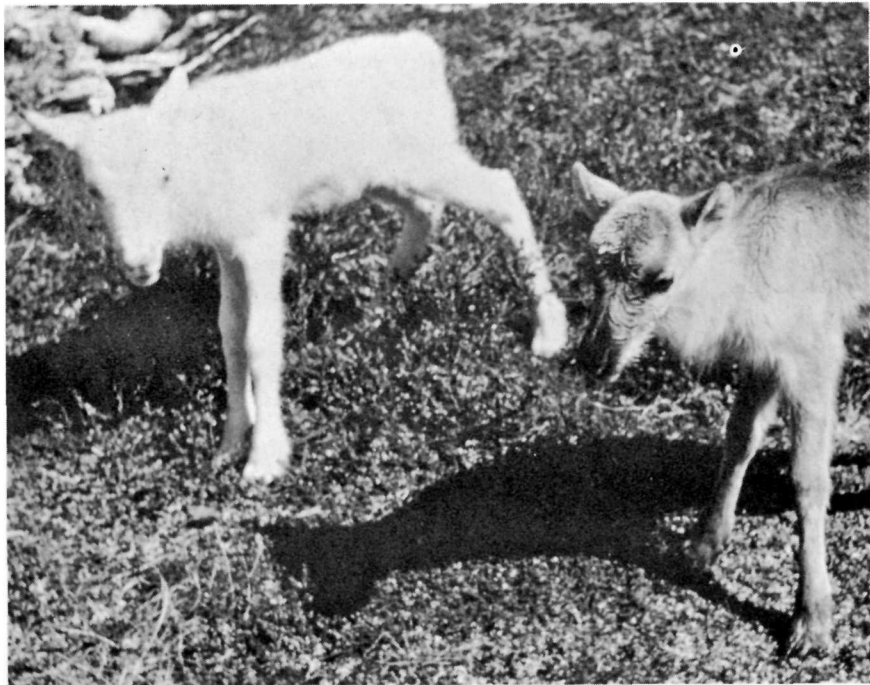


Breeding occurs during the autumn migration, and the cows calve after their return to the barrens in the spring. In some years bad weather kills many newborn calves.

The North is changing. Trapping used to be an important source of income, but people are learning new skills to earn a living. However, there are still people who live off the land, and the decline of the caribou has caused them much hardship.

Caribou on the Thelon. (Dalton Muir)

An albino and a normal caribou calf at Beverly Lake. (Donald Thomas)



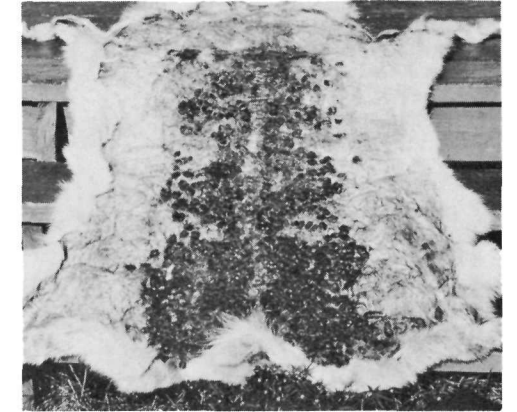
Sometimes the caribou break limbs when travelling in rough country.

The pictures below and to the right, showing the barren, glacial detritus, the stunted black spruce of the taiga, and the scudding clouds, have something of the feel of the caribou country.

Bulls on the move through the taiga. (Donald Thomas)



Each of the dark spots on this hide of a caribou killed in the spring represents a warble-fly larva. Such heavy infestation is not unusual in adult caribou in the barrens. (Alan Loughrey)



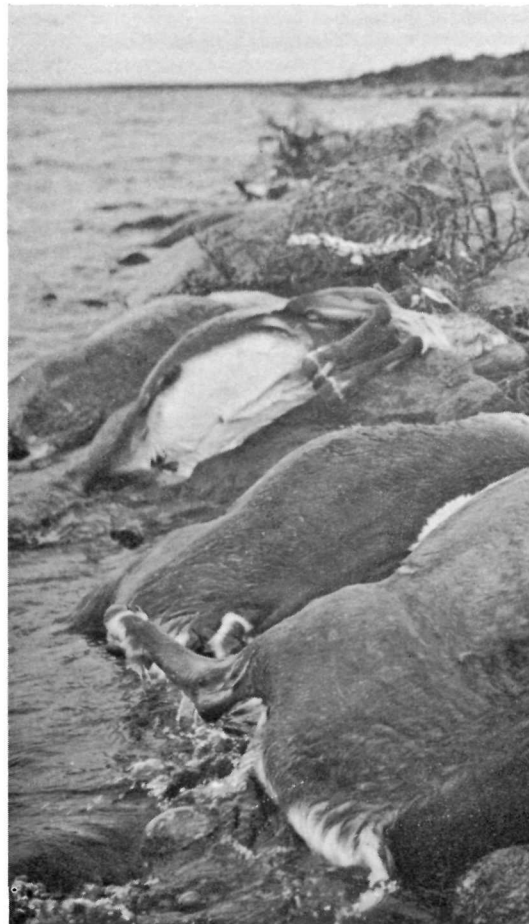
Another of the natural hazards to caribou is the warble fly. Suffering the summer attacks of warble flies, a lone female stands in the typical head-down position, enduring it. (Ernie Kuyt)



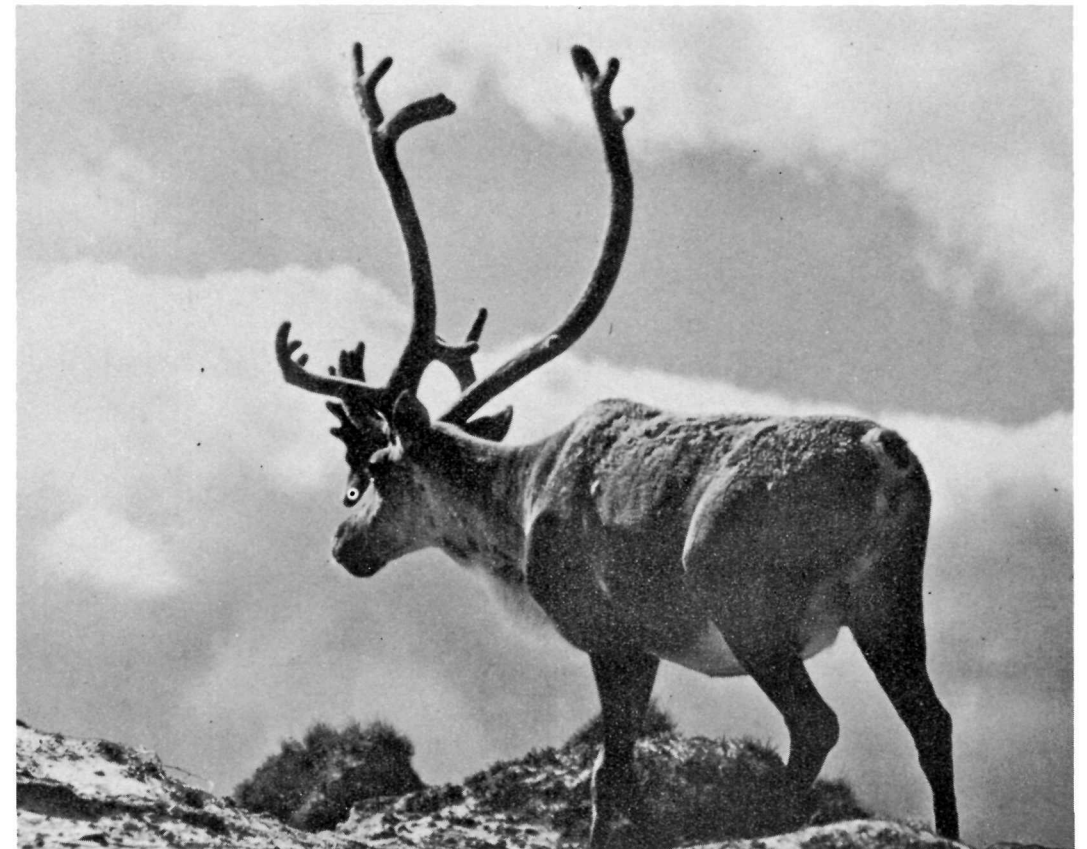
Sometimes more caribou are killed than can be used and the meat is wasted. In some years many caribou drown when making water crossings or when they fall through thin ice on lakes and rivers.

The barren-ground caribou has survived wolves and accidents and sickness and even man's bows and arrows for thousands of years. The new killer is man with a rifle, man with careless fires. But the problem is not one simply of game management; there are some Indians and Eskimos still living off the land, so the problem is a sociological one too.

Indiscriminate killing left a lake shore strewn with carcasses. (Manitoba Game Branch)



Unless the decline of the barren-ground caribou can be halted, the stirring sight of great migrating herds of caribou flowing over the rugged barrens may fade into dim memory. And Canada will be the poorer for it. (Donald Thomas)



TUKTU

The caribou of the northern mainland

by Fraser Symington

CANADIAN WILDLIFE SERVICE

Natural and Historic Resources Branch

Department of Northern Affairs and National Resources

Issued under the authority of the
HONOURABLE ARTHUR LAING, P.C., M.P., B.S.A.,
Minister of
Northern Affairs and National Resources

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FOREWORD

Over the past sixty-five years, the barren-ground caribou have declined from numbers roughly estimated in millions to a present count of about two hundred thousand.

This decline resulted in part from a change in the way of life of the people who depended for their livelihood on the caribou. They needed to harvest more than they had required before the trade in furs was important to them. The improved equipment secured through trade provided the means to take a larger annual crop. But the basic resource — the caribou herds — could not stand this heavier demand.

The shrinking herds have themselves brought about a further change in the way of life of the peoples. There are no longer sufficient animals to support the economy which developed in the twenties and thirties. If people are to continue to live in caribou country, alternatives must be discovered and expanded. Perhaps also there is room for more efficient management and use of the herds, so that they can continue to make some contributions to the economy of the region and the life of the people.

The Department of Northern Affairs and National Resources has a dual interest in the caribou. Through the Northern Administration Branch, we are concerned for the well-being of the people who have traditionally relied almost exclusively on them. Through the Canadian Wildlife Service, we are concerned with the survival of the caribou themselves and the best management of the resource in the interests both of the residents and of the nation as a whole. These are not competing interests, but they do imply different approaches to the same problem.

This book is written primarily from the wildlife management viewpoint. It is not intended as a statement of departmental or government policy, which must weigh social and other considerations outlined here only in the relatively narrow terms of their effect on the caribou herds.

An understanding of the biology of the caribou is essential not only to the management of the resource, but also to the development of policies affecting the people resident in the region. The book is published in the hope that it will be useful not only to those who are interested in and concerned about the caribou, but also to those who are concerned about the Indians and Eskimos of northern Manitoba, Saskatchewan, and the Keewatin and Mackenzie Districts.

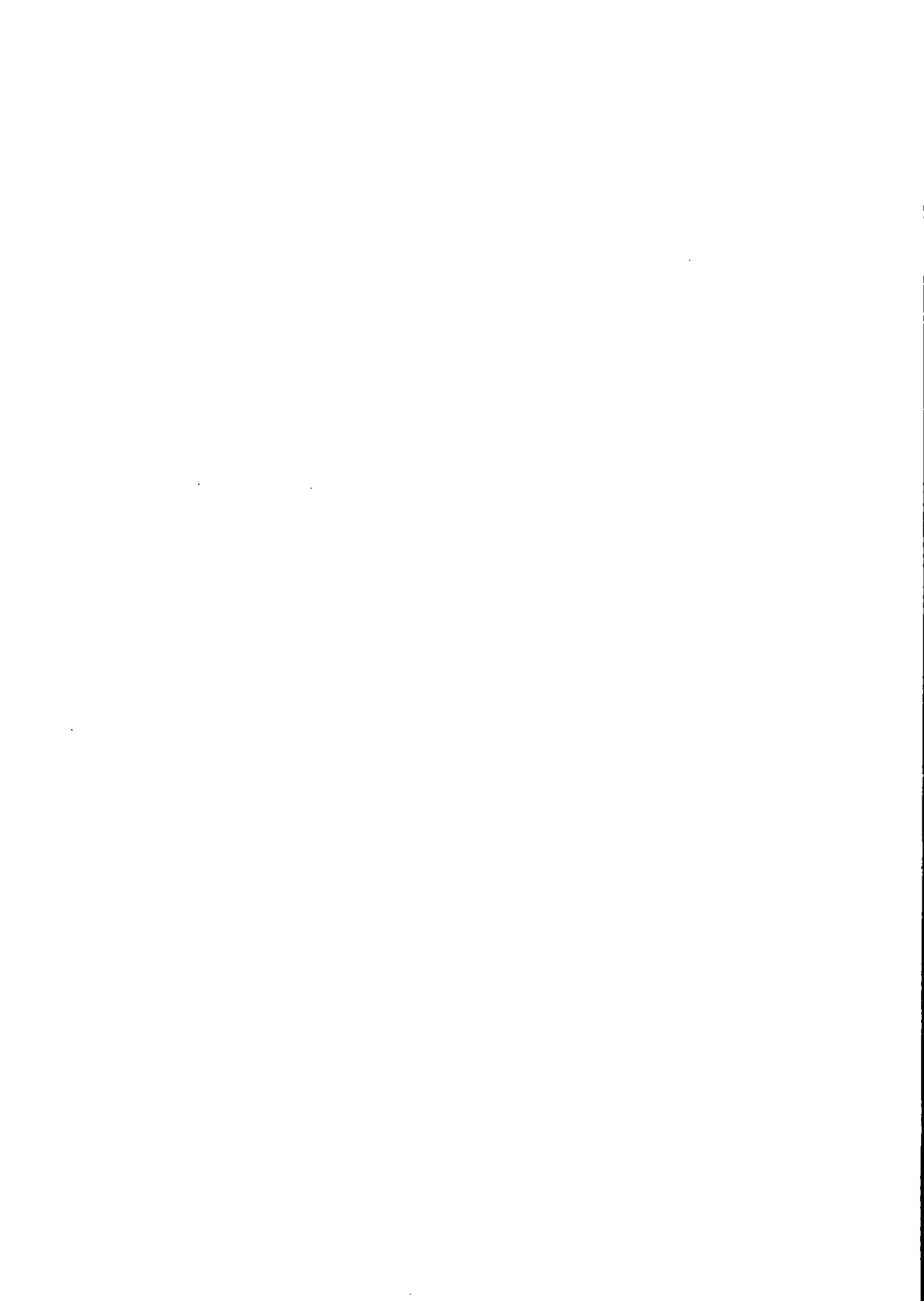
ARTHUR LAING

TUKTU

"Tuktu" happens to be an Eskimo name for caribou, but there are many other names, both Indian and Eskimo. To most readers "Tuktu" will suggest distant places and unfamiliar customs. Such is the land of the barren-ground caribou.

The species is distributed throughout Baffin Island, Coats Island, Ungava, and portions of northern Ontario. Some caribou are found in northwestern Yukon, but the largest herds range the wilderness region of the central mainland—the districts of Mackenzie and Keewatin, and the northern portions of the three Prairie Provinces. The central mainland herds are of great economic and social importance to Canada, and particularly to the Indians and Eskimos of the region.

