

The Decline of the Caribou

By John P. Kelsall

The barren-ground caribou of northern Canada have decreased alarmingly in recent years. The mainland population, *Rangifer tarandus arcticus*—their scientific name reveals that they are a geographical race of the European reindeer—is estimated to have numbered at one time between two and three million. But in 1948 and 1949 an aerial census made by the Canadian Wildlife Service estimated the population at 672,000, which was so far below what was expected that some people refused to accept the findings. A second census in 1955 suggested that the population had decreased again, by over 50 per cent, and the Government immediately increased both funds and facilities for research. Mr. Kelsall is a biologist of the Canadian Wildlife Service who directed the caribou research between 1950 and 1959, and is now correlating all the work done since 1948 into a single monograph. In this article, condensed from *Canadian Audubon* by kind permission, he describes the measures already taken to save the caribou, and outlines some of the problems involved, including the human ones of preventing the waste of caribou meat and controlling the hunting not only of Eskimos and whites, but of the Treaty Indians who have inalienable rights to hunt game.

BARREN-GROUND caribou constitute a wildlife resource of national importance in Canada. Early explorers relied heavily on the caribou for food, clothing, bedding, and today they are still a primary source of food for Canadians—Indians, Eskimos and whites—in isolated northern locations. The mainland caribou range over an area of about 750,000 square miles, between the Mackenzie River and Hudson Bay, about half of it treeless tundra, and the rest boreal forest. In the main the herds spend the summer months on the tundra and the winter in the forests to the south, travelling anything up to 600 miles between the two, although in some years up to half the population may remain on the tundra in winter.

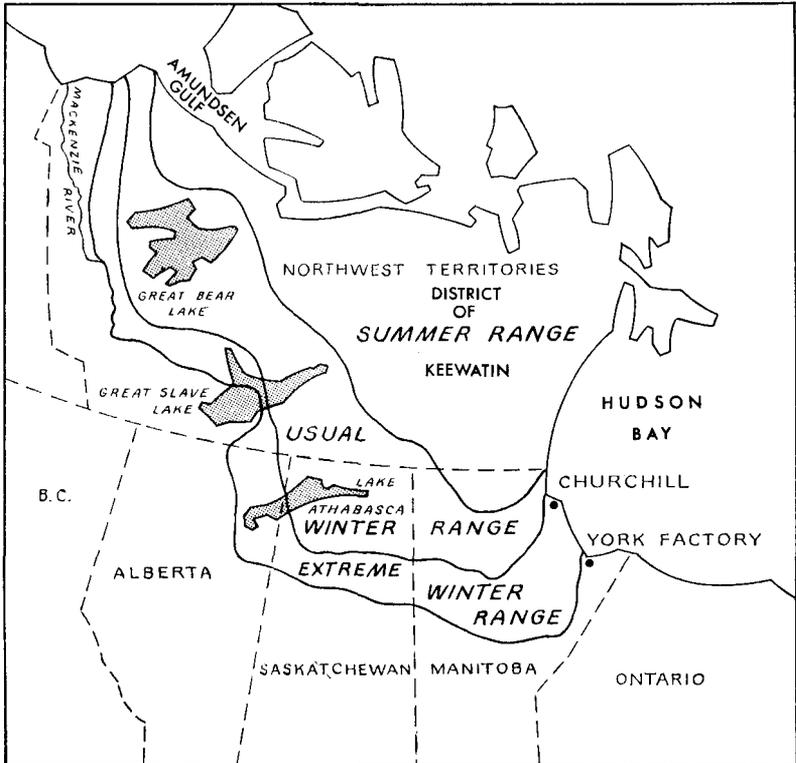
The Migration Pattern

The spring migration from the forest to the tundra begins in April. The herds travel rapidly, and the cows arrive on the calving grounds in late May and early June, most of the calves being born before the middle of June. The bulls and some non-breeding animals frequently lag behind but generally join the cows after calving. The caribou then spend the summer roaming widely over the tundra, though they are much harassed by mosquitoes, and sometimes by black flies too, especially in July. Indeed their movements seem to a great extent to be dictated by the degree of harassment and by the strength and direction of winds which provide temporary relief from the insects. In early August the insects decrease and the caribou spread out to feed and rest, and start a leisurely drift towards the tree line, where they gather once more in large herds. October and

November is the rutting season, when they may still be wandering at the tree line or have already started their return migration. By December they are generally back in their wintering areas in the forest. Their annual movements are variable, but this is the basic pattern.

