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Native use of moose and woodland caribou in the Cat Lake Band area, Northwestern Ontario

Hamilton, George D.

NATIVE USE OF MOOSE AND WOODLAND CARIBOU IN THE CAT LAKE BAND AREA, NORTHWESTERN ONTARIO

by

© GEORGE D. HAMILTON

A THESIS

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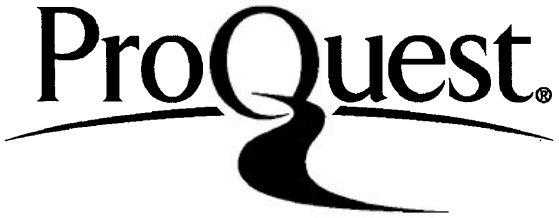
THUNDER BAY, ONTARIO



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ABSTRACT

This study was aimed at providing an objective analysis of native hunting of moose (Alces alces) and woodland caribou (Rangifer tarandus caribou) in the Cat Lake Band Area, an isolated area of some 11,560 km^2 in northwestern Ontario. Specifically, the study was designed to: 1) assess big game population levels and trends; 2) quantify native harvest; 3) assess sport hunting for moose; 4) assess the importance of big game to the people; and 5) gain an understanding of the attitudes regarding wildlife management and conservation held by Cat Lake trappers and hunters. Sources of information were: 1) data from 5 aerial surveys dating from 1977 to 1980; 2) government native and sport harvest data; 3) a detailed interview involving 44 Cat Lake trappers and hunters.

Aerial survey results were highly variable and imprecise for both moose and caribou, making interpretation risky. There was however, some indication that moose had declined during the study period. Ratios of moose:caribou calculated from transect suveys were near 2.2:1.

Government records of native harvest indicated that local trappers took 26 moose and 6 caribou during the 1979-80 season, with 4 of the moose being taken from outside the Band Area. Results from the detailed interviews suggested that actual harvest was closer to 50 moose and 10 caribou, with 4 of each species taken outside the Band Area. Government records of sport harvest within the Band Area indicated a total of 21 moose taken during the 1979 hunting season. Enquiries directed towards tourist outfitters and native trappers revealed an additional 2 moose taken by non-Indians.

Interviews with native trappers and hunters indicated that moose were perceived to have declined in numbers, while caribou were thought to have been approximately stable. A majority of men believed

overhunting, particularly by sport hunters, to have hurt the local moose population. Moose were overwhelmingly preferred over caribou as a game animal; caribou appeared to generate relatively little interest or hunting effort. One instance of overhunting of caribou was recorded, however. In early 1977, at least 65 animals were taken, primarily by 4 hunters. Snowmobiles contributed substantially to hunting success. Complaints of wastage were voiced and the overall consensus was that the harvest had been excessive.

Wild foods apparently provided more than half of the protein in the diet of the Cat Lake people. While store-bought meats were the largest single item, moose meat made up an estimated 28% of the total; caribou contributed only 2%. While most men hunted primarily for subsistence reasons, non-subsistence (aesthetic) values were also strongly in evidence.

Most hunters made comments indicative of a concern for wildlife conservation. A wide variety of approaches was suggested, including traditional, non-scientific views. In general, however, there was no consensus, and it appeared that there had been little attention directed towards the problem of positive wildlife management. The most consistent view was that total (native and sport) moose harvest was excessive, a perception that was corroborated to some extent by aerial survey and harvest data.

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NATIVE USE OF MOOSE AND WOODLAND CARIBOU IN THE CAT LAKE BAND AREA, NORTHWESTERN ONTARIO

INTRODUCTION

Demands for increased industrial development and economic expansion are putting great pressure on Canada's hinterland areas, most notably on water resources, forests, and wildlife. At the same time, the native people who are the majority now inhabiting such areas are demanding that governments live up to treaty obligations such as the recognition of the Indians' right to hunt, fish, and trap on traditionally-occupied lands. Since this right means nothing if there are no fish or game left to harvest, it is not surprising that Indians are asking for a greater say in resource allocation and management (e.g., Nicholas, 1979). A serious problem that immediately arises is the lack of communication and co-operation between native groups and government agencies, based partly on language and cultural differences, partly on feelings of resentment and mistrust.

Wildlife biologists, acting on behalf of the government may be confronted with anything from apathy to hostility when seeking the co-operation of natives (Tester, 1981). Since biologists commonly view themselves as champions of wildlife, with no ulterior motives or vested interests, they tend to be surprised by such negative reactions and may develop unsympathetic attitudes towards natives. They fail to understand why some Indians see them only as government agents. In this polarized and uncommunicative climate, it is common for the wildlife biologist to find his/her work seriously hampered by a lack of reliable information concerning the extent and importance of the native use of wildlife. Such data are, of course, basic elements in any sound management program.

This lack of dialogue may be serious enough to cause a management agency to conclude that reliable harvest information is

unattainable. The temptation then may be to ignore the problem and formulate policies based primarily on previously-held assumptions. This, of course, invites the accusation from native groups that they have not been consulted in the decision-making process.

It was in this context that the present study was undertaken. It constituted an attempt to formulate an objective analysis of big game hunting by people from the Indian community of Cat Lake in northwestern Ontario. The analysis was designed to incorporate standard biological approaches, and the views of native hunters, and hopefully to find some common ground between the two. To achieve this, the following questions were pursued:

1) What was the status of big game populations in terms of numbers and trend?
2) How many big game animals were harvested by natives?
3) How many big game animals were taken by sport hunters, and what impact did this have?
4) How important were big game to the people?
5) What attitudes did Cat Lake hunters hold with regard to wildlife management and conservation?