THE LIVING TIDE



THE LIVING TIDE

As April progresses, the snowline recedes northward through the forest like surf retreating on a shallow shore. Patches of white withstand the sun and mark ravines, lakes, and steep north-facing slopes. The retreating snow carries with it a multitude of caribou that over-wintered in the forest and now move north with haste. Urged by the high suns of May, the snow retreats through the land of the Little Sticks and the caribou pour out on the tundra, pell-mell toward the calving grounds of Keewatin and Mackenzie.

The region from which they emerge stretches in a two- or three-hundred-mile-wide band, the seemingly endless distance between Great Bear Lake and Hudson Bay. It is a country of stunted forests, rugged Pre-Cambrian granite, great sand plains, and of many ponds, muskegs, rivers, lakes, and streams.

The localities to which the caribou are going with such urgent haste are much smaller — the rolling highlands of the central barrens, which the females, following an age-old instinct, favour as calving grounds. One major calving ground is located near Beverly Lake — hill country covered with the debris of the glacial age: rock rubble, moraines, great gravel ridges known as eskers, huge scattered boulders, scores of little lakes, and many lost meandering streamlets.

As their calving time comes on them, pregnant cows drop out of the moving herd to choose a suitable location on the uplands where each gives birth to a single calf. The yearlings and barren cows that have swept forward in the van of the migration seek the richer grazing of the lowlands.

By the end of June most of the females, with calves at heel, have reunited with the main herds on the lowland pastures. The groups of mature bulls — often laggard on the northern migration — are now

with or ahead of the main herds. The summer migration, interrupted by the calving, now continues — erratic, seemingly purposeless wandering. In early August the herds may disperse completely into small groups over the whole of the barren grounds. Some herds may make a sudden mid-August journey south to the timber and then north to the open tundra again.

With the winds of late September driving chill from the northwest, bringing the occasional blizzard, the scattered deer* bunch into groups once more and move toward the timberline. Some may swing back onto the tundra for a brief October foray, then south again inside the shelter of the forest. By mid-October the rut is in progress, ending by the first week of November. Then the various herds move to their winter feeding areas and disperse loosely among the sparse timber to graze during the winter on lichens and other plants.

With many variations this is the cycle of life and migration of the caribou of the central Arctic. It has been going on for thousands of years in definite, immutable cycle, swinging like an annual tide across the magnificent ocean of sedges, dwarf shrubs, and lichens between the forest and the northern sea. But of late years the surge of this living tide has diminished, much as the great annual swings of buffalo on the grasslands south of the same forest had diminished a century previously. Within the past half-century the caribou herds have declined from their historic number — perhaps two and a half million — down to about a tenth of that number. There are many known and many suspected reasons for the decline — a complex interbalance of cause and effect that has yet to be fully understood.

*Northerners usually refer to caribou as "deer".

THE CARIBOU EATERS

THE CARIBOU EATERS

The caribou are not alone on their journeyings. The wolf packs move as the caribou move; the barren-ground grizzly bear ambles over the calving grounds and perhaps does some share of killing; the wolverine of the barren grounds and timber country may take the odd calf or even adult; the herring gull serves as a scavenger wherever the caribou move; and the ravens and foxes share the bounty of carcasses in the wake of the passing herds. But of all predators, man is the most important.

In times past, the lives of all inland Eskimos and Indians of north-central Canada hinged on the barren-ground caribou. The caribou remains important to these native people today; not because they are likely to starve without caribou, but because the alternative to caribou may be undesirable dependence on the white man or undesired change to the white man's ways.

It is thought by many that kill by man has been the key factor in the reduction of the herds to perhaps a tenth of their former number. Others are not convinced that human kill is the basic cause of the decline.

About ninety-nine and nine-tenths per cent of all Canadians live south of the caribou country. To them, caribou mean neither sport nor meat on the table. Most Canadians are not involved personally in the caribou problem, but nonetheless are now faced, as citizens, with the question of whether to try to save the caribou or allow them to decline still further, to the verge of extinction.

If the central Arctic were being systematically "ranchcd" with caribou herds, the value of these herds would probably be not less than a hundred million dollars. On the other hand, if we neglect the steps that lead to effective caribou management, these deer may

become so scarce that they will have no economic value. It is a plain fact, and an urgent fact, that caribou are needed to support native peoples in the present generation, and to support northern development in the next generation.

The question of *whether* to do something to save the caribou is easier to answer than is the question of *what* to do. Despite their numbers, the shifting herds are difficult to study scientifically in the vast reaches of the North. But notwithstanding, much research has been done during the past decade and more. The research is conclusive enough to show that a hard-and-fast program of scientific caribou management is impossible; yet it does provide a basis for carefully planned action.

Considering that human kill is undoubtedly a major factor in the decline of the herds, a person unfamiliar with the North might reasonably think of provinces where game laws have contributed to an abundance or over-abundance of white-tailed deer, and ask, "Why not make adequate game regulations and enforce them?"

It's not quite that simple. To understand why, one must understand a good deal about the interwoven factors of the land, the caribou, and the people.

KEEWATINOOK —
THE LAND WHERE THE NORTH WIND RISES



KEEWATINOOK —

THE LAND WHERE THE NORTH WIND RISES

"Is [heaven] more beautiful than the country of the musk-ox in summer when sometimes the mist blows over the lakes, and sometimes the water is blue, and the loons cry very often?"

Saltatha

The land slopes gradually "down north" from a height of land roughly coinciding with the northern limit of settlement. Off its broad flanks many rivers drain into Hudson Bay to the east, and to the west into the great river, the Mackenzie. The Back River and many minor rivers drain directly into the northern ocean.

The caribou country can be divided roughly into three great zones according to the plants that grow in them. First, in a band one hundred to five hundred miles wide, north of the settled region, is the "commercial forest zone". This is country familiar to most Canadians. Much of it supports spruce, pine, tamarack, poplar, and birch timber of a size suitable for pulp and lumber. The timberland is interspersed with lakes, muskegs, streams, and willow-and-alder-grown "moose pasture". Much of this zone is on the rugged terrain of the Canadian Shield.

The second zone, and a more important one to the caribou, is the taiga,* where stunted timber and shrubbery struggle to survive in the cold, dry climate.

Northward again lie the barren grounds — a vast prairie of grasses, sedges, lichens, tumbled rocks, occasional islands of stunted tree growth, and ill-defined, ever-visible water systems.

*A needle-leaved (usually evergreen) parkland or savanna . . . the Hudsonian taiga does not have a deciduous facies like that of the larch zone in Siberia . . .
(from *Dansereau*)

The Landscape, a Legacy of Glaciers

Much of the six hundred thousand square miles of the caribou range is underlain by the ancient rock of the Pre-Cambrian Shield. In many regions the gnarled outcrops of the Shield are visible, lichen-covered and in many ways altered by ice, water, and weather from the time, hundreds of millions of years ago, when they were formed by volcanic eruption. Ernest Thompson Seton, who visited the north in 1907, described the central Arctic dramatically in terms of its glacial origins:

"Imagine a region of low archaean hills, extending one thousand miles each way, subjected for thousands of years to a continual succession of glaciers, crushing, grinding, planing, smoothing, ripping up and smoothing again, carrying off whole ranges of broken hills, in fragments, to dump them at some other point, grind them again while there, and then push and hustle them out of that region into some other a few hundred miles farther; there again to tumble and grind them together, pack them into the hollows, and dump them in pyramidal piles on plains and uplands. Imagine this going on for thousands of years, and we shall have the hills lowered and polished, the valleys more or less filled with broken rocks.

"Now the glacial action is succeeded by a time of flood. For another age all is below water, dammed by the northern ice, and icebergs breaking from the parent sheet carry bedded in them countless boulders, with which they go traveling south on the open waters. As they melt, the boulders are dropped; hill and hollow share equally in this age-long shower of erratics. Nor does it cease till the progress of the warmer day removes the northern ice dam, sets free the flood, and the region of archaean rocks stands bare. . . .

The glaciers withdrew from the central mainland some ten thousand years ago. Relieved of its tremendous burden of ice, the land has been rising ever since. It is rising so fast that the little cove in Churchill Harbour, in which Jens Munck anchored his ships in 1619, is now dry land. Far distant from the present coast in many parts of the Arctic mainland, raised beach-lines can be seen where the surf of ancient oceans once pounded the slopes of hills now hundreds of feet above present sea level. Action of the sea over large areas of the central mainland is also evident in the fact that much of the rock is sedimentary, laid by water long ages ago, but long ages after the original rock had been pulverized by action of weather and ice. Great sand plains are also found in some areas, laid down by the action of the prehistoric seas.

Throughout much of the caribou country the northeast-southwest trend of the water courses testifies to the mighty strength of the glaciers. Thousands of feet thick, these mountains of moving ice bulldozed valleys out of solid rock.

In some regions of both the taiga and tundra, the granite hills of

Pre-Cambrian rock dominate the landscape — a jumbled terrain with almost no soil and little vegetation. No vehicle less flexible than a dog team can travel such country, and no major herbivore other than the caribou and muskox can find sustenance in it. In many areas the granite or sedimentary rock is covered with glacial till soils. Glacial till is an unusual soil that has never been much worked over by water, and remains much as the glaciers dropped it — rocks, large and small, intermixed with gravel, sand, and grains of sediment. Mixed with these, especially in the low-lying, wet areas, is humus from decaying sphagnum moss, lichens, and other vegetation.

The tundra of the central mainland is a vast plain with only a few major hill ranges, these seldom rising more than 1,000 feet above sea level. Here and there, in areas such as the calving grounds between Beverly Lake and Back River, the land rises in rolling hills to a height of 1,100 feet. East of Artillery Lake the ground rises to 1,300 feet. The Arctic coastal ranges and hills in a few other regions reach 2,500 feet. Broken hills of bare granite and terraced scarps of limestone occur throughout much of the caribou range, and eskers and sugar-loaf hills are common enough features of the landscape.

The Climate that Rules the Caribou Country

Climate governs all life, and the climate of the caribou range is one of extremes. In July the tundra of the far north soaks up nearly as much heat from the ever-visible sun as do the equatorial grasslands during the same month. Yet during January the lowest daily temperatures average 50 degrees below zero over the whole of the caribou range.

Winter lasts from late September to late May or early June. The howling nor'westerly blizzards of midwinter sweep snow before them for days on end, yet on most of the northern Arctic mainland less than 30 inches of snow fall each winter — two and one-half feet of dry powder snow which, melted, might produce three inches of water. Driven by the wind off the uplands, it compacts into a thin, hard layer on the plains and into deep hard-packed drifts in the

valleys and lee slopes. The country is wet mainly by virtue of its short summers and low total evaporation, and because its permanently frozen soil and rock foundation forbids seepage of water and the development of drainage channels that could carry the rains and spring melt-water down to the oceans. Farther south, in the forest region, snowfall is often 50 or 60 inches. High winds are not common in the forest, so the snow remains deeper and softer.

The weather of the Arctic does strange things. Winter snow may become so compacted by wind that a fourteen-ton tractor will make a track only an inch or two deep going over a four-foot drift. Old tracks of any kind stand out in high relief after wind has eroded the less compacted snow from around them.

A cold still day with a low cloud cover gives rise to most unusual phenomena. Sound carries a great distance. Caribou walking a mile distant may be heard quite distinctly because the sound waves are reflected from the overcast.

In the taiga country it is sometimes possible to locate caribou bands and even individuals by looking for the clouds of condensed vapour that hang above the animals, visible above the low forest cover.

In certain weather conditions light waves are bent so that objects below the horizon line come into view. This phenomenon is called "looming". When the sun is high the snow reflects sunlight with dazzling intensity. By early March dark glasses must be worn to prevent snow-blindness. When the sun is low in the sky and there is a low overcast, the bane of the northern traveller occurs — the dreaded grey-out. The muted greys of the snow blend into the dull greys of the overhanging cloud, obscuring the horizon and baffling perspective. A hump in the snow may look like a distant hill, whereas it may be merely a snow-covered stone a few yards away. Small hummocks and hollows cause walkers to stumble or fall, and air-plane pilots may make serious errors in judgement of distance. Even more dangerous to aviators is the white-out that occurs when the whole landscape is obscured by mist or drifting snow, and visibility drops to yards, sometimes very suddenly.

Farther south, within the rim of the northern forests, average temperatures and winds are less severe. Temperatures may fall to 50 or 60 degrees below zero, sometimes for weeks on end, but such temperatures are seldom accompanied by high winds. Thirty below

temperatures with 30-miles-per-hour winds have been recorded at Fort Chipewyan on Lake Athabasca, but such severity is unusual.

Southward again, in the closed forest, winter temperatures may be lower than on the prairies to the south, but high winds are unknown except on the larger lakes. Human beings are at least as comfortable outdoors in the forest as they are on the prairies.

Total annual precipitation is extremely low on the tundra and taiga, averaging ten inches or less. Total precipitation in the forest region varies from 10 inches to 13 inches per year. Yet drainage is generally so poor, and total evaporation so slight, that the whole of the caribou range is laced with rivers, ponds, swamps, and major lakes. A quarter to a third of the total range is either water or muskeg.

The transition from season to season in the northern regions is abrupt, and the seasons themselves intense. The winter with its bitter cold and pitiless winds ends with the coursing of the first rivulets in May. The summer season is short and growth is quick in the long days, as it must be to complete growth cycles between thaw and freeze-up. Yet even in high summer, blizzards may sweep the tundra. In a very short time — sometimes a matter of minutes — the weather may change from a sunny 60 to 80 degrees to snow or chill rain driven by a fifty-miles-per-hour wind.

Vegetation of the Closed Forest Region

A line drawn from the north end of Lake Winnipeg past the southeast tips of Reindeer, Cree, and Athabasca Lakes, and then along the Mackenzie Valley to Fort Good Hope would approximate the southwest boundary of the present range of the caribou. If a bush pilot were to fly this line, he would cover close to 1,500 miles, and much of it would be over forest able to produce timber of saw-log size.

Leaving Lake Winnipeg, he would fly over the western end of the great northern coniferous forest, where black spruce predominate on the lowlands and mix with jack pine and tamarack on the uplands. In the river valleys and on south-facing slopes, the pilot would see the lighter green of white spruce forests, with patches of poplar

and balsam fir. Everywhere through this forest region he would see a scattering of white birch. This is a region of many rocky, parallel ridges separating poorly drained depressions and numberless narrow lakes. There are rocky, barren hills of Pre-Cambrian granite, and numerous muskeg valleys.

Passing south of Cree Lake the pilot, at 3,000 feet or more, would be able to see not less than 100 separate lakes and ponds at one time. Some are growing smaller year by year with the growth of sphagnum moss; others are ringed with white sand beaches and cut by sandspits. In the southern portion of this region there are great fields of drumlins — small whale-backed ridges.

Between Cree Lake and Lake Athabasca he would see mainly open forests of jack pine on the great sand plains of the region. Where soils are finer textured, black spruce and tamarack grow. Deep valleys cut the generally level land, and toward Lake Athabasca rolling dune country shows yellow-buff among the evergreens.

After passing Lake Athabasca into the Mackenzie Valley, the pilot would fly over some of the best timberland in the northwest. The flood plains and river flats of the Valley produce fine stands of white spruce and balsam poplar, and pines and poplar are abundant on the valley slopes and benches, with black spruce in moist areas. Throughout all the forest regions there are extensive burned-over areas.