Some Irregular Movements

Superimposed on these basic annual movements are others which may not be at all regular in nature, and which cause a complex and changing picture of caribou movement and distribution viewed over a period of years. Sometimes population shifts occur during non-migratory periods in winter, or following calving in summer, in which the animals may wander far to one side or the other of the usual lines of movement. When the next migratory period arrives they simply travel to the nearest winter range (or calving area if it is spring), and in a single season the shifts may involve a lateral movement of several hundred miles across the normal migration lines. There is evidence to suggest that these shifts affect the entire range, and that the centre of abundance for the whole population moves from east to west and returns at rough intervals of about ten years.



A sketch map of northern Canada showing the summer and winter ranges of the caribou.

When numbers have built up in the extreme west of the range, population pressures force a shift eastward, until the population once again builds up at the eastern end and forces a return shift westward. This largely explains why caribou numbers fluctuate widely from year to year in given localities.

In addition there are unusual movements of caribou which are largely inexplicable and unpredictable, and involve prolonged movement in directions other than those usually used during migration. For example between July, 1956, and December, 1957, a herd of more than 30,000 caribou was periodically observed travelling across the tundra from Southern Keewatin District north-westward to forests south of Amundsen Gulf, a distance of at least 750 miles. The movement spanned over two-thirds of the total distance across the ranges, and for the most part it crossed regular migration routes at right angles.

Food for Men and Dogs and Bait for Traps

In primitive times barren-ground caribou probably numbered in the millions. Recent comparisons with the closely related reindeer, and with the known carrying capacities of reindeer ranges, suggest the mainland caribou population once numbered between two and three million animals. The human population of the barren-ground caribou range numbers less than 30,000: Eskimos dominate the northern and eastern portions of the area; Indians dominate the southern and western portions; and people of white extraction are scattered throughout at posts and settlements of various sorts. As recently as 1949 humans were taking up to 100,000 caribou annually to provide necessary food for themselves and for their dog teams. The value of the meat alone, when compared with beef in settled parts of Canada would be worth more than \$5,000,000 per year. Moreover the provision of alternative foodstuffs such as imported beef, would be nearly impossible in many places due to high transportation costs. Considerable added value is derived from caribou hides, which are still used by many residents for the best of Arctic clothing and bedding, and from bone and antlers which are still used for a variety of purposes by the indigenous population.

In the early 1920's, residents of the North and the Canadian Government became alarmed at the excessive slaughter of caribou by people engaged in the fur trade. Single trappers would kill hundreds of animals simply to provide bait for their winter trapping operations. Indians and Eskimos long accustomed, through necessity and primitive hunting methods, to take whatever game they could at any time, often slaughtered caribou until their ammunition ran out. Even so, many people could not conceive, or would not admit, that so numerous an animal could be seriously reduced in number through human action.

The Findings of the Census

However, by the late 1930's and early 1940's a few individuals and government agencies were beginning to express concern that the seemingly unlimited numbers of caribou were being reduced. Caribou stopped appearing on some of their usual migration paths; they had completely disappeared from some areas on the limits of the range; there were

increasing reports of starvation and hardship at remote human settlements. The Canadian Wildlife Service was commissioned to undertake a survey of the caribou resources. In 1948 and 1949, during which biologists travelled over 36,000 miles on survey and census work, the population was estimated at 672,000 animals. This was far fewer than was generally supposed to be the case and many persons accepted the findings reluctantly or not at all. However research funds and facilities were greatly expanded and caribou studies have continued without interruption since 1950.

Studies on western caribou ranges before 1955 disclosed a number of previous unknowns. In areas of intensive human activity forest fires were destroying critical winter ranges faster than regeneration was taking place. This led to increased, and still increasing, forest fire control measures. In remote areas fire control is very expensive and it will fall short of complete coverage of the caribou ranges for years to come. The total recorded loss of forests to fire in the Yukon and Northwest Territories, in 1958 alone, was 1,639,695 acres and that figure was probably conservative. The remaining forests are adequate for the present reduced caribou population, but they might well be inadequate for an increasing population.

Controlling the Wolves

Wolves, the only major predator of caribou, other than man, were found to be unexpectedly abundant. They live almost entirely on caribou by following them in their migrations throughout the year, except for a few summer months during the denning season. So an extensive and selective wolf control campaign was started, aimed not at the extermination of the wolves, but at their rigid control on important caribou ranges until such time as the caribou might recover. Bounties are not paid on wolves now for sound biological and economic reasons. It was found that a half dozen trained men using aircraft and dog teams could kill more wolves in a single winter, on chosen areas, than were killed by the entire human population of the Northwest Territories at a time when high bounties were paid.