BACKGROUND

Legal Context

The legal basis for treaties between Indians and the government of Canada originated with the Royal Proclamation of 1763, which followed the acquisition of French territories in North America. This proclamation made the Crown the sole legal agent for gaining title to Indian lands, i.e., it became unlawful for any other party to acquire directly or settle in Indian lands which had not been surrendered (Sutton, 1977).

The Constitution Act, 1867, formerly known as the British North America Act, established the Dominion of Canada, and gave to the federal government jurisdiction over "Indians and lands reserved for Indians".

Judicial practice has construed "lands" as broader than merely Indian reserves (Hunt, 1979). The Constitution Act, 1981 recognized existing aboriginal and treaty rights held by Indian, Inuit and Metis peoples.

Historically, aboriginal rights have only been recognized for the purpose of extinguishment, and then only when necessary (Sutton, 1977). A modern example will clarify this. The James Bay and Northern Quebec Agreement of 1975 recognized that there was an aboriginal interest in lands which had never previously been ceded, and which were required for imminent large-scale development. A negotiated settlement guaranteed certain land-use rights to natives in the agreement area while extinguishing all other title, thus allowing development to proceed (Hunt, 1978). It may be noted that there remain large areas in Canada, primarily in British Columbia, the Yukon, and the Northwest Territories, where aboriginal title has never been extinguished.

Aboriginal title to the study area in the present work was extinguished by the James Bay Teaty (Treaty No. 9), signed in 1905, with adhesions in 1929 and 1930. Typically, treaties have been signed in advance of proposed development schemes (in this case, railway construction, mineral exploration and timber harvesting), but also partly in response to Indian requests. Many destitute bands hoped for increased government care under treaty, and further, wished to see their traditional occupancy and use of the land safeguarded from the encroachment of Euro-Canadian civilization (Long, 1978).

Specifically, the Indian signatories to Treaty No. 9 surrendered to the government of Canada all rights, titles, and privileges to the land under consideration. Further, they agreed to obey the law, and to refrain from interfering with others using the land.

In return, the Indians were guaranteed "the right to pursue their usual vocations of hunting, trapping and fishing" on the surrendered territory, subject to regulations which might be made by the federal government and "excepting such tracts as may be required ... for settlement, mining, lumbering, trading or other purposes". In

addition, the government agreed to establish reserves, pay annuities of four dollars per person, and provide for Indian education.

The Constitution Acts, 1867 to 1981 do not specify which level of government has jurisdiction over wildlife, but according to Bossenmaier (1979), the provinces claim proprietary rights, and these have never been seriously challenged. The federal government has, however, acquired certain roles through the Migratory Birds Convention Act of 1917 and the Canada Wildlife Act of 1973 (Bossenmaier, 1979). It has been well established that federal laws such as these may validly override Indian treaty rights (Hunt, 1979).

The Indian Act (R.S.C. 1970) puts Indians under the authority of provincial laws, except where these conflict with treaty rights (Hunt, 1979). Game laws illustrate this well, since wildlife generally fall under provincial control. For example, provincial laws prohibiting the spoilage or commercial use of game animals apply to treaty Indians. Provincial laws governing bag limits or hunting seasons do not apply, since these would deny treaty rights.

Cultural Context

The opinion is often expressed that treaty rights regarding fish and wildlife harvest are no longer appropriate and should be altered or withdrawn to reflect the modern situation (e.g. Crichton, 1981). This is based on two premises:

1) that subsistence harvesting is a thing of the past;

2) that pressures on fish and wildlife populations are such that all user groups should be subject to reasonable control by the regulatory authorities charged with the management of the resources. A clear understanding of these fundamental issues is needed to provide a proper context for the present study.

Importance of Subsistence Harvesting

Various studies have documented the dramatic changes in life-style following the gathering of northern natives into permanent

villages. Rogers (1962;1963), for example, detailed the transition from more "traditional" patterns of land use and occupancy to the modern village era for natives of Round Lake (145 km north of Cat Lake). These changes can be outlined as follows: before about 1910, the people lived "off the land" following a yearly cycle of trapping, hunting and fishing activities. Occupancy of a given land area was by 'clans' consisting of 50 - 100 individuals. During the non-summer period, this group would be dispersed over most of the area in smaller kinship units. During summer, these units coalesced at a traditionally used site. There were no permanent dwellings.

Gradually, under the successive influences of traders, missionaries, and government agents, a permanent village was established, with people spending an ever-increasing portion of their time there. With the introduction of a compulsory day school in the early 1960s, the era of the family hunting unit passed. Since then, most families have lived in the village year-round, except for occasional bush excursions, especially in fall and spring.

Trapping is now a part-time activity, with major effort restricted primarily to the early winter and spring periods, and involving adult males almost exclusively. Hunting is still an important activity, carried out both in conjunction with trapping and, independently, for its own sake. Fishing for domestic consumption is also widely practised, but restricted primarily to the open-water months.

Rogers (1963) found evidence of a conscious effort to forget the past and Indian culture. Store-bought food was considered superior, and had been widely substituted for wild or "country" food, especially by the younger members of the community. Trapping was considered difficult and unrewarding, and education was felt to be a necessary route to a more desirable alternative.