This great region of forest is the usual limit of the caribou's winter movement south. Occasionally, bands move down as far as the headwaters of the Churchill River. In 1951 caribou were in the vicinity of Buffalo Narrows in Saskatchewan. They often come to Upper Foster Lake, and sometimes to Pelican Narrows. Their farthest-west migrations may take them to the Mackenzie River occasionally, and their farthest-east migrations across the Nelson River to Molson Lake.

The Taiga — the sub-Arctic Parkland

The term "taiga" is, like "tundra", of Siberian origin, and is used to describe the zone of open sub-Arctic woodland that extends from Hudson Bay almost to the Mackenzie Delta. The taiga zone varies

in width from less than 100 to more than 400 miles. Great Bear Lake is within that region, as is the western part of Great Slave Lake and all of Wollaston Lake and South Indian Lake.

Harsh climate, thin soils, and frequent fires have combined to keep the forest sparse and the trees small. Areas of bog, muskeg, and barren rock alternate with open stands of stunted trees. There are small sheltered areas where soil is good, and these produce good stands of timber. But a typical landscape is one of scraggy black spruces, ten to forty feet high, growing in open formation, interspersed with occasional tamaracks and perhaps the odd grove of stunted birch or poplar. Between and among the sparse conifers is a shrub layer, usually of dwarf birches or Labrador tea. In the extensive open areas is a fine sward of light grey-green or yellow-green caribou mosses.

The "permafrost line" runs in a very irregular line from the Ontario shore of Hudson Bay northwestward, passing north of Reindeer Lake and Lake Athabasca and along the north shore of Great Slave Lake. All land to the north of this line is permanently frozen except for 18 to 36 surface inches that thaw in summer. (High dry sand or gravel thaws more deeply.)

The tree-growth of the taiga country gradually diminishes as the climate becomes more extreme toward the edges of the tundra. On the northern fringes, trees taper sharply and grow so slowly that the annual growth rings can be counted only with a magnifying glass. On the edge of the tundra, an ancient spruce, survivor of 300 winters, may have achieved a height of 8 or 12 feet and a ground-level diameter of 12 inches.

The Tundra

A large-scale map shows the barren grounds as a land of lakes and rivers, yet no map shows it as it mostly is — a constant succession of ponds and minor lakes, with here and there a large body of water or waterway. Occasionally, a range of hills shoulders up from the broad plains, or the crested length of a sand or gravel esker marks the ancient course of a glacial river, or fields of rock scree extend so tumbled and forbidding that they would seem to bar all life from moving over or existing within them.

Yet despite the roughness and general austerity of the land, the term "barren ground" does not fairly describe it, especially in summer. In no place on the tundra where soil exists is it devoid of vegetation. Even the granite rocks bear their gaudy crops of lichens, and each sheltered nook among the rubble rock contains its tiny quota of small flowering plants and shrubs. Vast plains of sedges, and glades of caribou moss extend to the far horizon; the fringe of each watercourse supports its shrubs and sedges; and in season the hills and rocks and vales blaze with the colour of flowering plants: mile upon mile of cotton grasses wave their white plumes in the breeze; fields of fireweed extend bright pink over the rocky hill-sides; intensely crimson bearberries provide flamboyant contrast to the deep green of the alpine cranberry bushes and the green-grey tumble of Keewatin rock. Literally hundreds of other varieties of sedges, lichens, flowering shrubs, ferns, and mosses add their small quota to the colour and diversity of summer plant life in the Arctic.

The "Feel" of the Caribou Country

This, then, is the general environment in which the caribou lives out its life, walking on snow or wading through snow during two-thirds of each year. This land is so vast that all the "endless prairies" of western agriculture are small by comparison. It is so diverse that few men know all its varied regions.

This northern expanse of undulating land has many things in common with the northern oceans of the world: the harsh implacable winters bereft of visible life, the many birds and animals that are found there during its brief ice-free growing season, and the multitude of minute plants that form the basis for their lives. Like the sea, it is moody and dangerous at times, inviting and exhilarating at other times. Like the sea, it is an environment to which man adapts with difficulty. And like the sea it exerts a strange, romantic attraction on many men who know it.

The eyes of some beholders have seen in the reaches of the barren grounds a desolation so vast as to recall the myths of the land beyond the Styx: an iron land, a land of awesome, naked

distance, where the grandeur of empty sky above empty land dilutes the mind's ability to comprehend. But the eyes of many others have seen the beauty of broad, curving vale, black granite stark against green sedge glade, mist rising over hill-girt tarn, the loon's slim profile, dark shadows of wings in the spring night; the beauty of a land forsaken only of familiar things.

THE CARIBOU ON ITS NATIVE HEATH



THE CARIBOU ON ITS NATIVE HEATH

'No man knows the way of the wind and caribou'

Cree proverb

Physical Characteristics

The barren-ground caribou, *Rangifer tarandus groenlandicus* is adapted physically in various ways to cope with the rigours and dangers of its stern environment. Through the cycle of the year the importance of each of its characteristics becomes apparent. In the winter afternoons groups may gather from the adjoining forest feeding-ground to rest on the hard snow surface of a little lake. A resting band here is free from surprise attack by wolves, but the wind which was broken by the trees in their feeding area is keen on the open lake, perhaps moving 30-below-zero air at 20 or 30 miles per hour. Here, at rest in the intense cold, the short, rather stocky body formation of the deer tells in its favour, for it means a short circulation course for blood and a minimum of body surface exposed to the cooling effect of the wind. Light winter hairs are so closely spaced on the skin that the pelage resembles a deep-pile rug -- hairs erect and an inch or more long -- an effective windbreak and superb insulation. Ears, tail, and muzzle are well-furred, and tail and muzzle are short and thus protected from freezing. During the winter the fur becomes bleached, or the dark ends of the hairs break off, leaving the coat greyish white by early spring.

As the caribou begin to rise in the late afternoon and move slowly back into the forest, an observer would notice that their tracks on the hard-packed lake show as double crescent marks, made by the outer edges of the cloven hoofs. The edges of the hoofs are

sharp enough to assure the caribou a good footing except on glare ice and permit them to clamber about on granite hills seemingly suited only to mountain goats. The hoofs splay widely to support the deer on softer snow or muskeg. When the going is especially tough, the dew-claws, located to the rear, below the fetlock joint, provide additional support. The hoof outline together with dew-claw marks is larger than a man's hand with fingers extended. Caribou are powerful swimmers, as they must be to traverse their great range, and the reason for their ability is seen in the great paddle-like hoofs and the dense, buoyant hair which supports them high in the water.

The sharp, concave hoofs are also efficient snow shovels. In the winter feeding areas of the taiga the snow may be 15 to 40 or more inches deep and relatively soft. The caribou, in loose herds, wander about through the sparse timber seeking forage. When an animal senses palatable food beneath the snow — probably *Cladonia* or *Cetraria* lichens, it strikes out with its foreleg and hoof, with a smooth circular motion repeated almost too fast to be followed by the human eye, and within seconds has cleared a small feeding crater out of the snow, revealing the food beneath.

Like most deer, the caribou has a sensitive nose but, surprisingly in a deer of the plains, it has relatively poor eyesight. Caribou may react to the sight of an unfamiliar, moving object half a mile away, but are often completely unconscious of motionless objects. An example of this was seen by a biologist near Stony Rapids in northern Saskatchewan one mid-April day in 1957. Wearing a dark green parka with hood up, the biologist was standing motionless beside a ten-foot-tall pine, when a band of six does and two fawns appeared, walking downwind toward him. They all passed on his windward side practically at arm's length. They happened to change direction at that point, and walked away without catching his scent.

While the animals are congregated on the lakes before and during the migration, they are less wary than at most other seasons of the year. In April, 1949, biologists landed in a plane among the herds on frozen Ghost Lake, and were able to walk within 25 yards of the larger herds. As they walked through a herd of 5,000 animals, the herd divided to form a corridor for their passage, and fringes of the herd passed within 10 yards of their photographer. The pilot of the plane lassoed a yearling caribou with a mooring rope as the

herd rushed past him at a distance of about five yards. The biologists were struck by the perfect co-ordination among the animals of the galloping herd when it stampeded: each caribou racing in perfect control in the close-packed formation.

During the early spring and up to midsummer, the annual moult occurs. By August the adult bulls are in new pelage: rich clove-brown on back and flanks, darker on face and along the spine. The broad muzzle is covered with short white hair, and chest and legs are almost black. The "stockings" above the hoofs are pure white, as are the belly, rump, flanks, and the underside of the tail — a striking contrast to the general colouring. An area of light grey extends along the neck and shoulder, and down to the flank in a narrow strip. Bulls carry a flowing white throat mane in autumn and early winter.

About the same pattern of colour change occurs with the other ages and sexes, with minor variations in both colour and dates of colour change.

The moult begins about the end of June. A. W. F. Banfield, during a 1949 biological survey, visited the upper Hanbury River and found a wide swathe of matted caribou hair on the banks for many miles below favourite crossing points.

Bulls carry the largest antlers. Cows usually have antlers, but they are smaller than the bulls' and are often not symmetrical. Antler nubs appear on mature bulls in March, and by August the antlers are almost fully developed, but are still in velvet. During mid-September the bulls rub the dead velvet from the now-hardened antlers and carry them until shedding time in November or early December. A well-developed rack of antlers carried by a bull is a magnificent headpiece with palmate (shovel) brow tine and long beams each having palmate ends with several tines. The bulls' cycle of antler growth and shedding occurs a few weeks earlier than that of the cows and young stock.

Habits

A startled caribou may make a characteristic jump, rearing high on its hind legs and pivoting, then taking off at a fast gallop or flailing trot.

A closely pursued caribou in desperate flight has an ungainly running action: its head and neck turned back to observe its pursuer and its long thin legs with their large hoofs flailing wildly. Conversely, the pacing gait is a swinging action with tremendous reach that eats up distance with little apparent effort. A pacing bull in autumn presents a magnificent picture, his great antlers laid back, white throat-mane flowing, and legs swinging in a high-actioned powerful stride.

Caribou are much more approachable in herds than in small groups. A human can come closer without frightening them during the migration period than at any other time. In August they are usually wary, and only a competent half-mile stalk will bring the hunter within range of a band. However, caribou are most inconsistent in their behaviour; no one can accurately predict their actions and reactions. For example, during a summer research survey, biologists were lying fully exposed on a rocky hillside, observing caribou feeding in the valley below. The caribou drifted up the slope, feeding as they moved, and eventually came to within a few yards of the observers, showing no sign of fear.

Caribou usually feel safe in the presence of others of their kind, and hunters take advantage of this when stalking in open country. The hunter bends forward from the waist, one arm held up to represent antlers and the other down toward the ground to represent the head and neck of a grazing animal. This provides an approximate silhouette of a feeding caribou.

The Migration

All winter the caribou have waded through the sparse forest pawing for lichens. When not engaged with feeding they have rested on the open lakes, and have only occasionally indulged in flight when menaced by a wolf or hunter. They have moved unhurriedly over their chosen wintering ground, drifting from small watershed to small watershed as the depth of snow and presence of suitable range dictated. The barren cows are fat if the range is good; the bulls, probably in groups far to the south, are putting on a bit of fat; and the majority of cows are beginning to fill out, not with fat but with their pregnancy.

With early April comes the first thaw, and a new sense of restlessness and anticipation drives the caribou to congregate in larger groups on the lakes, and to move with more purpose. Soon they begin their northward course.

In times gone by the northward migration was a phenomenon unique in history. The hordes — *la foule* in the idiom of the French-Canadian northern voyageurs — moved north in such numbers, at such a pace, and with such determination that neither predators nor natural obstacles could stem their march. The present-day migration is smaller, but still impressive. In late April 1957, caribou of the northern Saskatchewan herd, under observation and study at that time, were on the move north over a wide front of about 150 miles. The depth of the herd from north to south was estimated at 100 miles. During a single day, April 28, some 14,000 animals moved out over Lake Athabasca.

The summer range of a given herd may be 800 miles distant from its winter range. Individual herds move north simultaneously out of the thousand-mile-wide taiga strip between Great Bear Lake and Hudson Bay. A number of herds may converge like the spokes of a wheel to a centre like the great calving grounds on either side of the Thelon River. Most of the Saskatchewan herds, and those that winter between Great Slave and Athabasca Lakes, migrate to this region. Some herds from Manitoba head for the uplands of Kaminak and Kaminuriak Lakes. Others from the Great Bear Lake region may move to the Coppermine Mountains or the uplands west of Contwoyto Lake.

Their course is purposeful and compass true. They may be diverted for a day or two to face a northwest wind, or a deep fall of snow may stop them for a time. An unseasonable cold snap may crust the melting snow. This makes movement painful and slows them down or stops them; but normally they press forward at a fast, steady walk which may average five or six miles per hour. The average day's travel is about 30 miles.

The migration between given major regions is usually along a traditional route across the tundra. An observer in an aeroplane in summer can trace the migration routes by the many parallel paths cut by caribou marching in file over the centuries.

By early June, the rivers of the tundra are breaking up, the larger lakes are still solid with ice, hundreds of thousands of ponds dot

the surface of the tundra, and tens of thousands of rivulets, most of them temporary, bear the surplus water from rapidly melting drifts down to the catch basins or to the rivers. The caribou are now on the last leg of their migration to the calving grounds, and the pregnant females now leave the herds and disperse over the high, forage-poor hills. The remainder of the herds, except for the few yearlings that tag along with the cows, browse in the rich foliage of willows, birch, new green grass, and sedge along the lowland watercourses.

Calving occurs throughout June. The height of the calving in years of normal weather is around the tenth to the twelfth. By the end of June the deer are bunched again, and the migration continues, with little year-by-year consistency of direction.

Caribou have a characteristic joint click as they walk, and although they are not usually very vocal they grunt and bawl occasionally and cough a good deal. A large herd is noisy in the extreme. A biologist, Pruitt, in late July of 1958 found himself on the path of a migrating herd of 50,000 deer, and described the experience:

"They poured over the hills, flowed up the valleys, running to a new patch of green vegetation, then stopping to feed while those behind ran to fresher vegetation ahead. They came to a little lake east of camp—some waded out and began to drink, others started around the edges, both sides. This caused them to bunch up and many began to wade and swim across. They came on toward me, stopping when downwind. These moved upwind around me, but there were always more coming on. They came to within 30 yards of me, all around, except downwind.

"The clacking of their hoofs, the constant blatting of the fawns, the grunting of the females, the constant coughing and wheezing all made a roar that was deafening. Then some bolted from my scent; the movement spread to about 1,000 and the ground fairly shook with the pounding hoofs, the roar increased. Each stampede only affected a thousand or so, then sort of petered out after one-half to one minute... I tried to segregate by age and sex but was almost overwhelmed by the constant movement. The herd kept moving northwest, it stretched fairly solid for about five hills (two miles) but was only about half a mile wide.

"Yearlings and two-year-olds came closest, but males also came close, females with fawns were shyest...

"As they moved into the hollow north of the hill they split into two streams, moved across the flat, then up the hill where they spread out and flowed across several more ridges."

The spring migration with its purposeful movement until calving time, and its bunched erratic journeyings after calving time, sometimes breaks up in August. The caribou then wander the tundra in small groups and often singly. In other years the deer remain in larger groups. Often they make a brief August foray south into the taiga and then out on the tundra again. At the first signs of approaching winter they begin to bunch and drift, often by circuitous

routes, toward the winter range. As they travel they gradually group into great herds.