Three discoveries of a particularly disturbing nature were made. First, the caribou herds seemed to be becoming far more nomadic and erratic in their wanderings than was considered usual. Unusual movements of the sort already described took major herds far from normal migration routes in unlikely directions. Such wanderings are believed to be characteristic of many declining mammal populations. Secondly, the reproductive rate, when studied on a continuing basis, seemed abnormally low. Ungulates from most temperate and northern climatic zones maintain calf crops in the vicinity of 20 per cent of total herd strength per year, and caribou are capable of calf crops of over 30 per cent under ideal conditions. The herds under study were found to have calf crops, in the 1950 to 1955 period, averaging only about 14 per cent of total animals, with individual herd increment in some instances as low as 4 per cent. Thirdly, and of greatest concern, were the findings of continued studies of human utilisation. Wherever herds were subjected to moderate to heavy hunting it was found that the annual kill approached and often exceeded, the annual calf crop. This, of course, is an impossible situation if the caribou are to increase numerically, or even hold their own. When the human kill equals

or exceeds the number of calves which survive annually, and when a further loss to predation, disease and accident is added, a continuing annual deficit of large proportions is inevitable.

As a result of these findings a second range-wide census was undertaken in 1955. Biologists flew 40,000 miles of census in a period of little over two months, and calculated the total remaining caribou population at 278,900 animals. This figure, involving a decrease of 50 per cent since 1949, correlated closely with the calculated annual deficits in the years between the two surveys. It provided a quantitative demonstration that extraordinary measures were necessary if caribou were to be saved and increased, so that they would continue to be a useful renewable resource.

A Crash Research Programme

The main result of the 1955 census was greatly increased interest in caribou management and research at all levels in government and public bodies. Since the animals regularly range over portions of Manitoba and Saskatchewan, as well as land in the federally controlled Northwest Territories, complete federal-provincial cooperation was necessary. This was achieved even before 1955 by two committees drawn from interested federal and provincial agencies. The first—the Technical Committee for the Preservation of Caribou—included biologists and other technical officers working directly on caribou or related problems. The function of this Committee was to plan and implement research programmes and to recommend research and management measures to the second committee, the Administrative Committee for the Preservation of Caribou. The latter was empowered to act on the recommendations of the Technical Committee, with such modifications as might be administratively necessary. Among its functions were the provision of money for research from the agencies represented by its members, and the recommending of courses of action, legislative or otherwise, to the federal and provincial Cabinet Ministers concerned.

On the research level the 1955 census with its calamitous findings greatly accelerated field work. Between 1956 and 1959 the federal and provincial governments jointly contributed nearly \$250,000 for biological research on caribou. This made possible a crash programme of research that in 1957 and 1958 alone employed six full-time biologists, two full-time field assistants, and a dozen highly specialised research men from time to time as required. The entire field of caribou biology has been considerably advanced. Particular studies have been made of ranges and range vegetation; herd composition and dynamics; behaviour; migrations and its causes; breeding and reproductive success; and mortality among all age and sex classes of caribou.

The most important new discovery showed that the pregnancy and birth rates among breeding female caribou were excellent but that excessive infant mortality was frequent on the calving grounds. Calf survival, curiously enough, frequently appears to depend on prevailing meteorological conditions at the time of parturition. If blizzard conditions prevail during mid-June, the majority of calves born may die within a few hours of birth. The calf loss in each case where figures are available seems

directly proportional to the severity of the weather as measured in terms of temperature, precipitation and wind velocity. Excessive loss of body heat kills young calves directly, particularly if adverse weather is prolonged, and others die through associated factors. In a blizzard a calf may become irretrievably separated from a cow and starve. Calves have been found stuck fast in unseasonably deep snow. Wolves have little trouble catching exhausted calves, and unusual accidents occur more frequently in bad weather. Unfortunately, blizzards have occurred in some areas during calving in a majority of the years since 1950.

These findings lead to all sorts of speculation regarding the adaptation of caribou to their environment—some of it highly pessimistic. It may be that the bad calving weather of recent years is an anomaly of a transitory nature. However, it seems quite possible that adverse weather is a function of a generally recognised warming trend in the Canadian Arctic which has been going on for centuries. In this case it is likely that caribou have long been in very delicate balance with their environment. Possibly one good calf year in ten was sufficient to maintain numbers in the face of primitive hunting. With the introduction of modern firearms to the hunting population the balance may have been permanently upset.