Bishop (1974) described a similar pattern for the Onasburgh Band, which until 1970 included Cat Lake people. By the late 1960s, people living in Onasburgh (125 km southeast of Cat Lake) obtained over 75 per cent of their food from the store. He noted that almost half of

the total band income was unearned (family allowance, welfare, etc.), and that trapping was increasingly unimportant.

Similarly, both Van Stone (1963) and Bone et al. (1973) reported that natives in Snowdrift (central Northwest Territories) and Stoney Rapids (northern Saskatchewan), respectively, had become generally confined to permanent villages by the early 1960s. Trapping was considered difficult and unpopular, and had become concentrated in areas close to the villages (Van Stone, 1963). Bone et al. (1973) stated that bush life had become a minor element in the local society and economy, and was shunned by the younger generation. The new institutions encouraged a sedentary life by providing health care, educational facilities, and opportunities for both wage employment and unearned income. Van Stone (1963) also noted the almost complete disappearance of trapping in the late 1950s in response to alternative employment opportunities in Winisk (on Ontario's Hudson Bay coast).

It would be remiss to conclude this cursory outline of rapid change without noting its less benign aspects. In this regard, Tanner (1979:xii), was particularly lucid: "The reserves....were revealed to be a sordid archipelago of dispossessed bands whose powerlessness had turned to self-destructive social pathologies, including internal bickering, petty crime, heavy drinking and suicide. On or off the reserve it appeared that a further depressing chapter was being written in the saga of the disappearing Indian".

In the face of this overwhelmingly consistent documentation of the decline of the bush economy, there is yet a substantial and growing literature asserting its continued importance, albeit in an altered form. For example, while Feit (1973a) acknowledged the tendencies outlined above, he affirmed (1973b) the cultural and economic importance of hunting, fishing and trapping, and maintained that store foods provided no more than 40 per cent of the caloric intake of Cree hunting groups in northern Quebec in the late 1960s.

While Rogers (1962; 1963) documented the declining importance of wild food in three subarctic communities (Round Lake, Attawapiskat and Mistassini), he admitted (1967) that, "...a large part of the food consumed...comes directly from the land". Data presented by Winterhalder (1977) indicated that meat from moose (Alces alces) and caribou (Rangifer tarandus caribou) alone would have provided an average of 0.35 kg/person/day for the community of Muskrat Dam (190 km north of Cat Lake) in 1975.

The James Bay and Northern Quebec Native Harvesting Research Committee (1976) reported that over 55 per cent of the active males over 18 recorded fur harvests. Furthermore, they estimated that between 50 and 55 per cent of the weight, and most of the protein in the diet of the James Bay Cree, was provided by their own harvesting activities. They concluded that, "hunting, fishing and trapping as a way of life is satisfying in terms of Cree culture and personality and nourishing in terms of the Cree diet".

Muller-Wille (1974) found that the Dene of Fond du Lac (northern Saskatchewan) relied almost solely on caribou as their main meat source. Its importance was seen as a means to reduce cash outlay requirements in a region with a poor and unstable economic base, and to retain socio-cultural continuity.

Usher (1976; 1978) provided a way out of this paradox. While he acknowledged (1976) that the traditional sector of the northern economy is believed by many to be progressing inevitably and rightfully towards oblivion, he claimed that this view is not supported by those engaged in it. He affirmed that hunting and trapping remain of vital, although altered, significance to the native people who are in the majority in most parts of the Canadian north. He pointed out (1976:117) that, "The obtaining of a high income in the form of country food obviously has important favourable connotations which the obtaining of large welfare payments, for example, does not". He maintains that wild food is far more nutritious than store bought food.

(This is supported by Bishop's (1974) observation of a generally poor dietary regime at Onasburgh, where most food was store-bought). Usher (1976) further contended that native people prefer country food, a fact which should not be surprising given that food habits are an important and deep-rooted part of any culture. He argued (1978:154) that, "...native peoples' economic, let alone cultural, dependence on the land and on country food has been drastically underestimated by outside observers, whether policy makers, administrators, social scientists, or ordinary citizens". He concluded (1978:154) that, "These facts go far to explaining why native people have been more and more emphatically asserting their present dependence on the land, and their desire for that dependence to continue...".

Thus, subsistence harvesting is far from being an anachronism, even though the old self-sufficient bush life has virtually disappeared. Two main themes may be discerned here.

First, the dreams of economic development so widely expressed in the 1950s have simply not materialized. Employment opportunities on reserves are severely limited, and per-capita income is far below that of non-native Canadians (e.g., Frideres, 1974). The value of wild food as a means of avoiding cash outlay for extremely expensive store-bought alternatives has been well established (Usher, 1978).

Second, there has been a widespread reaffirmation of native cultural values, which of course are closely linked with the harvesting of wild foods. This trend cannot properly be separated from the economic argument outlined above. As Bone et al. (1973:78) commented, "In a nutshell, the problem is less a refusal to join the Canadian society than an absence of a meaningful opportunity."

Usher (1981) predicted that subsistence harvest of fish and game will continue indefinitely to play a central role in the economic and social life of large numbers of natives. He argued that such activities are rational adaptations of people in the periphery of the dominant economic and social order, and noted (p.59) that, "...

they provide the means for at once adapting to and resisting forces beyond their control." In this regard, he drew attention to similarities between "marginalized" groups, including natives, small farmers, and fishermen.