Herds on the move to the wintering grounds drift southward, not leaving the barrens before freeze-up but stringing out along the northern fringe of the taiga. During late summer the adult bulls may form separate herds, but by the end of September the bulls join the main bands and begin to show increasing antagonism toward each other. Sparring between bulls occurs with increasing intensity during the first week of October. By the second week the bulls are very active on the rut, eating little and growing thinner as the rut continues. Bulls do not collect harems as some deer species do. On cold days, even during the rut, the herd moves rapidly in its southward migration. With the end of the rut early in November, the bulls again segregate into bands. Their antlers are shed during this period.

That general pattern of movement is usual, but with the caribou the unusual often occurs unpredictably. Some herds, for unknown reasons, choose to remain on the tundra all winter. A biologist, J. P. Kelsall, observed a herd of some thousands of animals wintering on the bald, wind-swept mountains south of Coppermine, clambering about on the highest, rockiest hilltops and apparently thriving in this unusual environment. Biologists have observed many such peculiarities and apparent inconsistencies of behaviour. There was, for example, a general trend during the late 1950's away from the eastern part of the range. At this time most of the caribou of the central mainland were crowded between Great Bear Lake and Black Lake (southeast of Stony Rapids). Yet between Black Lake and Hudson Bay the winter range seemed quite satisfactory. The forage appeared good, snow cover was not too heavy, and predators no more numerous. If any factor other than accident influenced the deer to move west, it was not discovered.

Some herds seem reluctant to leave a chosen wintering area. A large herd wintered within 20 or 30 miles of Snowdrift on Great Slave Lake, and Indian hunters had "easy meat" all winter. The herd might as easily have moved a day's travel south and east into the rockier country where hunting would be more difficult.

The caribou is a restless, nomadic, and unpredictable animal. A given herd may migrate along a given route for years or decades, and then for no apparent reason shift to another route. These char-

acteristics are recognized and sometimes explained in the folk beliefs of the Chipewyans: "Caribou don't like being killed by bludgeoning with a wooden club; if this is done to an animal, the herd will not wish to return the following year. Caribou meat should be eaten with relish; if this is not done, or if a man should be sick and vomit after eating, the caribou will be offended and may not return."

The Caribou and the Hazards it Faces

By all appearances the caribou is physically well adapted to its environment, able to live successfully and reproduce its kind in sufficient numbers. The breeding life of a female may be more than ten years, so with no deaths except by old age, the herds could double in a decade or less. But nature, when generous with the means of procreating and maintaining life, must be equally profligate with the means of death, or the exploding population of a wild-life species will destroy the delicate system of relationships that keeps an environment healthy and productive.

The caribou of the barren grounds is well enough supplied with natural controls. The four major natural hazards are predators (of which the wolf is the most important), adverse weather in calving time, insects, and accidents. The other major hazard is human kill. An overriding control is the availability of adequate winter range. Without enough food, the herds cannot build up to great numbers.

The wolf and the caribou

The wolf has been depicted as the "villain of the piece" in much of our literature, especially the fairy tales of impressionable childhood days. Nature stories for adults often evoke sympathy for the prey and repugnance for the killer. We have many images, conscious and unconscious, of cruel glowing eyes and dripping fangs. It is sometimes a little difficult to consider that in some circumstances the wolf may be the caribou's best friend. Wolves may save caribou from mass starvation by keeping their numbers within the food-producing capacity of their range. Wolves may maintain the health and alertness of the caribou by eliminating the diseased and perhaps the inferior animals.

The wolves of the tundra and taiga have lived with the caribou over the tens of centuries, killing them constantly for their own food and providing food for the many species who scavenge on carcasses.

There are two more-or-less distinct types of wolf on the caribou range: the white or light grey wolf of the tundra and the darker grey wolf of the timber. There are many variations in colour between these two types. The numbers and habits of the wolves are not well known, but it is known that the whiter race of wolves follows the caribou throughout the year except for the few weeks of May and June when they are raising litters on the tundra and are unable to move freely. The darker wolves of the timber may stay with the herds in winter, but few of them venture far out on the tundra in summer.

The darker wolves of the timber are like the timber wolves found throughout the great boreal forest from Labrador to British Columbia. The whiter tundra wolves have obviously adapted to Arctic conditions. They are imposing beasts, long-legged, broad-footed, and deep-chested, and carry a heavy coat of long creamy white or pure white fur. A yearling killed by R. A. Ruttan at Wollaston Lake in 1956 weighed 105 pounds. A mature wolf killed by J. P. Kelsall weighed 136 pounds. Specimens of 120 pounds are common.

Wolves are usually fat when they are with the caribou herds, but this does not mean that they can kill caribou whenever they wish. Hunting success probably depends on many factors, such as the health of the caribou, the depth and hardness of snow, smoothness of ice, or presence or absence of water as a means of escape. Biologist Ruttan saw a tundra wolf allow a caribou a lead of several hundred yards, then quickly overtake it and rip off the front shoulder and leg as if by a flick of his head. Many other observations show that the wolf cannot usually kill so easily. Biologists have seen about 100 pursuits of caribou by wolves, of which three were successful. Caribou are usually nervous when wolves are in a pack or show signs of aggression, but are often quite at ease in the presence of individual wolves.

Wolves can pass within 50 yards of large herds without disturbing the animals. One aerial photograph shows a wolf rushing into a large herd of caribou. The deer directly in front of the wolf are at full gallop; these on either side of the wolf are trotting; and those

to the rear stand watching the pursuit. Others on the fringe of the herd are lying down.

Wolves are hard to locate from the air because they often try to find shelter as soon as they hear a plane engine. Biologists, therefore, have little evidence on which to base estimates of wolf numbers. A reasonable guess is that there are now less than 3,500 wolves that depend mainly on caribou for their food.

A wolf control program, initiated in the 1940's by the Province of Manitoba, has since 1952 been expanded by the federal government in co-operation with the governments of Manitoba and Saskatchewan. The kill has been more than 2,000 in some years. In 1957-58, 600 wolves were killed in the area around Aylmer and McKay Lakes, among a herd of 50,000 caribou. Between 1953 and 1959, 5,166 wolves were killed in the Northwest Territories, and perhaps half as many were killed in the northern areas of the Prairie Provinces.

Wolves sometimes kill more caribou than they can eat, and are quite likely to do this in April, May, and June. Banfield reported finding 113 carcasses within a mile or so of each other on an open lake. Kelsall in 1950 found half a dozen recently killed caribou in a close group on Ghost Lake, each carcass intact except for the head and neck. It is believed that wolves kill more heavily before the mid-June whelping period, in order to lay up a store of meat against the needs of the nursing bitch and growing pups.

Various studies in Alaska, and observations on the Canadian range indicate that a wolf will probably kill an average of 16 caribou each year. Thus the 600 wolves caught in the Aylmer and McKay Lakes region in 1957-58 could have taken 20 per cent of the 50,000 caribou in the herd. As a consequence of the wolf control program wolves have become increasingly hard to find, and it is likely that the annual kill of caribou by wolves does not now exceed five per cent of all caribou each year.

Insects and parasites

The fly season in the central barrens is a phenomenon to wonder at. However harsh the climate, rigorous the topography, and immense the distances, the country offers no tribulation to compare with the plague of biting and stinging insects that begins about mid-

July. No adjectives can convey an adequate impression of the magnitude of the insect horde and the intensity of their attacks on any unprotected warm-blooded creature. Most distressing to man are the mosquitoes and black flies that on a windless day swarm in unbelievable numbers. Seton, always intent on getting some documentation for his observations, produced some astonishing figures during his trip to the barrens in 1907. While still inside the taiga country just north of Fort Smith, he estimated that 24,000 mosquitoes — five per square inch — were resting on his tent. He counted about 800 on his guide's back, head, and shoulders. He was able to kill 100 with a single stroke of his palm. Yet these, he said, "were gentle compared to those of the barrens". Seton supported this comment by figures. He tested the viciousness of the barren-ground mosquito horde by holding out his unprotected hand for five seconds and counting the number that lighted on it. His usual score was 100 to 125. Black flies are no less formidable to the traveller.

Mosquitoes and black flies torment all warm-blooded creatures: lemmings, ground squirrels, nesting birds, and most of the myriad fauna of the summer barrens. They attack the caribou on lips, muzzle, ears, eyes, and other parts where the hair may have been rubbed off during the annual moult in July. The deer's lips may be ringed with hundreds of mosquitoes and black flies; ears may be swollen; eyes are attacked with terrible ferocity; thousands of flies work their way into the fur; and antlers in velvet, being tender and difficult to protect, are favoured feeding places for the black fly and mosquito hordes.

If these particular insects are terrible in their harassment of the deer, one other is worse — the warble fly. These bee-like insects are on the wing on the tundra for about three weeks in July and August, and sometimes literally drive deer to distraction. They are slightly different from the warble fly of cattle to the south, but their life cycle is similar. They deposit eggs on the legs or rump of the caribou, and these develop into larvae which burrow into the skin. They make their way gradually to the back, where they grow as large as a thimble, and in June burrow through the hide of the back to drop to the ground, there to pupate and emerge weeks later as adult flies.

The warble is the most common parasite of caribou. Few hides of mature animals are free from warble scars. There was an average of 70 per hide on 25 hides examined by the biologists, and 350 on

one mature bull. Warbles do not harm the meat for human consumption—in fact, before the standards of the more squeamish white man became current among the Eskimos, warble larvae were thought to be an excellent aperitif for a feast on caribou meat. (Stefansson, who was one of the few white men willing to live according to the way and style of the country, found the larvae palatable enough—similar to gooseberries—but the spiny outer skin was of slightly unpleasant texture.)

Another serious parasite is the nostril fly or nose botfly. About a quarter of the animals studied by the biologists had from 10 to 40 larvae in the nasal passages and soft palate, usually only enough to irritate the animal, occasionally enough to interfere with breathing and slow down a running animal.

Another parasite of the caribou which may infect man is a tiny tapeworm, *Echinococcus granulosus*. In its normal life cycle the caribou is secondary host, and some dog, wolf, or fox is terminal host. The adult tapeworm occurs in the intestine of members of the dog family, including sled dogs, and millions of tiny eggs are dropped with the faeces. Caribou grazing months later may accidentally pick up eggs with their forage. These become larvae and migrate to the caribou's lungs or occasionally to the liver or other parts of the body, where they form cysts. Eggs accidentally ingested by man may affect him similarly. Cysts in the brain, lungs, or other organs may cause death. The importance of this parasite to caribou health is not known, but it is thought to be relatively insignificant.

Aside from their effects as internal parasites, the warble and nose botflies, together with mosquitoes and black flies, make the caribou's life almost intolerable during the height of the season. A warble or botfly makes a low buzz and flies in rapid darts, and caribou react strongly to its presence. When a fly approaches a deer the animal stiffens and points its muzzle stiffly down, shakes its head and antlers, twitches or shakes its hide, and may quickly turn its head to bite at a flank. If the attacks become unbearable, the animal races wildly away across the tundra, bucking, tossing, and wheeling as it runs. During the worst of the fly season groups may seek relief in ponds and marshes, splashing through the shallow water or swimming in the deeper water. A group may gather in a tight circle with their heads lowered to the centre. Or

they collect on high points where a good breeze may keep the insects away, standing with their heads to the wind. Only when a strong wind keeps the insects on the ground, or at twilight when they are not active, can the caribou feed and migrate.

Adverse weather and calving time

Of all the natural catastrophes that can affect the caribou populations, none is more destructive than the mid-June blizzards that occasionally sweep the calving grounds when the calves are very young.

Most barren-ground caribou of the central mainland migrate, breed, and calve at about the same time. In this behaviour lies a good portion of their strength as a species. Most of the females are bred because the rut occurs when they are in large groups. But this kind of group behaviour (biologists call it "synchronous behaviour") has its hazards. In some years 80 per cent of the calves in a given herd may be dropped in a four-day period. And if it happens that a severe blizzard occurs at the height of the calving period, thousands of calves may perish.

The caribou calf is generally well enough adapted to its environment. It is able to stand within minutes of birth and is soon able to move about. At no more than 12 hours after birth a calf will plunge fearlessly off an ice shelf and swim easily. By the time it is 24 hours old it can probably outrun a man, and in a few days can keep up with the cow when she is trotting. Calves suckle frequently during the first few days of life, but also start grazing almost from birth.

However, conditions are sometimes too rigorous even for such a hardy animal as the caribou calf. In 1958 the minimum daily temperature on the Beverly Lake calving grounds averaged about four degrees below freezing. On several occasions blizzards swept the area, two of them continuing for several days. Under such conditions calves perish in considerable numbers. A wet blizzard, followed by a dry cold quite often results in deaths. Turner, travelling out of Eskimo Point in 1947, found the tundra around Kaminack Lake littered with the carcasses of new-born calves.

Weather seems to be the major reason, perhaps the only reason, why calves make up 25 per cent of the herd in some years, yet in other years may amount to less than five per cent.

Accidents

Accidents are an ever-present hazard when caribou are on the move. Groups startled by a wolf or hunter in rocky terrain may race away with inevitable casualties if they are on precipitous ground, especially if there are young calves in the group. The deer tend to cross rivers above rapids. If they are bunched during the crossing, some may be swept away into the fast water and drowned. In 1937 a biologist found more than 500 carcasses at the foot of Helen Falls on the Hambury River.

By late October, winter has come to the caribou country, but the larger rivers and the lakes do not freeze until well into November. In this slowness in the formation of ice lies an important hazard for the caribou. Driven by their instinct to move south, they are not easily deterred. In November 1957, caribou moved east along Lake Athabasca and tried to cross the lake on new ice before it was thick enough to be safe. Many groups were seen standing at the edge of open water many miles from land. Later that year several animals were seen frozen in the ice.

Wind squalls sometimes endanger swimming caribou. At a fording spot on Aberdeen Lake in 1951 biologists found 45 caribou, mainly calves, dead along one mile of shore. They estimated that a further 400 carcasses lined the 10-mile shore of the Narrows. At this point the Narrows is two miles or more wide, and the herd was probably caught midway across by a high wind.

An individual animal may break a leg travelling over rocky ground. Seton saw a number of caribou on the islands of Great Slave Lake and Artillery Lake, all of them apparently waiting in these wolf-free hideouts for broken legs to heal. Other observers report that nearly every migrating herd has its rear guard of cripples. Some of these are victims of accidents, others may be suffering from old age, foot-rot, or other infirmity. The fly season is particularly bad for accidents, because the caribou may dash wildly over the tundra with little regard for anything except escaping their winged tormentors.

Calves or even mature animals may bog down in muskeg or in gullies or "zabois" filled with soft, wet snow.

Other wildlife of the caribou country

The caribou is the dominant mammal of the Arctic prairies and

forest. Without this wild reindeer the country would be uninhabitable by Eskimos and Indians living "on the land", and many carnivorous fur bearers would have difficulty surviving.

The wolf is the only significant predator of the caribou, but other predators may to some extent affect caribou populations. These include the coyote, black bear, wolverine, and barren-ground grizzly bear. Any of these may kill the occasional calf, cripple, or even adult.