Hunting for Sport Abolished

Since over-utilisation by humans was, and is, the crucial factor in the caribou decline, and since it is also the factor most subject to control, the improvement of protective legislation has been almost a continuous process since 1950. As far as possible, comparable legislation, for the protection of the caribou resource, has been enacted in the three Prairie Provinces and the Northwest Territories. Caribou hunting for sport has been completely abolished, and hunting has been restricted to persons who are obliged by their manner of life (e.g. Indians and Eskimos) to use caribou for their own consumption. Female and calf caribou are protected. Waste and abandonment of caribou meat is prohibited. At one time, one-third to one-half of all caribou killed was fed to dog teams, but legislation and the stimulated use of other dog food (e.g. fish which abound in most caribou country) have reduced that abuse. Agencies concerned with Indian and Eskimo welfare have worked extensively on the problems of alternative food supplies for those people to whom new legislation might prove a hardship. There are still hundreds of Canadian Indians and Eskimos, however, who derive a substantial proportion of their livelihood from caribou, and for this reason over-all closed seasons on caribou have not been initiated in the North.

Rights of the Treaty Indians

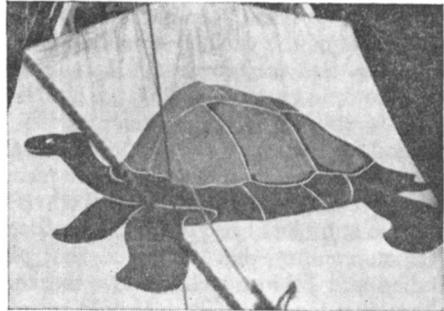
The greatest problem in reducing the loss of caribou through hunting lies with Canada's Treaty Indians. Several thousand of these people inhabit caribou ranges and depend heavily on caribou for their subsistence. These people are still following the nomadic hunting and trapping economy of their forefathers. They have inalienable rights to hunt game for food for themselves and their families, and they are not subject to hunting regulations that apply to non-Treaty Indians, Eskimos and white

persons. Their rights were established and guaranteed by treaties signed jointly by their forefathers and the Canadian Government. Although it is possible that their treaty rights might be abrogated and the Indians made subject to restrictive legislation with respect to caribou hunting, such an approach would undoubtedly raise strong moral and legislative conflicts. In addition, without the co-operation of the Indians the enforcement of such restrictions might be extremely difficult and meet with little success. People eking out a tenuous subsistence in a harsh climate cannot be expected to react favourably to any measures that make their existence more difficult.

The problem of reducing the hunting of caribou by Treaty Indians is a complex sociological one that is not likely to be resolved by direct legislative and enforcement measures. An intensified educational and persuasive programme might obtain their co-operation in preventing unnecessary waste of caribou, but it would necessarily be long-term. The real problem of increasing their standard of living must be resolved before we can expect any lasting results from a conservation education programme. The problem is urgent and complex; the solution will be difficult and costly. But if the valuable and irreplaceable human and caribou resources are to be saved it must be resolved. The matter is too urgent for the long-term approach alone. The outcome is still in doubt.

A New Post in the Galapagos

A CONSERVATION Officer for the Galapagos Islands has been attached to the Charles Darwin Foundation's Research Station, thanks to a grant from the New York Zoological Society. He is Sr. Miguel Castro. As a native of the Galapagos, well known and respected there, it is hoped that he will be able to persuade the islanders of the importance of conservation. Among his first tasks is the eradication, on some of the uninhabited



Julian Fitter

Galapagos Emblem on *Beagle's* Foresail.

islands, of the introduced goats which are the chief enemies of the wildlife, thanks to their thorough grazing. The new Director of the Station, Roger Perry, formerly a member of the BBC's Natural History Unit, takes over from Dr. David Snow in September. Dr. Jean Dorst, formerly Hon. Secretary of the Foundation, has succeeded Dr. Van Straelen as Chairman. The Foundation's new ship, *Beagle*, given by the World Wildlife Fund and the Gulbenkian Trust, a photograph of which appeared in our April issue, arrived in the islands on May 7th, and is now in full use. The picture of the Galapagos tortoise on the foresail of *Beagle* was taken during the first voyage by a member of the crew from the crosstrees on the foremast. The name Galapagos means tortoise.