Implications of Cultural Differences

At this point, let us turn to an examination of the second fundamental issue here, namely that of ultimate authority to manage fish and game in the context of treaty rights. First, from a strictly legal point of view, it may be restated that federal law can validly override treaty provisions (Hunt, 1979). Further, no one seriously suggests that governments do not have the rightful authority to manage fish and wildlife resources for the common good. Rather, there is a question of how government authority can be exercised without destroying treaty rights. The key here is obviously native participation in management decision-making. Indian spokesmen have asked for precisely this, and generally not for absolute control (e.g. Manuel, 1978; Mercredi, 1978; Nicholas, 1979).

At the same time, however, the priority of subsistence harvesting over other uses is held to be the only basis for effective participation and for the recognition of treaty rights (Manuel, 1978; Nicholas, 1979). This claim has received broad support from non-natives as well (Finney, 1979; Hunt, 1979; Tester, 1981), and is an important component of the James Bay and Northern Quebec Agreement of 1975 (Hunt, 1978).

The approach, however, is fraught with difficulties, based on cultural and political differences. Differences in cultural perception exist because, contrary to much popular opinion (e.g. Presnall, 1943), Indians have traditionally exerted management control over fish and wildlife resources through cultural institutions (Feit, 1973b; Martin, 1978; Tanner, 1979; Usher, 1981). The essential idea has been that, "...the animals of hunter harvests are a gift to him from God, and that he must use those gifts wisely and fully and not waste them" (James Bay and Northern Quebec Native Harvesting Research Committee, 1976:352).

As Martin (1978:148) put it, "A kind of contractual agreement existed between man and animals: the one was not to ruin the other with the powerful sanctions each was possessed of. The Indian hunter, for example, had the right to harvest game, in return for which privilege he was to perform proper rituals of disposal and consumption and observe taboo." Indiscreet slaughter, or hunting for self-aggrandizement would invite reprisals from the spiritual masters of the fish and game (Martin, 1978). Obviously, there is a sizeable gap between such concepts and the principles of wildlife science. The foregoing is not meant to deny that wasteful slaughter by natives has occurred. Such incidents have been well documented, (e.g. Martin, 1978; Presnall, 1943) and are acknowledged by native spokesmen as well (e.g. Nicholas, 1979).

Conflicts between scientific and non-scientific approaches inevitably arise which are stubborn and deep-rooted. For example, Bone et al. (1973) reported the concern of a local native leader who criticized the activities of biologists carrying out ear-tagging and other operations on migratory caribou populations. It was alleged that such "fooling around" showed a lack of respect for the spiritual nature of the caribou, and resulted in the animals' avoidance of their usual wintering grounds. Of course, the same "avoidance" might be explained by biologists as due to reduced population and range sizes, both resulting from overhunting.

There is also a political dimension to the general unwillingness of both sides to reach agreement on such issues. For example, scientific research may be opposed by natives because of the fear that regulations, imposed from outside, will inevitably follow (Tester, 1981). Closely related to this, but also involving a cultural component, is the idea that the practice of wildlife science does not allow for native participation, and thus denies "cultural self-actualization" (Tester, 1981).

While any number of authors have called for greater co-operation, communication, and understanding in resolving these difficulties, there do not appear to be any easy solutions (Roots,

1981). The James Bay and Northern Quebec Agreement of 1975 represents one attempt, but the apparatus of game management committees with equal representation from natives and non-natives is essentially a non-native approach, and it remains to be seen how well this will stand up. Usher (1981) has offered an interesting alternative, which might be applicable in some similarly isolated jurisdictions. He has suggested that game management units correspond to traditional community hunting areas, with significant community control over the local resource. This would allow for both community participation and community responsibility. He is not specific, however, on what role scientific management, or higher government authority would play.

STUDY AREA

General

Cat Lake (51° 43' N, 91° 50' W) is a community of about 300 residents (Department of Indian Affairs and Northern Development, unpubl. data), located 180 km north of Sioux Lookout, Ontario (50° 14' N, 91° 56' W). The study area consisted of the 11,560 km^2 Cat Lake Band Area, which is made up of 17 traplines registered to Cat Lake residents by the Ontario Ministry of Natural Resources (Figures 1, 2).

Only the extreme northeastern corner of the Band Area (near Stirland Lake) is accessible by road. There is one radio-telephone in the village, and the twice-weekly mail plane from Pickle Lake (51° 26' N, 90° 12' W) is the only scheduled air service.