The coyote and black bear seldom venture out on the tundra, and thus are not near the herds in summer. The wolverine ranges over all of the caribou country. It is capable of killing deer and has been observed to do so, but not often. The barren-ground grizzly is similar to the plains grizzly, a buffalo killer common on the prairies before settlement. The barren-ground grizzly can kill deer and probably does so occasionally, but all the biological investigations on the caribou range have not revealed a single instance of a kill by a grizzly. For the most part the grizzly spends his summer digging for ground squirrels, lemmings, and roots, and ambling over the tundra, especially on the calving grounds, seeking caribou carcasses to scavenge.

The golden eagle, which nests on the western barrens, is known to kill the odd calf.

All these species scavenge on carrion carcasses of caribou, but none of them can be considered serious predators. Other scavengers found throughout the caribou range are the gulls, ravens, and foxes, both coloured and white.

Some animals might be considered competitors of the caribou for food. Among these are the lemmings, small mouse-like animals that make their tunnel homes throughout the tundra range of the caribou, and who forage on and line their nests with herbage suitable for caribou. The lemming is well known as a cyclical animal. Populations rise to multitudes during a period of three years. On the fourth year the crash comes, leaving great sections of the tundra covered with their runways and burrow mouths, and littered with their droppings, but devoid of more than a tiny breeding stock of the little animals. Food eaten by lemmings in years of high population may seriously reduce the forage available to caribou, but scientific evidence is lacking.

A possible minor competitor for food is the Arctic hare, an animal somewhat larger than the jack rabbit of the prairies. The Parry's

ground squirrel — the "sik-sik" of the Eskimo, is common in some localities. It is quite similar in appearance and habits to the gopher (Richardson's ground squirrel) of the prairies, and may compete in some areas with the caribou. In the taiga zone the varying hare (snowshoe rabbit) is a major forage eater. These animals rise to great numbers in irregular fluctuations sometimes called a "cycle", and at peak, populations may do some harm to caribou food supplies.

Other possible minor competitors are the muskox and woodland caribou. Muskoxen are scarce and rigidly protected throughout their whole range. They are slow-breeding animals and are easily killed. The woodland caribou eats about the same forage as the barren-ground caribou, and in a few areas is plentiful enough to make inroads on the forage supply.

The moose now ranges throughout much of the taiga, especially where fires have replaced the coniferous forests with poplar, birch, and willow.

There have been surmises that these species of herbage eaters may compete with the caribou for food. However, study of the relationships among living things (ecology) is a most complex science, and study of Arctic ecology is in its infancy, so no one can say for sure. The fact may be quite the reverse: that far from harming caribou populations by competing for food, the rodents and other herbivores may greatly help the caribou by providing a food supply for predators that otherwise might turn to caribou. Intensive study of the Arctic and its plants and animals must yet be made before anyone can answer this and many other interesting and important questions.

The Caribou Range

Natural controls such as cold, wet weather in calving time, kill by predators, the ravages of insects and parasites, and accidents, taken together, are a powerful deterrent to population growth. Under natural conditions during thousands of years it is possible that these factors alone may have controlled the populations. But it is more likely that when caribou numbers rose — possibly up to three million or more animals — winter range conditions may have caused starvation, or at least malnutrition, and consequent low resistance to weather, wolves, and other hazards.

The winter range within the great taiga belt is, the biologists think, the ultimate limiting factor in population growth. Typical range is black spruce in open formation, with a scattering of tamarack, areas of shrub, and in the open areas a dense carpet of caribou moss—mainly lichens of the genera *Cladonia* and *Cetraria*. This is the preferred winter range of the caribou. Jackpine-lichen forests on high, sandy soil such as those south of Lake Athabasca are not as good, but are nonetheless able to support caribou.

A puzzling fact is that the caribou—always an unpredictable animal—does not always seek out the best range for wintering. Some herds may venture out on the windswept tundra in January. Some may choose to winter in rough, rocky regions with very poor grazing. No one knows why.

Studies by the Russians indicate that one reindeer needs about four and a half to six and a half pounds of lichens, sedges, cured grasses, or small shrubs each winter day. A caribou probably needs an equal amount. To get it the animal must dig dozens of feeding craters per day on good range, and perhaps scores of craters on medium or poor range. A herd may feed twice over winter range, but even then they may get only a fraction of the food that is there.

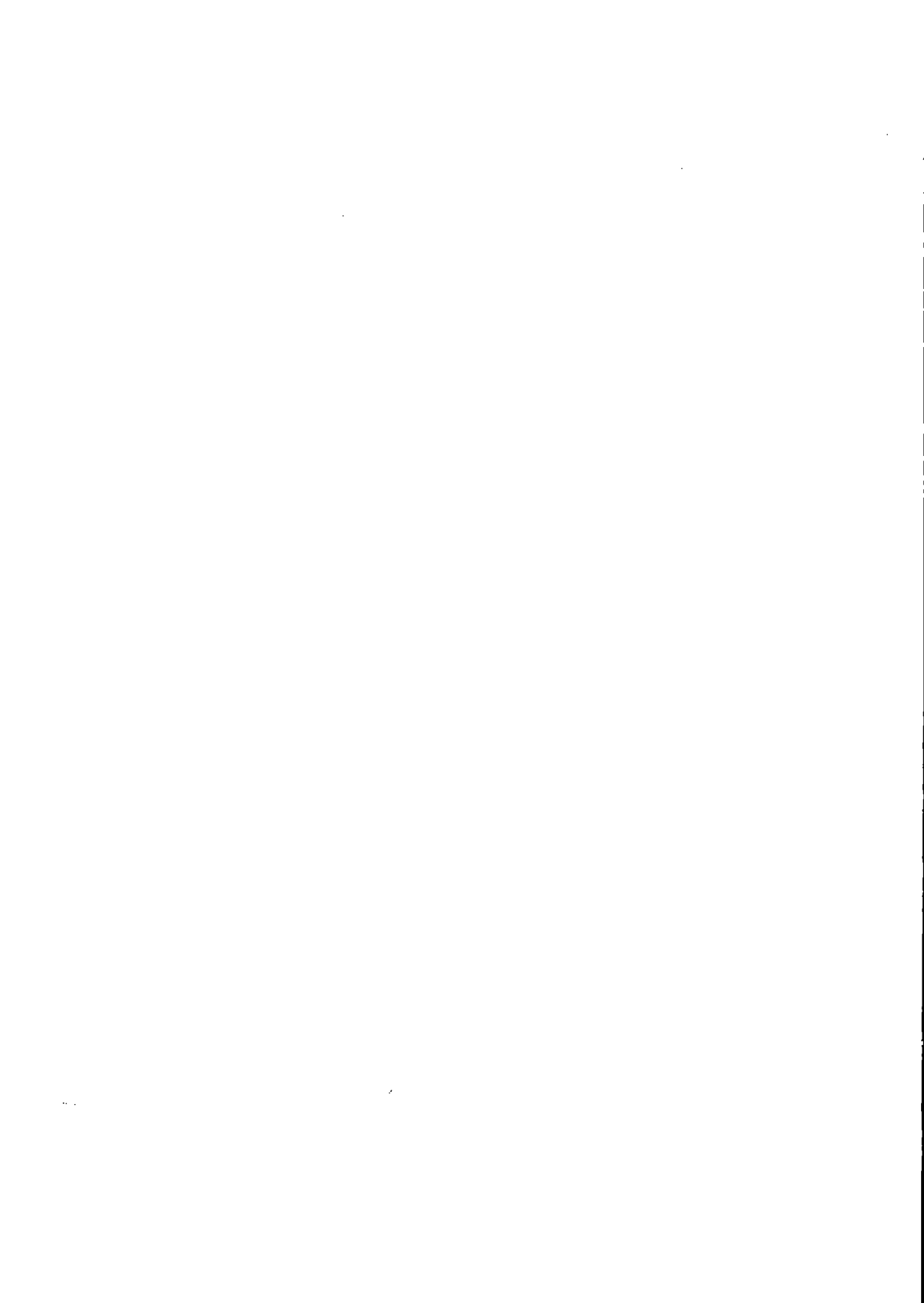
Fire reduces the amount of forage available on the caribou range. Lightning has always caused fires in the forest and on the tundra, but one of the new facts of life in the North, since the coming of the white man, is that fire occurs more often. The airplane moves prospectors from point to point, and in the past it has happened that prospectors have set fires to the dry uplands of spruce and moss vegetation to clear the rock of its overburden, revealing previously hidden signs of minerals. The outboard motor has enabled travellers to range more widely along the waterways of the caribou country in summer, with the inevitable result that fires have occurred through accident or carelessness. And it is an unfortunate fact that the best caribou range—black spruce or white spruce with a shrub layer and dense carpet of *Cladonia* moss—is most susceptible to summer fire. After a dry period, fire, driven by a hot dry wind, can become a holocaust, moss meadows exploding in flame so intense as to destroy the humus layer beneath, which may have accumulated over centuries. The shrubs and trees remain only as charred spars and accentuate the devastation.

Through 30 years or more such wild fires have burned unchecked,

especially in the large prospecting and mining region between Great Bear Lake and Stony Rapids. Bush pilots flying over the great caribou wintering area between Great Bear and Great Slave Lakes reported 24 fires burning at one time in the summer of 1952. This area, which once wintered 200,000 animals, will not do so again for half a century, for the lichens are a slow-growing crop. Lichens take at least 25 years to develop into good range under favourable conditions of soil and moisture and, under unfavourable conditions, a century or more. About 30 per cent of one great wintering area surveyed by J. P. Kelsall was stripped by fire. Burn after burn showed charred and bleak, or blazing with the yellow of autumn poplar and willow instead of the characteristic dull and dark green of unburned spruce-birch-lichen forest. Kelsall estimated that one burned area of 800,000 acres was stripped of more than 80 per cent of its caribou forage. Triangles of green showed only on the lee side of ponds and lakes, and strips of green bordered watercourses where new growth, useless to caribou, had risen since the fire. One serious effect of a fire may be to bar caribou from good range beyond, for they will not normally cross a wide burn.

Notwithstanding the prevalence of burned areas in the wintering range, biologists are reluctant to attribute the present decline of the caribou solely to fires and over-grazing. The factors that have caused the caribou's decline are not simple, and it would be most unwise to pretend that they were. By the same token, the steps that must be taken to permit the rise of the caribou are not simple. The deer is an unpredictable wild animal in a mysterious, sprawling, wild country. The people concerned with the deer are of four diverse races, Eskimo, Indian, Metis, and "European". There are many viewpoints which may influence their actions relative to the deer.

CARIBOU AND PEOPLE IN THE OLD DAYS



CARIBOU AND PEOPLE IN THE OLD DAYS

When the bitter wind sweeps across the tundra in winter, the southern white man cannot conceive that human beings could live, travel, and hunt under such conditions. Yet the Eskimos and Indians have done so for centuries, and most are able to do so now — if they have caribou-skin clothing.

The refrigerated blast of the wind flows through ordinary cotton or wool protective clothing and sucks the heat from the body. Only a body covering that is impervious to wind is effective in the Arctic. Caribou hide is almost impervious to wind. Arctic clothing must also be light, flexible, and must provide good insulation. It must be light to permit free movement without tiring or undue sweating. And it must insulate efficiently because the human body can produce only so much heat, and this heat must be conserved. Caribou skin with late summer hair is light, flexible, and provides outstanding insulation.

Arctic clothing must have one other quality: it must allow water vapour to escape. The body continually produces moisture, and if this is trapped inside vapour-proof clothing, the wearer becomes soaked with sweat when in motion, and extremely vulnerable to cold when motionless. If his clothing becomes wet in this way he is surrounded by a thin, icy sheet with little insulative value. Caribou skin permits the escape of body vapour. With inner and outer clothing of caribou skin, the Eskimo and northern Indian could move freely in a country that took heavy toll of early explorers.

In the absence of carbohydrates, fat is essential to human life. Without it, the body cannot generate the heat necessary to withstand the cold. A bull caribou in the autumn may weigh 300 pounds, and

a fifth of that weight may be fat — perhaps 40 pounds in a single slab of back fat, and the rest distributed throughout the body. The back-fat slabs were an article of commerce in the early days of the fur trade, for possession of fat meant mobility to travel and trap.

Dogs became essential to the Eskimo and Indian when trapping became a part of their way of life. Caribou meat and fat, with some fish, made it possible for the natives to maintain their teams.

The caribou provided the interior people with many other items essential to the life they led: sinew from neck and spine for sewing; bone for needles, skin scrapers, and utensils; bone and antler to shoe the wooden sled runners; carrying bags, babiche for the snowshoes used by the Taiga Indians; skins for tents and kayaks; and numerous other items of daily use.

In short, the deer were about as essential to the northern Indians and Eskimos as the yak to the Tibetan or the camel to the Bedouin. The whole culture of the Interior peoples centred around the caribou, and much of their daily lives was spent in hunting the deer.

Traditional Hunting Methods

At Contwoyto Lake, along the valleys of the Back, Thelon, and Kazan Rivers, and at various points along the Keewatin coast, the present-day traveller can see the evidence of old-time hunting methods used by the Eskimos. Leading to caribou crossing-places on lakes or rivers, or at right-angles to deeply worn caribou trails, are seen drift fences — rows of stone columns 50 yards or more apart, made by setting rock upon rock to form a man-like silhouette. Some of the drift fences are close to six miles long.

If the fence led to a lake, women and children would be stationed along it. The men would be in their kayaks in the lake. When a band of caribou came to the fence, they would be unwilling to pass through it, and would drift toward the lake. When they were close enough to the water, the women and children would move out of concealment and stampede them into the water, where the hunters would spear them as they swam. Some fences might lead to a rocky defile where the men would crouch with bows and arrows and spears to slaughter the deer as they raced past. Some fences were funnel-shaped. Some led into circular pounds or to precipices.

The Indians made similar drift fences, using spruce saplings instead of stones, and the circular pound might be made into a maze of passages between rows of trees, with snares set to capture the animals.

Both Indians and Eskimos waited at the known crossing places of the migrating deer. The big hunts at the crossings usually took place in the late summer and autumn. The natives hid themselves and their canoes on the opposite bank of the river or lake the deer were expected to ford, and when the animals were nearly across would rush their canoes or kayaks into the water and pursue the deer. Their short-hafted spears with diamond-shaped heads were (and are) efficient killers. A single stroke to the proper point in the back was enough to kill or fatally wound a swimming caribou. H. Brown of the Hudson's Bay Company reported seeing 12 Eskimos kill about 250 deer on a Kazan River crossing a couple of decades ago, and Samuel Hearne in 1795 told of his Chipewyan companions carrying out a similar slaughter on the same river.

Some stalking was done with bow and arrow, snares were set on the forest trails, and pitfalls were used both by the Indians and Eskimos. The natives knew the caribou thoroughly, and used many tricks and ruses to get their prey. For example, two hunters might walk away from a feeding herd in close single file, and one hunter would quickly drop behind a rock while the other walked on. The caribou, usually curious, would move to follow the walking hunter, well out of his range, but would pass the hidden one at close range.

The Tribes of the Caribou-eating Peoples

Most of the Eskimos of the central Arctic lived along the coasts, usually in small groups. They averaged about one person for every two or three miles of coastline, along the thousands of miles of shore that extend from Eskimo Point on Hudson Bay to the Mackenzie Delta on the Beaufort Sea. Those coastal Eskimos traditionally lived by hunting seal, walrus, and whale, but made hunting excursions inland after caribou, usually in late summer. But a number of inland Eskimo groups that were almost wholly dependent on the caribou lived in the valleys of the Dubawnt, Kazan, Thelon, and Back Rivers,

and around Contwoyto Lake to the northwest, and Kaminak Lake to the southeast.