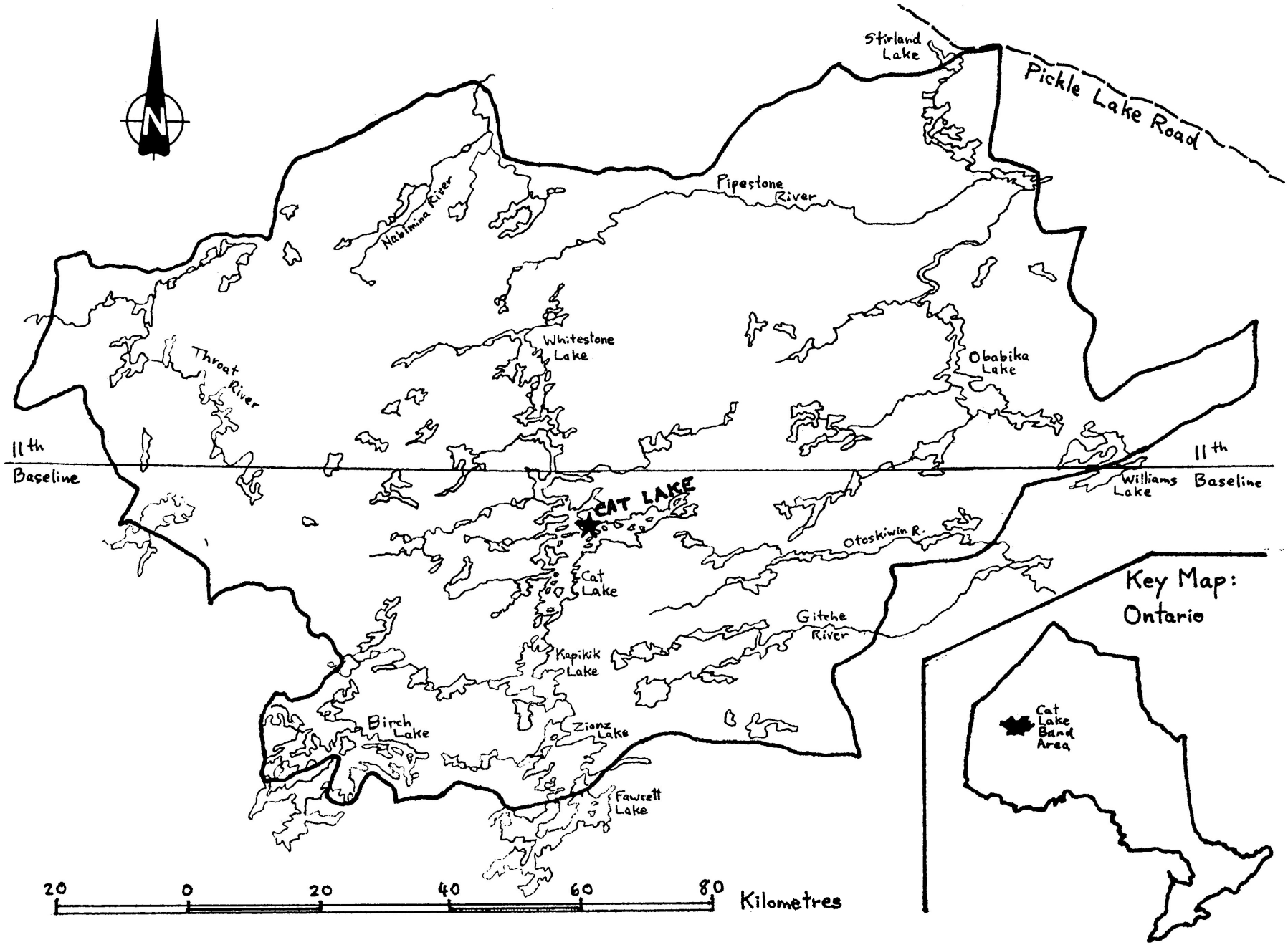
Trapping is an important local industry, carried out primarily during the fall and winter months. Much of the resident big game hunting is conducted in association with trapping activities.

Fly-in moose hunting by non-natives is a major autumn activity, serviced primarily by outfitters based in the Red Lake (51° 03' N, 93° 49' W), Sioux Lookout, and Pickle Lake areas.

Fly-in fishing services are also provided by outside outfitters during the summer months. Guides from Cat Lake are occasionally hired. Virtually all medium to large-sized lakes in the Band Area receive at least some angling pressure.

Most of the largest lakes have been commercially fished since 1973 (Ontario Ministry of Natural Resources, no date). This industry has not been carried out consistently nor on a large scale. There is one non-native commercial fishery in the study area, based at Birch Lake, along the southwest boundary of the Band Area. Scattered minerals exploration is being carried out, mainly in the southernmost portion of the Band Area.

Figure 1. Cat Lake Band Area.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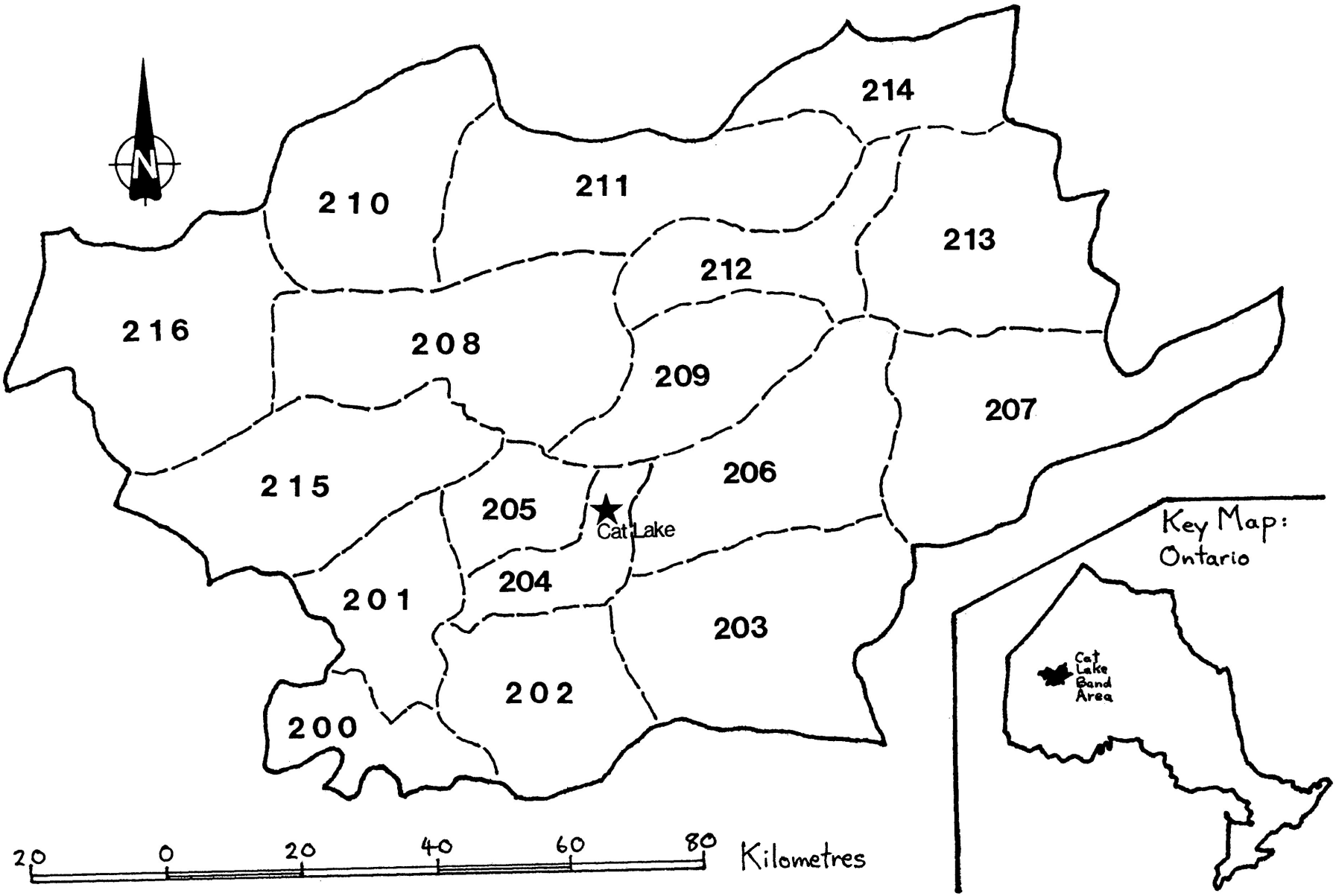
Cat Lake Band Area

Figure 2. Registered traplines - Cat Lake Band Area.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Kilometres

Physiography

The study area is entirely within the Superior Structural Province of the Precambrian Shield (Stockwell, 1961). It is underlain mainly by Archean granitic rocks, with small areas of metavolcanics and metasediments, primarily in the southern portion of the Band Area (Douglas, 1970).

Surficial geology of the study area is related to the Wisconsin period of glaciation, which ended some 7,000 years ago (Prest, 1963). Glacial deposits are quite variable in thickness, with eskers oriented in an east-west direction being the most prominent features. Most of the region, however, is characterized by scattered to abundant rock outcrop (Prest and Donaldson, 1963).

Topography can be described as undulating to rolling (Department of Agriculture, 1972). Elevations are almost entirely between 365 and 427 m above sea level.

Climate

The study area is within the Albany Climatic Region (Chapman and Thomas, 1968), a subarctic continental climate with moderate precipitation, and wide temperature variations between summer and winter. This region generally exhibits an annual frost free period of 86 days, and an annual growing season of 154 days (Chapman and Thomas, 1968).

The nearest weather station is in Pickle Lake (115 km ESE of Cat Lake). Mean January and July temperatures there between 1941 and 1970 were -21.1^{o} C and 17.1^{o} C, respectively, while mean annual precipitation was 731.6 mm (Environment Canada, 1974).

Snow cover data for the village of Cat Lake were interpolated from isogram maps. Mean maximum snow depth was estimated at 85 cm, occurring on a mean date of March 1, while mean annual snowfall was 220 cm (Fisheries and Environment Canada, 1978). The median number of days having snow cover greater than 2.5 cm is 177, with the snow-free period beginning about April 30 (Potter, 1965).

Drainage

The Cat Lake Band Area is a headwater region, being drained by five major river systems. The central and southwestern portions of the study area drain to the southeast into the Albany River system. The southeastern portion drains to the east into the Attawapiskat River system. The northeastern portion drains to the northeast into the Winnisk River system. A small portion along the north-central edge drains north into the Severn River system. The western portion drains west to the Berens River system.

Drainage patterns are highly irregular, reflecting the general condition of glacial deposits of variable thickness over Precambrian bedrock. Overall altitudinal gradients are slight and there are innumerable small lakes, streams, and bogs.

Soils and Vegetation

Most of the study area is covered with humo-ferric podzols, interspersed with rocky areas (Department of Agriculture, 1972). Organic soils have formed in poorly-drained pockets (Rowe, 1972).

The study area is included in the Northern Coniferous forest region (Rowe, 1972), which is characterized by moderate tree growth and the development of closed forests wherever there is sufficient depth of soil.

Black spruce (Picea mariana) is generally dominant, and found in association with jack pine (Pinus banksiana) on upland sites and tamarack (Larix laricina) in lowland areas. Fire has been an important influence, favouring the spread of jack pine. On more productive sites (especially, southern slopes), mixed stands of white spruce (Picea glauca), balsam fir (Abies balsamea), and aspen (Populus tremuloides)

may be found. White birch (Betula papyrifera) and balsam poplar (Populus balsamifera) are also represented in the study area, but are not common.

Shrubs and herbaceous plants are those typical of boreal regions.