The Indians of the caribou country were mainly of the great Athapaskan or Déné nation, of which the Chipewyans were the most numerous. The Chipewyan territory extended from Hudson Bay to Lake Athabasca and beyond, and to the north there were Slaves, Yellowknives, Dogribs, Hares, Bear Lake Indians and, in the lower Mackenzie, the Loucheux. All of these except the Loucheux and Slaves might be called "edge of the woods people", because they were nearly as much at home on the tundra as in the forest. To the south, the Swampy (Woodland) Cree within the caribou range depended on caribou nearly as much.

The Eskimos could be divided into groups according to their traditional hunting grounds and certain more or less pronounced differences in dialect. There were no great tribal chiefs. A leader might rise because of his personal qualities as a hunter and man of good judgement, but he held few special privileges. Usually the family unit made the decisions, such as where and when to move, how to hunt, and so on. Among the Indian tribes the situation was similar, except that the language variations between the eastern Chipewyans and the northwestern Loucheux were much greater. All the Indian and Eskimo groups were nomadic to some degree. They travelled a great deal to take advantage of seasonal fluctuations in fish and game supplies, but a given season usually saw a group located at a traditional camping ground.

Since game could not be depended on as a reliable source of food, life was a constant struggle in the face of capricious nature. Indians and Eskimos were fatalists, and many of their religious beliefs, taboos, and practices were tied closely to hunting. Their way of life did not encourage conservation of game. Samuel Hearne, in his famous journey from Churchill to the Coppermine River in 1771, collected many acute observations about the country and its people. He wrote:

"The deer were plentiful, and the Indians killed great numbers, frequently only for the fat, marrow and tongues. I tried to convince them of the great impropriety of such waste but, as national customs are not easily overcome, my remonstrances proved ineffectual. They replied that it was right to kill plenty and live on the best for it would be impossible to do this when the game was scarce."

How They Used the Deer

Much of the meat was used fresh in the camps and on the trail. Some was cut into strips and air-dried to produce a light, nutritious food similar to the "jerky" of the early cattle ranching days on the prairie. Some meat might be dried over a fire, absorbing a smoke flavour which made it very tasty. Dried meat might be put in a skin bag and pulverized to a stringy powder by pounding between two rocks. Sometimes this was carried in powder form; sometimes hot tallow was poured over it to make pemmican. Unlike buffalo or moose, caribou is not considered "strong" meat. Residents of the country say that a man may gorge himself on caribou and in a few hours will be hungry again unless he has also eaten plenty of fat.

The hides were dressed in a variety of ways, to suit the need. Clothing skins were dried, then moistened and rubbed with fat or brains and "relaxed" with scrapers of bone or stone so the skin, dry and with hair on, would be flexible and easy to sew. Calf skins were favoured for undergarments, and summer or autumn skins of adults for outer parkas. Leg skins were used for mittens, for mukluk legs, and for the soles in the absence of the superior moose or seal skin. The Indians sometimes made buckskin according to the traditional process of soaking to remove the hair, rubbing with fat and brains, scraping, smoking, and scraping again until the hide was permanently flexible. The Indians made babiche by cutting a sheet of green, de-haired hide in circular fashion to produce a long strap about an inch wide, which when dried under tension would shrink to an extremely tough thong suitable for stringing snowshoes, and for many other uses such as snares and dog harness.



THE EFFECTS OF THE WHITE MAN'S INVASION



THE EFFECTS OF THE WHITE MAN'S INVASION

Since the turn of the century in the Eskimo country, and for a hundred years before that in the Indian country, the white man has been bringing a mixed bag of benefits and evils to the north: matches, metal, rifles, smallpox, syphilis, moral standards, medicine, tuberculosis, sugar, dental caries, canvas, an increasing gadgetry, education, Christianity, law, and, for better or worse, an increasing desire to acquire more than nature freely allots.

It would be entirely presumptuous to pretend that the history of northern development is simple and divisible into distinct time stages, or that any general version is fully applicable to any single community. Yet there has been a discernable pattern of development, and it is now apparent that the native peoples of the North have come to a turning point in the way in which they will live. It is quite important that those who are interested in the future of the natives — and of the caribou — must recognize the change of northern life for what it is, and neither try to turn back the clock nor turn it forward too fast.

In the beginning there was the Hudson's Bay Company. Its typical post was a primitive enough group of frame or log houses and warehouses, but luxurious to the natives who traded there. The post might have been located at a seasonal gathering place of the semi-nomadic tribes of the caribou country, or it may have been located quite arbitrarily, because the area looked like good fur country, or because water, fuel, fish, and game were abundant. Much depended on the knowledge and the personality of the individual Company servant charged with locating a trading post.

In the opinion of many, the golden years of the Eskimos and Caribou Indians began with the establishment of fur trading posts

throughout the region. The difficulties and uncertainties of the environment were diminished by firearms and the more assured supply of meat they could provide. Iron sled-runner shoes and kerosene-burning primus stoves resulted in mobility of winter movement. Steel needles and knives, and various cloths resulted in economy of effort. The Hudson's Bay Company, its old servants say, "never let a native starve".

The new system worked well enough for a time. The trader normally functioned as a benevolent director of the natives' activities during most of the year. The result was usually ample food and plenty of fox skins and other valuable trading furs.

Ominous results also occurred, almost unseen or unrecognized by responsible people capable of doing anything about them. With primus stoves, rifles, canvas tents, and steel-shod sleds, coastal Eskimos of Coppermine and Bathurst Inlet could stay out on the tundra to the south all winter hunting caribou and trapping white foxes to buy ammunition and other now-needed white man's goods. The increasing possessions had to be carried, so dog teams increased from the traditional two or three dogs up to seven, and as high as eleven. Use of caribou meat for dog food increased more than proportionally, since winter seal hunting was reduced. This trend occurred over the whole of the caribou range, from the turn of the century until the late 1940's.

The migrations of the caribou to their summer calving grounds on Victoria Island ceased in the mid-1920's. The government investigator of the day, W. H. B. Hoare, attributed this to the repeating rifle in the hands of Eskimos who stationed themselves in the mountain passes to the south of Coronation Gulf and turned the herds back onto the mainland barrens.

With matches and summer mobility came the increasing scourge of fire in the taiga. At Bathurst Inlet, far up on the northern fringe of the mainland barrens, Hoare in August of 1925 observed thick smoke of burning spruce. He later deduced that it came from a fire in the bush 400 miles to the southwest, on a portage between Providence and Rae.

This initial trading phase of the white man's movement north changed but probably did not adversely disturb the pattern of life and thought of the Indians and Eskimos. But it did intensify some aspects — notably consumption of caribou meat.

Missionaries came to the northern communities with or shortly after the traders. The missions of the north have, by and large, been staffed by hardy and dedicated men. Many of them were able to understand and sympathize with the problems created in the minds of the natives when an alien religion was superimposed over a deeply ingrained native concept of the spiritual. While primarily concerned with the spiritual rather than the temporal welfare of their charges, most missionaries tried to teach their charges how to cope with the "white" culture and economy, and instruction might include trading skills, sanitation, repairing outboard motors, and the like. However sound and balanced such instruction may have been, the breach of the old hunting taboos probably resulted in increased slaughter of caribou and decreased harmony with the environment. Whatever may have been the effects, good or bad, of a given mission in a given community, one effect was universal — that the native people had another strong reason for congregating in the vicinity of the post and mission.

Along with the fur trade and missions came the manifestation of law and Canadian sovereignty in the North — the Royal Canadian Mounted Police detachments. In their northern duties the individual policemen have usually maintained their organization's tradition of fairness and competence. The judiciary also have behaved with humanity and common sense when faced with moral-legal problems like infanticide and the killing of the aged and infirm — customs which were traditional among the Eskimos and essential to their survival as a race in earlier days. With the coming of the R.C.M. Police the reasons for congregating in the communities became stronger, especially as the police functioned as the administrative representatives of the Government of Canada throughout most of the North. This meant, among other things, social welfare payments for indigents, and a further strand in the net that was gradually meshing the people closely to the settlements.

At the end of World War II family allowances began, payable in produce at the local Hudson's Bay Company post.* These regular allowances clinched the fact that the Indians and Eskimos no longer would or could remain nomads.

In 1945 the Canada Department of National Health and Welfare took over responsibility for health care in the North, and the follow-

*All family allowances are now paid by cheque.

ing year the Department of Mines and Resources began to increase its activities. The Indian Affairs Branch of the Department of Citizenship and Immigration similarly stepped up its activities in the southern part of the caribou range.

The formation of the Department of Northern Affairs and National Resources in 1953 heralded a more active federal policy in the North. The construction of the Distant Early Warning (DEW) Line and the Mid-Canada Line in the mid-1950's, with their great freight movements throughout the North gave impetus to the activity of the governments, both federal and provincial. The school, the hospital, and the local administrator's office became part of nearly every community throughout the region, and improved communication, social services, and transport have had their effect on the life of every citizen. Schools, social services, and wage employment (or the hope of wage employment) have been the most important factors in drawing the native people to the settlements and holding them there.

The white man's intrusion caused changes in the caribou populations and caused changes in the way of life of the people who use the deer. It thus became the direct responsibility of the governments of the three Prairie Provinces and the Northwest Territories to ensure that the deer and the people be given a chance to survive in the best possible harmony with each other and with their great northern environment. If government action was to be planned, research had to be done.

RESEARCH IN THE CARIBOU COUNTRY

RESEARCH IN THE CARIBOU COUNTRY

A strange beast . . .

Methinks it is greatly like a rope.

No, 'tis more like unto a wall.

Sooth, 'tis a reptile!

'Tis uncommon like a tree.

. . . the elephant as perceived through the senses of blind men.

The Canadian North is large, varied, and little known. Our research to date has not enabled us to perceive it clearly and objectively. Knowledge of the central mainland is now at about the same level, proportionate to our needs, as knowledge of the Canadian West was in the 1860's. At that time the West had been trapped and traded over for about 85 years. Writers like Dr. Cheadle and Lord Milton had visited it. A geological survey was being planned. Mines were being worked in the Cariboo country of British Columbia and in the coal country of Alberta. Captain John Palliser and Henry Youle Hind had made their conflicting reports on the agricultural possibilities of the prairies. We do have a much greater fund of information on the North than they had of the West, but our needs are infinitely greater. Research in all fields must be continued and increased if Canada is to make intelligent use of one of the greatest single blocks of under-used land in the northern hemisphere. And study of the caribou and the caribou people has been one of the most urgently needed areas of research.

Biological Research on the Caribou

It is now more than a century and a quarter since Richardson, of Franklin's Expedition, and others who followed, began to 'discover' and classify scientifically the wildlife of the Arctic prairies. And it is

50 to 70 years since the old-time naturalists — Low, Stone, Preble, Anderson, and Russell began their first systematic studies of northern wildlife. The main significant information about the barren-ground caribou which resulted from those explorations was a listing of the caribou crossing-places on the major waterways, sketchy knowledge of their habits and migration patterns, and equally sketchy knowledge of human utilization.

Hoare's more detailed studies of 1925-27 resulted in reasonable recommendations for caribou conservation which were never carried out. C. H. D. Clarke in 1936-37 studied caribou and muskoxen in the Thelon Game Sanctuary, and reported comprehensively on the caribou herds of the central Arctic. Clarke confirmed that the herds were declining, but again no solution was pursued.

Since 1948, more or less continuous study of the caribou has been carried on by the Canadian Wildlife Service, in co-operation with the three Prairie Provinces, the R.C.M. Police, Indian Affairs Branch of the Federal Citizenship and Immigration Department, and several other agencies. Many trappers, traders, bush pilots, missionaries, and others — Eskimos, Indians, and Europeans — helped.

The biologists cannot hope to see everything personally and to study all phenomena thoroughly in the vast and difficult 600,000-square-mile territory. They must adduce bits and pieces of scattered evidence — reports, old and new, of explorers, naturalists, traders, and others; conversations with native and white hunters; R.C.M. Police reports on game and fur; Hudson's Bay Company records; and the studies of biologists who have gone before. They must travel extensively merely to keep in touch with the moving herds — 36,000 miles in a given survey, by air, canoe, and dog team, is considered a minimum for a good look at the herds and their movements. They must plot the areas of forest fires in the taiga and do range studies to assess the extent and importance of fire damage. They must study the behaviour of the animal and its relationship to its whole environment. And they must study the way caribou die — by human and animal predation, accidents, weather, parasites, and disease.

There are certain hazards that go with such extensive movements of men in all types of weather. Ski-equipped planes may crack up on rough lake ice at embarrassing stages of spring break-up, leaving parties stranded until a float plane can be brought in

to rescue them. Logistics — the simple essential movement of food and fuel — can prove inordinately difficult in the North. The animals of the barrens are not normally dangerous to man, but incidents did occur that seemed more humorous later than at the time. For example, a biologist, de Vos, walking over tundra apparently devoid of life, was more than merely startled to see a full grown grizzly bear materialize from nowhere and charge down upon him with obviously unfriendly intent. Armed with a .22 pistol only, de Vos was reluctant to argue tenure. He took off at his top running speed over the hummocky terrain toward the nearby Thelon River, which he hoped would save his life if he could reach it. However, the bear was obviously going to catch him many yards short of his objective, so de Vos turned to make his futile last stand. The bear, still racing at great speed, swerved a few yards before reaching the biologist and made off across the tundra. De Vos thinks the bear, upwind of him and with the notoriously poor eyesight of the grizzly, may have mistaken him for a caribou, identifying him as human only during the last second or two of his charge.

Aside from the adventures and misadventures of months on the caribou range, biologists are faced with a constant, difficult problem of separating truth from untruth, sense from nonsense, and the exception from the general.

The dangers of believing too much or too little are illustrated by innumerable examples from the journals of explorers and students of the Arctic. Hearne, astute observer though he was, said "I have observed, during several journeys, that . . . the edge of the forest is faced with old, withered stumps and blasted trees that sometimes extended for 20 miles from the living woods; which is proof that the cold has been increasing in these parts for some ages." In actual fact, it is now well known that the temperature has been rising in the Arctic "for some ages".

Probably the greatest single widely believed error about the caribou was Seton's population estimate, which he based on the capacity per square mile of the state of Illinois to produce cattle. Seton's estimate of the caribou population of the central Arctic was about 30 million. This error of at least 1,000 per cent was derived from Seton's failure to take into account two important facts. The first was that it takes not less than 25 times as long for the Arctic to produce a crop of lichens as it takes Illinois to produce a crop of

hay. The second was that the caribou are for the most part concentrated during seven winter months into less than a third of their total mainland range.

Like many questionable items of information about the deer, this estimate of Seton's is still quoted, creating a totally false picture of the way things were. Other serious errors cropped up, complicating the studies.

The actual number of caribou the range originally carried remains a subject for speculation and debate. The early studies of R. M. Anderson led him to believe that the range would support five caribou per square mile. C. H. D. Clarke in 1937 estimated that the total mainland range was 600,000 square miles, of which about 40 per cent was water. This left some 360,000 square miles of useful range. If the Anderson figure of five head per square mile was used, the estimate of total population in the 1930's would be 1,800,000. If a figure of 10 animals per square mile (based on Alaskan experience) were used, the total population would be estimated at 3,600,000 head. Human kill during the three decades up to 1950 was estimated at 200,000 per year, gradually diminishing to 100,000 per year.