Vertebrate Fauna

Moose and woodland caribou are the two big-game species of importance here. White-tailed deer (Odocoileus virginianus) have been known historically from the vicinity of the Band Area, but are believed to be absent at the present time (Williamson, 1979). Snowshoe hare (Lepus americanus) are sometimes important small-game items, depending on their abundance. Wolves (Canis lupus) and lynx (Lynx canadensis) are the most important large predators. Black bears (Ursus americanus) are present, but not common (Gray, 1979). A variety of furbearers typical of the Canadian subarctic inhabit the region. The most important of these from an economic viewpoint is the beaver (Castor canadensis).

A wide variety of birds inhabits the study area for varying periods of the year, but few of these are economically important. Waterfowl are hunted primarily during their spring and fall migrations. Grouse (Canachites canadensis and Bonasa umbellus) may be taken year-round.

The greatest proportion of the native fish harvest in central northwestern Ontario consists of walleye (Stizostedion vitreum vitreum), lake whitefish (Coregonus clupeaformis), northern pike (Esox lucius), and suckers (Catostomidae) (Rogers, 1963; 1972). Lake trout (Salvelinus namaycush), ling (Lota lota), and lake sturgeon (Acipenser fulvescens) are much less important (Rogers, 1963; 1972). A great

many "forage" species also inhabit the study area; these will not be catalogued here.

Historical Perspective: The People

According to Wright (1972), human habitation of what is now northern Ontario began before 7,000 B.C. During the Archaic period (7,000 B.C. - 3,000 B.C.), forests gradually replaced tundra, and faunal resources changed accordingly. Some ethno-historians have suggested that the "northern Ojibwa" now inhabiting much of this area (including the Cat Lake Band Area) established their present distribution relatively recently, as a result of the dynamics of the early fur trade (circa 1660 - 1800)(Bishop, 1974; Ray, 1974). More recently, however, Morrison (1980) has argued that the "northern Ojibwa" and their ancestors have occupied this area from Archaic times. Although the Indians of the northern Ontario interior were among the last to be contacted by Europeans on their own lands (Rogers, 1963), a brisk trade was carried on throughout the 1770s, reaching a peak between 1763 (signing of Treaty of Paris, ceding New France to Britain) and 1821 (merger of the Hudson's Bay and Northwest Companies) (Ray, 1974). During this period, there was intense rivalry between the two major fur trading groups. The Northwest Company established posts at both Cat Lake and Osnaburgh in 1787; the Hudson's Bay Company opened a post at Osnaburgh in 1787 (Bishop, 1974). Trade goods became relatively cheap for Indian trappers, and they grew increasingly dependent upon them (Bishop, 1974). At the same time, the faunal resources of the area were heavily exploited, presumably contributing to the subsequent virtual collapse of several key wildlife species (Ray, 1974).

Beaver began to grow scarce as early as 1805, while moose had become virtually exterminated, and caribou extremely rare, by the 1820s (Bishop, 1974). The Hudson's Bay Company gained a monopoly over the fur trade in 1821, and the Indians were faced with a situation of

higher prices combined with scant resources. This was the beginning of the "fish and hare period" (Rogers and Black, 1976), which was characterized by dependence on fish, hare and small game for survival. It was a time of great hardship, during which clothing was made of hare pelts, snowshoes made of wooden boards, and moccasins sometimes fabricated from pike skins (because of a lack of moose or caribou hides)(Rogers, 1979). Cases of starvation were not infrequent, and many people became totally reliant on the trading posts for bare survival (Bishop, 1974). In the Osnaburgh-Cat Lake area, this period lasted from about 1820 to 1890 (Bishop, 1974).

The Cat Lake post was closed in 1826 as an economy measure, but was re-opened in 1873 (Bishop, 1974). Caribou gradually became more numerous after 1870, and moose returned about twenty-five years later, the latter quickly expanding in numbers and distribution, and becoming a very important source of meat (Bishop, 1974).

The period which followed (1890 to 1945) has been called the "era of early government influence" by Bishop (1974). Because of increasing interest in hinterland resource development, the federal government undertook to extinguish aboriginal title to the land through the James Bay Treaty (Treaty No. 9). This was signed in Osnaburgh on behalf of Cat Lake Indians in 1905 (Royal Commission on the Northern Environment, 1977). The first Indian Agent visited Cat Lake in 1928. Occasional visits were made by provincial game officers, who, according to Rogers (1962), were met with fear and distrust (Rogers, 1962).

The "present village era" (Bishop, 1974) was deemed to have begun in 1945, the same year Family Allowance and government relief payments became available. In 1948, the provincial system of registered traplines was established, giving sole trapping rights on a given portion of land to one registered trapper and designated "helpers". A school was established in Cat Lake circa 1965 (Lessard, pers. comm.), marking the end of family participation in hunting and trapping activities, at least for those with school-age children. Snowmobiles made their first appearance circa 1970, the year that the

Cat Lake Band was formally distinguished from the Osnaburgh Band by the Department of Indian Affairs and Northern Development (Lessard, pers. comm.).

A detailed history of social development has not been attempted here. It should be clear, however, that change has been both extremely rapid and, in many respects, disruptive. The process is, of course, ongoing.

The Historic Distribution of Moose

Peterson (1955) documented a large-scale expansion in the North American range of moose since 1875, and speculated that this may have represented a continuation of post-glacial dispersion. In particular, he noted the apparent absence of moose from Ontario north of Lake Superior, and the subsequent colonization of this area by the early 1950s.