Biological Survey of 1948-1950

It was with such sketchy information and opinions that the Canadian Wildlife Service in 1948 first began its relatively intensive studies of the herds.

A spectacular and highly disquieting fact emerged from the survey: that in 1950 the deer of the central Arctic probably numbered no more than 670,000. Human kill alone, at rates well below the 100,000 per year of earlier estimates, could destroy the total annual increment to the herd except in years of unusually high calf production. The survey also produced an estimate that wolf kill probably amounted to not less than two and one-half per cent of all caribou each year, and possibly as much as five per cent. Accidents, disease, and other predators might account for another two or three per cent. The combined results of these factors, possibly coupled with successive years of unusually bad weather during

rutting and calving seasons, meant a net decrease of caribou that promised total extinction of the mainland herd unless something was done.

The Herds as They Are Now

A resurvey, carried out in 1955 produced the latest detailed information available. Ominously, the 1955 estimate of caribou population was 278,000 — less than half the estimated population five years previously. It appeared that only drastic action could save the deer. But further research was necessary to establish more clearly what conservation methods would be suitable.

Accordingly, in 1957 and 1958 an intensive ground and air research program was begun. During two springs, two summers, and a winter the scientists and their assistants lived continuously on the northern taiga and tundra in tent camps. With the aid of light aircraft they were able to remain always with the caribou herds, except for a few brief periods.

The program began in March, 1957, with an air search to discover a suitable study herd. The northern Saskatchewan herd was chosen, and the field men began work out of Stony Rapids in April. In May, when the deer were nearing the barren grounds on their northward migration, the biologists began a long session of leap-frogging their camps to positions in advance of the herds. Their course brought them up to the Back River, down to the Lockhart River before freeze-up, and back to the Fond du Lac River near Stony Rapids just after freeze-up. By calving time of 1958, 13 men were established in four camps, some of them more than 600 miles from the base of operations.

The scientists flew a total of 155,000 miles, and members of the group survived three serious aircraft accidents. Several travelled by dog sled, on foot, and by canoe some further thousands of miles.

The study herd wintering in northern Saskatchewan numbered about 100,000 animals in 1957. By winter of 1957-58 it was up to over 140,000. Herds from the northwest, and from Manitoba, had joined the study herd. Tens of thousands of air miles revealed only two

other major herds in the whole of the caribou range—16,000 animals north of Great Bear Lake, and less than 40,000 in northern Manitoba. On this evidence the biologists estimated the total population of the central Arctic herds at 200,000 caribou.

In a land as big as the caribou range it is possible for substantial herds to 'disappear' for considerable periods of time. The Great Bear herd, totalling well over 30,000 animals at that time, was 'lost' during the winter of 1949-50; that is, none of the biologists, bush pilots, trappers, or hunters who would normally have been in touch with the herd had any idea where it had gone.

There are still some people in the North who point to such facts and declare that the drastic decrease in caribou numbers is largely a myth—that the caribou are not here or there this year simply because they chose to move in another direction and winter in a different location. The actions of the deer often seem to support the arguments of such sceptics, for when the deer do come to a given locality, they come in such numbers that it is hard to believe that the original hordes are not in the land still.

It is known that deer can be missed during surveys. It is known that some deer do not come near the taiga in winter, choosing to spend the whole year on the tundra. It is known that the caribou is a restless, inconsistent, erratic wanderer; that sometimes, especially on windless days at the height of the fly season, the caribou move with such speed that a herd of 20,000 may come into sight over the tundra, move across the range of vision of the observer, and disappear within two or three hours. All these things are true, and there is a large additional list of unknowns about the caribou. Yet at no time in previous history have *all* sections of the caribou range been under co-ordinated observation during one season, and never before has a systematic method been applied to estimating caribou populations. The scientific method, as applied in the huge Arctic, may be accurate only to within 20 per cent, yet it represents the best information we have—information that is far less fallible than purely local observation could possibly be.

Enough is now known about the caribou that all the various people interested in the deer can find common ground for action to the benefit of the deer, of the native people and, in the long run, in the interest of Canada as a whole.

The Present Circumstances of the People

In earlier days, the Indians and the Caribou Eskimos depended to an amazing degree on caribou for their livelihood. Kaj Birkett-Smith, as a result of his studies of the inland Caribou Eskimos during the Fifth Thule Expedition, made the following comment:

"To [the inland Eskimo] the caribou occupies at least the same position as the seal and walrus to their kinsmen [the coastal Eskimos], or as the bison of the past to the Plains Indians. The caribou is the pivot around which all life turns. When it fails, the mechanism of culture comes to a stop and hunger and cold are the consequence for those tribes which, relying upon it, have created an almost incredibly one-sided culture. And yet . . . this culture is the only one that has made these regions habitable."

Even in the early 1920's the inland Eskimos were almost totally isolated from direct contact with white men. However, occasional contact had reduced their number by disease to seven or eight hundred, had provided them with firearms, and had turned them into white fox trappers of modest industry. In the early 1950's there were small groups at Ennadai Lake, Padlei, Baker Lake, Beverly Lake, Aberdeen Lake, Garry Lake, Schultz Lake, and occasional families at strategic caribou crossing points throughout Keewatin.

By the mid-1950's the pressure of caribou scarcity was beginning to bear hard on the slim resources of the inland people, and in the early winter of 1957 tragedy struck, leaving some 19 of them dead of starvation or allied causes. Starvation has never been alien to the Keewatin, but never has it seemed as inevitable as during the present caribou decline. Nor has there ever been an alternative. There is an alternative now. During the past half-dozen years the inland people, with government encouragement, have fled the open tundra, concentrating in Baker Lake settlement, Eskimo Point, Whale Cove, and Rankin Inlet. There, with the help of social aid and minor government-sponsored enterprises, they have adapted to some degree to the shore communities and to fishing and sea mammal hunting.

Thus no longer are the inland people solely or even mainly dependent on caribou for their actual survival. The coastal Eskimos never were so dependent. Before the white man they occupied most of the winter with sealing and other sea mammal hunting, and a portion of the summer with fishing for Arctic char. The caribou was desirable enough in season as food. Clothing skins of deer killed in

summer and autumn were, with the coastal Eskimos as with the Indians and inland Eskimos, essential to survival in winter. Sinew was, of course, useful for sewing. But the seal would provide all essentials except light, warm clothing. When the white man came the "white fox economy" began to govern the seasonal movements of most coastal Eskimos. These Eskimos moved inland in time for the autumn hunt and remained all winter with their rifles and dogs. They killed deer constantly for themselves and their dogs, and for fat to supplement kerosene and willow-twig fuel for their heating lamps. Biologist Andrew Macpherson has estimated that a family living on the land in primitive style nowadays needs between 100 and 150 caribou to maintain itself and its dogs. (Under primitive conditions in the early days of the fur trade a family of four, with dogs, probably needed 250 caribou per year.)

At present, however, there is little wintering on the tundra. White fox pelts dropped in price to less than \$20 after 1961. Recently, caribou have seldom been available at the proper season for prime clothing skins, essential for winter trapping on the tundra. Few hunters and trappers are equipped to move outside a 20-mile radius of their settlement. Few complete outfits of caribou-skin winter clothing are now seen in any settlement. And an alternative source of food is available through wage employment or social aid. In some communities the government has established minor but useful money-making devices such as carving and handicraft work, small commercial fisheries, and tourist guiding. Only a few groups remain "on the land": a small group at Chantrey Inlet, another at Bathurst Inlet, and a few isolated kin groups at such places as Contwoyto Lake, Wager Bay, Aberdeen Lake, and Yathkyed Lake.

Thus the cultures that were totally or greatly dependent on caribou are now broken up. The Eskimos hunt caribou whenever they can. But they do not commit themselves to dependence on the deer. Most merely make forays from the settlements if the deer come within one or two day's travel by dog team. All told, the Eskimos of the caribou country number no more than 2,500 and their total kill in 12 months of 1959-60 probably amounted to no more than 12,000 animals.

The trend toward concentration in settlements is shared by the taiga Indians. Most of them now live in relatively stable communities such as Churchill, Brochet, Stony Rapids, Fond du Lac, Fort

Chipewyan, Lac la Martre, Snowdrift, Rae, and Rocher River, with a few around Yellowknife and Port Radium. There are also tiny congregations of cabins and houses at a few places, and often-used summer camping grounds at a number of key points.

Like the Eskimos, few Indians now depend for their clothing on the caribou — and by the same token, Indians are not as mobile in the winter as hunters and trappers need to be. In the winters from 1958 to 1962 most of the men of Snowdrift on Great Slave Lake — caribou hunters for a hundred generations or more — went *en masse* to work at road-building on the Mackenzie Highway. Like the Eskimos, the Indians hunt when they can, and they may hunt quite often during a winter when employment is lacking.

What the Caribou Really Mean to the North

There are two ways of looking at the caribou: one, the long-range view of the white man, and the other the short-range view of the Indian and Eskimo. A white man, with his accountant's mind, may theorize that the caribou country with adequate management is able to support perhaps two million caribou, and that 200,000 of these could be "harvested" every year. At a conservative \$40 per beast, "on the hoof", the annual worth of the caribou, properly managed, would be \$8 million. Capitalized at six per cent, the value of the herds that the central Arctic probably could maintain would be close to \$135 million.

Carrying the theory further, the white man might see valuable "side benefits" such as a great Arctic tourist trade based in part on the herds. And he might see the herds as a means of permitting more economical prospecting and mining operations — partly by the fact that caribou could provide an important part of the food supply, and partly because if the herds exist, a large supply of fluid local labour will exist with them — people who were born to the country and who like to live in it.

So much for accounting. The figures are (theoretically) valid. But our sense of values as a Canadian people is not necessarily that of the accountant. What does the caribou mean to the Indian and Eskimo, in terms of today and tomorrow; in terms of living? Without

caribou, the native, if he is lucky, has a choice of two alternatives: he will work for wages for the white man, or he will accept the white man's charity. Some choose work; some choose social aid. But at present not too many natives have even that choice. Wage employment is not easy to get during this generation in the central Arctic. Without it, and without caribou, there is no choice but charity. Following this line of reasoning, the caribou is as important to the Indian and Eskimo as a job is to a citizen of Southern Canada. A caribou hunter is a *man*. Without caribou his self-respect and general well-being must inevitably decline, for he is idle, not too well fed, and a burden on his fellow Canadians. In short, the natives of the North need the caribou with a need just short of desperation.

How can we ensure that this need will be met — and that the accountant's dream of the future may be realized?

CARIBOU MANAGEMENT – A SCIENTIFIC SOLUTION

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"Accuse not nature, she hath done her part;
Do thou but thine."

Milton

Biology and social science aren't exact sciences. (If they were, we would all lead very prosperous, well ordered, and dull lives.) Who can predict accurately how human beings are going to react when someone changes a law or proposes a different way of doing things? And who can say what will happen to the caribou if we do certain things, like protecting it completely from hunters and wolves, or increasing hunting pressure, or doing selective hunting, or any one of a dozen different things we might do to try to manage the herds better?

The fact is that we must experiment, for we cannot afford to drift aimlessly and watch the caribou and the people go steadily down hill. We should avoid the pat answer, for there is no simple, known solution to the problem. And we should continue to increase our scientific knowledge, while at the same time applying what knowledge we have in developing new courses of action.

All judgments arise out of assessments of evidence, so before attempting an answer, let us gather up our evidence. What are the principles that should govern our objectives, and what are the outstanding facts about caribou and people?

General Principles

- It is in the interest of the Canadian nation to ensure that the caribou and the native people prosper in their northern environment.
- Wildlife management is the art of maintaining a sustained yield or crop of wildlife for maximum benefit of people.
- Law is the expression of the will of the majority; if in a given region most people do not regard the law as reasonable it will be difficult or impossible to enforce.

Facts

- The caribou population of the central mainland has declined from its historic numbers, which have been estimated at between two and three million, to a much smaller number which has been estimated at 200,000.
- The decline is probably the result of two major factors: excessive human kill and range depletion by fire. Other important contributing factors have been a succession of poor calving seasons, excessive kill by wolves, and perhaps other factors not yet known. Human kill alone has nearly equalled the annual calf crop in most years since 1948. When this happens, decline of the herds is inevitable.
- The length of the period of decline is not positively known, but the herds seem to have been decreasing since about the turn of the century.
- A single family of Indians or Eskimos living in relative isolation "on the land" needs 100 to 150 caribou per year. However, most Indians and Eskimos are now living in northern communities. They lack adequate employment opportunities, trapping equipment, food, and clothing as a direct result of the caribou decline. They would probably co-operate in organized harvesting of caribou and in development of alternative sources of food.

- Considerable money is being spent by the federal and provincial governments on direct or indirect relief for the native people, and this will continue until some better alternative is found.
- Beside the caribou, a number of sources of food are found in most parts of the North. There are fish, moose, snowshoe rabbit (varying hare), muskrat, beaver, bear, sea mammals, and waterfowl. "White-man's food" can be bought with fur, wages, relief, and family allowances. None of these foods is as useful as the caribou, but all are useful.
- Fire on the caribou range is a hazard to future growth of the herds. Complete fire control, as in the commercial forest, would be impossible or prohibitively expensive, but considerable control could be achieved at moderate expense.

Principles of Game Management

- If a decline in an animal population is caused by over-use by humans and predators, a sound general game management principle is to decrease hunting pressure and reduce predator populations.
- If a decline in animal populations is caused by overgrazing, a sound general game management technique is to increase hunting pressure.
- An important element in managing game is "managing people".

Practical Caribou Management

With these facts and principles in mind, what action should be taken to improve the situation of the caribou and the native people?

- Fire in the taiga winter range is undoubtedly harmful to caribou populations. Fire should be controlled as far as economically possible.

The country is so vast that fire fighting operations that depend on ground transportation are too costly in most regions. Airborne crews in planes equipped for water bombing seems to be the only method that can work. Constant patrols would be made in the wake of lightning storms and during days of high fire hazard when the taiga is tinder dry. Most fires could be caught while small enough for the crews to handle with the aid of the water-bombing plane. This method might be tried for a couple of years experimentally. If it works well, enough planes and crews should be put into the North to keep the whole taiga strip under control from Churchill to beyond Great Bear Lake. At the same time, an educational campaign could be undertaken to reduce the number of fires caused by human carelessness.

What to do about caribou kill by humans is much more complex.

- First, there is the basic and important question, "Was human kill mainly responsible for the caribou decline, or was range depletion by fire and overgrazing mainly responsible?" But as long as human kill equals or exceeds the annual increment of the herds, the question of range carrying capacity remains of secondary importance. We must assume for the time being that human kill is responsible, and act on that basis.

The action required is many-sided. Most of the Indians and Eskimos now live in communities all or most of the year, and the most important steps to reduce kill must centre around them. Any plan to reduce caribou kill involves two essential elements: efficient use of the caribou that are killed, and full development of the many alternative sources of food that exist.

Caribou hunting should be done in an organized way. Hunts should be organized in each of the caribou communities so that caribou are killed selectively (bulls where possible). And the meat and hides should be brought to the communities with as little waste as possible. Adequate freezing and storage facilities are essential. Fish, moose, sea mammals, and small game should be taken in quantity and preserved by cold storage or drying. Trapping should be encouraged (based on adequate supplies of dog food and human food) so that money is available for "southern food" like flour, lard, and vitamin-rich supplements.

What of the Indian and Eskimo hunters who still live on the land, away from the main settlements?

- There are those who believe that laws must be made to protect the caribou, and that these laws should be enforced strongly "across the board". The native hunter, feeling the bite of 70 or 80 degrees of frost as his finger caresses the trigger of his rifle, would not understand this viewpoint. The caribou have always been there, and the hunters have always killed them. And there are hungry bellies back in his camp.

In considering the vitally important human aspect of caribou survival, it becomes easily apparent that the question of caribou survival is not only a biological question; it is also a social question. If the various agencies concerned, both government and private, are able to plan action wise enough and practical enough to gain the confidence and co-operation of the native people, the caribou can be saved. If not, the caribou will disappear, and with them any prospect there may be that elements of the traditional relationship between man and caribou can survive.

While taking all necessary steps to reduce human kill yet still providing for human needs, we must consider that the assumption may be wrong that human kill has been the only major reason for the decline. When hunting pressure on the herds is reduced, we may find that the caribou numbers do not automatically and quickly rise. Alternatively, as numbers increase, we may find evidence of malnutrition in some herds. If that proves to be the case, management techniques will have to be developed to keep each herd within the "carrying capacity" of its range.

Wolf control is a matter for some further action and study.

- When the 1948-50 survey showed a drastic decline in caribou, the major step taken to protect the deer was a wolf control program.

Federal and provincial game officers set out poison baits at about 700 locations on rivers or lakes in the caribou country each winter. They were set far enough out on the ice to avoid the possibility of forest-dwelling fur bearers eating the poison. Most baits were distributed by crews carried by plane and nearly all baits were picked up in the early spring. Those that were not picked up would sink

and disintegrate in the water without further harm to wildlife. Poisoning was supplemented by the work of paid hunters, and by scalp bounties on pups taken from dens. The known kill between 1953 and 1959 was about 7,500 wolves.

Such rigorous wolf control to reduce the annual loss of caribou is an emergency measure. By itself it would be foolish and self-defeating, because the wolf is a vital part of the life systems of the caribou and many other species. It is probably essential to the health of the environment.

Research should be continued.

- Much remains to be learned about caribou nutrition and the condition of the range. Annual movements should be studied thoroughly by means of air patrols and constant tagging operations. The effects of disease, insects, and predation are still too little known, and without greater knowledge logical control measures are impossible. Better definitions of the social and economic value of the caribou are required. But the acknowledged need for more research should not obscure the possibility, and *the desperate need*, to take immediate action.

What Has Been Done So Far

Wolf control — probably because it is simple and direct — has been the major positive measure taken so far to assist the caribou in their fight for survival. Steps have been taken to begin an important experiment in fire control by use of aircraft. Nearly a dozen large refrigerator units have been installed for the use of Indians in the caribou settlements. Indians and Eskimos have been helped to get wage employment — most of it temporary — as an alternative to caribou hunting. Several important domestic fisheries have been developed. One fishery at Trout Rock on Great Slave Lake yielded about 86,000 fish in one season — which represents the meat of about 2,000 caribou. Large-scale caribou hunts, well planned, well supervised, and quite efficient, have been carried out at a couple of points. Compared to unplanned hunts, these hunts bring much more meat per caribou killed into the settlements for human food.

These steps are a good beginning; but they are only a beginning. Many agencies — both government and non-government — that are concerned with the caribou are doing work individually and co-operatively toward better caribou management. Scattered and partly unco-ordinated as these efforts are, they cannot accomplish what must be accomplished. The various governments concerned — the governments of the Prairie Provinces and the Northwest Territories, and several agencies of the Federal Government — need to co-ordinate and integrate their efforts more thoroughly. These efforts must be in line with the needs and desires of the people — Indian, Eskimo, Metis, and white, who make their homes in the North; yet they must not be half-measures, and compromises. The efforts must also meet the needs of a healthy caribou population. What needs to be done must be done.

A FRAGMENT OF HISTORY

A FRAGMENT OF HISTORY

The present North is tied to its history, as all regions and all countries are. In a country as vast and little-peopled as the land of the caribou, history is intimately tied with personalities.

Samuel Hearne made the first major intrusion by a white man into the country of the caribou. Hearne completed his famous journey from Churchill to the mouth of the Coppermine River in 1771, after two years of trying. During his trip he collected many acute observations about the country and its people. At this time Hearne's employer, the Hudson's Bay Company, had been on the Bay for about a century but had not gone far inland to the west or northwest.

The early voyages in search of the Northwest Passage, dating from 1576, were captained by such men as Frobisher, Hudson, Davis, and Munck, and a number of them had penetrated to the northeast shores of the great central Arctic caribou country. Alexander Mackenzie in 1789 made his epic journey to the mouth of the river now bearing his name. This completed the general picture of the caribou country. Men had been around it almost on all sides, and one man had been through its interior.

Then came the large, highly organized expeditions through the interior, captained by Franklin, Back, Simpson, and Dease. After the disappearance of Franklin and the crews of his ships, *Erebus* and *Terror*, in 1847 and 1848, the great searching expeditions began, headed by Rae, M'Clure, M'Clintock, and others. Finally, in 1906 Raold Amundsen completed the first voyage through the Northwest Passage and the period of basic exploration was over.

The period of scientific exploration began in the late 1800's and continued through the 1920's. Stefansson carried out his important journeys and studies from 1908 to about 1918, and Anderson, Dia-

mond Jenness, J. B. Tyrrell and J. W. Tyrrell, Charles Camsell, Bell, and other Canadians began to appear in the literature of northern exploration. Long before the turn of the century, whalers — mainly American — were moving into Hudson Bay with Fullerton, near Chesterfield Inlet as base and into the Beaufort Sea on the west, with Herschel Island as base. With the establishment of Hudson's Bay Company posts throughout most of the Arctic between 1900 and 1930, the carrying out of the Fifth Thule Expedition under Rasmussen from 1921 to 1924, and the establishment of air routes down the Mackenzie in 1926, the new era of northern development was ushered in.

During the period after 1890 a number of naturalists, some of them highly trained, visited the caribou country, particularly its western fringe. These included Franklin Russell, Stone, Buffalo Jones, Warburton Pike, Ernest Thompson Seton, E. A. Preble, and R. M. Anderson. In 1925, W. H. B. Hoare reported specifically on the caribou, and in 1940, C. H. D. Clarke reported on the animals of the Thelon.

The north country has produced native leaders of note. In past generations we hear of Naohnby, the Bear Lake Chief; of "Baron" Laviolette on the Yellowknife River; Little Crapeau of the Yellowknives; Kasmere of the Manitoba Chipewyans; and Hearne's outstanding guide, the great Matonnabee.

The present generation also has its native leaders, such as Scotty, an outstanding Eskimo leader at Baker Lake; Shevigatah of Sandy Point north of Eskimo Point; Jimmie BrunEAU, the great Chief of the Dogribs; and a few others. But effective leadership has become more and more difficult as cultural patterns change and as people of many backgrounds come together in the communities of the North.

A few families living in the country and by the country provide essential leadership in the strange transition period between the old ways and the new: people like the schooner-owning Wolki and Gruben families of the Mackenzie Delta, and the Voiseys who moved from Labrador to settle at Tavani and Whale Cove on the west coast of Hudson Bay. A score or more of white trappers have operated along the southern fringe of the barren grounds more or less constantly during the past 30-odd years, and a few of these remain active.

As interest in northern development has increased during the past

half century, a considerable number of biologists, botanists, geologists, geographers, anthropologists, engineers, transport men, hydrographers, bush pilots, miners, and enterprisers have made their mark on the North. And, of course, the traders, missionaries, and R.C.M. Police continue to be significant in northern development.

A TIME OF TRANSITION

A TIME OF TRANSITION

More recently — mainly since World War II — many agencies of government have become a powerful influence in most communities. In fact, with the decline of the fur trade, and with the decline of the caribou herds, government activities are the basis for much of the economy, except in a few mining communities.

The boundaries of the caribou range do not conform to political boundaries. Parts of three provinces and two great territorial districts make up the vast mainland range of the caribou. The government of each province or territory may have several agencies at work in the North, for such distinct purposes as education, social welfare, law enforcement, and the like. Such agencies may affect caribou management in a variety of ways, good or bad, because they affect the attitudes and abilities of the native people.

The population of the caribou country is dispersed in tiny settlements: dots in a vast firmament of timber and Arctic prairie. Most of the natives are literate in their own language, but are not yet literate in English or French.

With these facts in mind, any person who is familiar with governmental organization will easily perceive how very difficult is the task of establishing a caribou policy and putting it into effect. The initial need is for the governments of the provinces and the Northwest Territories to agree on a course of action, allot money to support such action, and decide what agency or agencies will be made responsible for carrying it out. The second and equally essential need is that the program be worthy of the confidence of the Indians, Eskimos, and Metis, and that they become deeply involved in putting it into effect.

In the North of today, "ten years ago" is distant history. Change has swept the people and such portions of the grand countryside as can be affected by people. Much mature judgement is essential during the next decade to ensure that the continuing changes are beneficial.

The history of the caribou country has been forged by a long succession of able, courageous men, both native and European. Its history has now come to a critical turning point. The future of the country and most of its native people is tied closely to the fate of the caribou. If all men concerned apply their knowledge and imagination to the problem, the history of the future will not record a priceless opportunity lost by default.


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RANGE OF BARREN-GROUND CARIBOU


(RANGIFER TARANDUS ARCTICUS)


J. P. KELSALL, JANUARY, 1963

TREE-LINE 

WINTER RANGE, SOUTHERN LIMIT 
Any part of the entire area may be used in winter, but most wintering animals are found between the tree-line and the southern limit of winter range.

SUMMER RANGE 
The summer range extends from the tree-line northward to the coastal limits.

RANGE EXTREMITIES SINCE 1935 

A FEW CARIBOU REPORTED OCCASIONALLY 


PRODUCED BY THE SURVEYS AND MAPPING BRANCH, DEPARTMENT OF MINES AND TECHNICAL SURVEYS, OTTAWA.


HABITAT DU CARIBOU OU RENNE


ARCTIQUE DU GRAND NORD


(RANGIFER TARANDUS ARCTICUS)

J. P. KELSALL, JANVIER, 1963

LIGNE DE VÉGÉTATION ARBORESCENTE 

LIMITÉ SUD DE L'HABITAT D'HIVER 
En hiver, les caribous occupent certaines étendues de cette grande région, mais la plupart d'entre eux hivernent entre la ligne de végétation arborescente au nord et la limite sud de l'habitat d'hiver.

HABITAT D'ÉTÉ 
L'habitat d'été s'étend vers le nord de la ligne de végétation arborescente jusqu'au littoral arctique.

LIMITES EXTRÊMES DE L'HABITAT DEPUIS 1935 

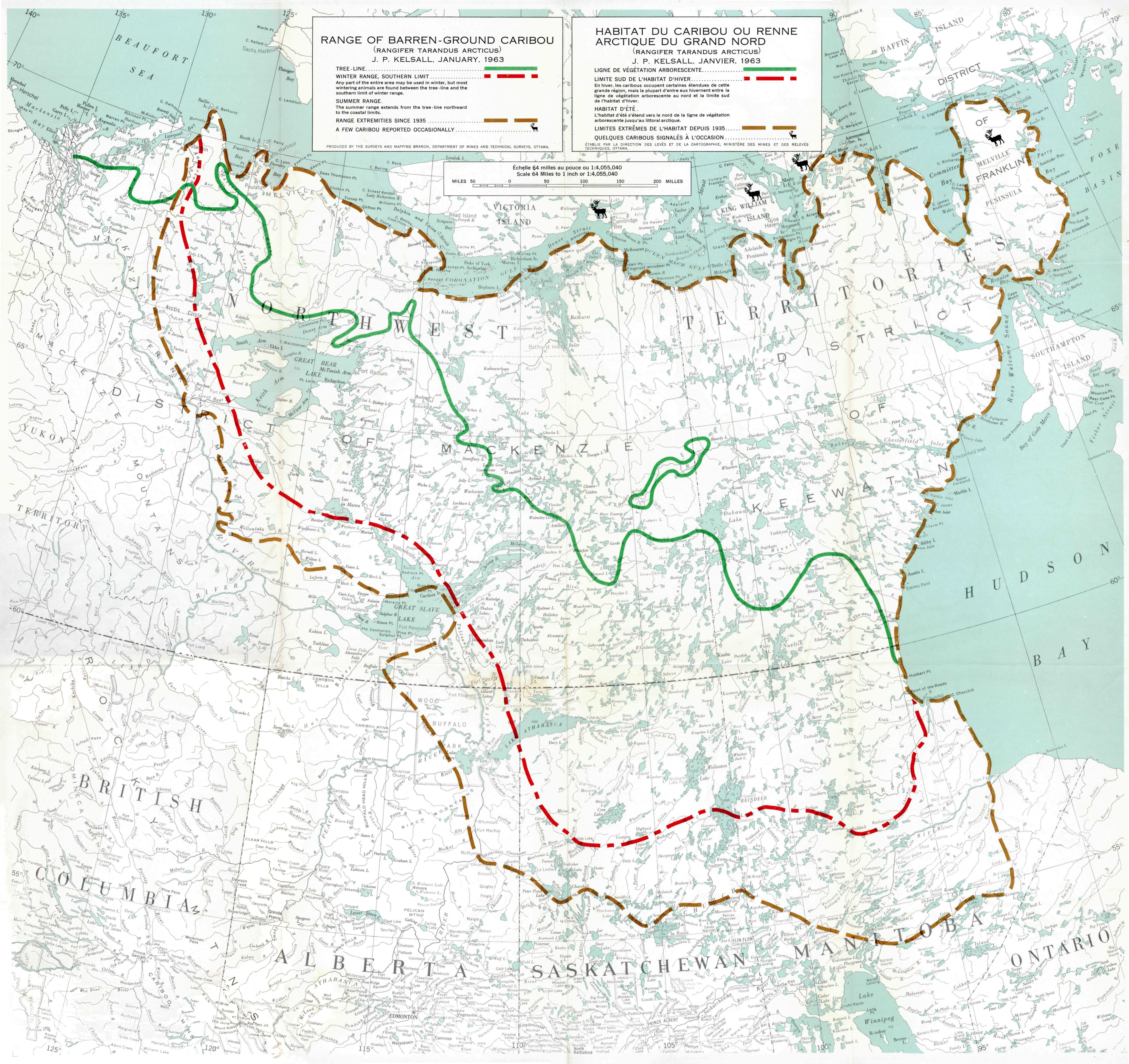
QUELQUES CARIBOUS SIGNALÉS À L'OCCASION 

ÉTABLI PAR LA DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DES MINES ET DES RELEVÉS TECHNIQUES, OTTAWA.

Echelle 64 milles au pouce ou 1:4,055,040

Scale 64 Miles to 1 inch or 1:4,055,040

MILES 50 0 50 100 150 200 MILES



ENVIRONMENT CANADA LIBRARY
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The barren-ground caribou has survived water crossings, accidents, wolves, sickness, and even man's bows and arrows for thousands of years. But of the 2 to 3 million that roamed the barrens in 1900, only about 200,000 survive in 1965.

The new killer is man with a rifle, man with careless fires. However, the problem is not simply one of game management. It is a sociological one too, because some Indians and Eskimos are still living off the land.