Archaeologists, however, have assumed that the post-glacial occupation of northern Ontario by moose occurred much earlier (Dawson, 1979; Morrison, 1980), a position supported by both archaeological and historical records. Pollock (1976), for example, has documented the use of moose as a human food item sometime between 800 and 1400 A.D. in the Kirkland Lake region of northeastern Ontario. Moose bones have also been identified from campsites near Lake Nipigon dated about 400 A.D., and again at about 1100 A.D. (Dawson, 1981). Six other sites in the Lake Nipigon area have yielded similar evidence, with estimated dates between circa 1000 and 1750 A.D. (Dawson, pers. comm.). Churcher (1965) noted the discovery of moose bones during the archaeological excavation of Fort Albany on James Bay, a Hudson's Bay Company post operated between about 1680 and 1720 A.D. Records from the Hudson's Bay Company post at Osnaburgh House show that moose were traded there in an almost unbroken sequence between 1788 and 1821 (in Bishop, 1974). While archaeologists suppose that moose were present much earlier than even these dates suggest, little other than copper and stone artifacts have survived the acid soil condition of the Precambrian Shield from earlier times (Wright, 1972).

Kelsall and Telfer (1974) warned that historical accounts noting the absence of moose in portions of northern Ontario prior to 1875 may not be wholly reliable, since these sedentary animals could easily have been missed under conditions of scarcity. Krefting (1974) speculated that moose may have been rare or absent prior to 1875 as a result of overhunting, a suggestion that receives broad support from the records of early fur traders, as reported by Bishop (1974) and Ray (1974). In conclusion, it would appear that the recent expansion of moose populations in northern Ontario was not a post-glacial dispersion, and may in fact have represented a growth from existing local populations.

METHODS

Aerial Survey

The first objective of this study was to assess population levels and trends of moose and woodland caribou within the Cat Lake Band Area. Aerial survey was the primary method used to achieve this. The Cat Lake Band Area (11,560 km^2) is split into northern (7,156 km^2) and southern (4,404 km^2) portions by the 11th baseline (a surveyed line running east-west), which separates adjacent Wildlife Management Units. These Units are the basis for the administration of Ontario's moose management programs, including most aerial surveys. Data from four recent surveys conducted by the Ontario Ministry of Natural Resources (referred to here as 1977, 1978, 1979 and 1980a) were kindly made available to the author. All of these were portions of larger programs which included part or all of the Band Area. The author organized the 1978 and 1979 surveys, but did not participate as an observer. In addition, the author undertook a fifth survey (referred to as 1980b) specifically for the present study.

1977 Plot Survey

The 1977 survey sampled only the southern portion of the study area as part of a larger inventory of Wildlife Management Unit 16 (total area 38,600 km^2). Eleven randomly selected plots of 25 km^2 each (2.5 x 10 km) fell within the Band Area, representing a 6.24 per cent sampling rate for the southern zone.

Survey dates were January 9, 11, 12, and February 18. Temperatures recorded during the survey averaged -25.4° C. Snow depth during the January 9 - 12 period at Pickle Lake was approximately 52 cm. On Feburary 18, it was close to 80 cm. The snow cover was not crusted during the survey.

Eight plots were flown with a de Havilland turbo-Beaver, three with a single-engine de Havilland Otter. All were piloted by experienced Ontario Ministry of Natural Resources pilots. Survey crews consisted of a navigator and two rear-seat observers. Nine different observers participated, of whom only three had previous experience.

1978 Transect Survey

The 1978 survey sampled the entire Band Area as part of the West Patricia Land Use Plan wildlife inventory. This was a special program covering a very large area within northwestern Ontario. This survey was based on north-south transects, 600 m wide and spaced at 10 km intervals. Sampling intensity was calculated to be 5.95 per cent.

Survey dates within the study area were January 6, 13, 14, 22-25; February 1, 8, 9, 16, 20 and 21. Mean daily temperatures on survey dates at Pickle Lake averaged -19.5°C. Snow cover at Pickle Lake during the survey period ranged from approximately 56 to 65 cm. Little or no snow crust was recorded for the January 22-25 period.

De Havilland Otters flown by experienced Ontario Ministry of Natural Resources pilots were used. Spotting was by two different 4-man survey teams. Three members of a team were in the air on any given day, functioning as navigator and two rear-seat observers. The surveyors had no experience prior to 1977. Their training, however, began on January 3, and they flew on a 7 days/week rotational basis (weather permitting) from then on.

1979 Transect Survey

The 1979 survey was basically identical in method to that of 1978; the transects, however, were offset 5 km, and only the northern portion of the Band Area was sampled. The sampling rate here was calculated to be 5.91 per cent.

Survey dates were December 14, 15; January 8-10; February 13 (82 per cent flown January 8-10; 11 per cent on February 13). Mean daily temperatures on survey dates at Pickle Lake averaged -25.4°C. Snow depth did not exceed 42 cm by the end of January (thus describing almost 90 per cent of the survey period), and reached about 50 cm by February 13.

De Havilland Otters flown by experienced Ontario Ministry of Natural Resources pilots were used for the bulk of this survey. An Ontario Ministry of Natural Resources turbo-Beaver was used for the small December portion. Spotting was done by a four man survey team, of whom three were in the air on any given day. Three members of this team had extensive experience from the previous year.

1980a Plot Survey

The 1980a survey was comparable to the 1977 survey, in that it sampled only the southern portion of the study area as part of a larger inventory of Wildlife Management Unit 16. Seventeen randomly selected plots of 25 square kilometers each (2.5 x 10 km) fell within the Band Area, representing a 9.65 per cent sampling rate for the southern zone.

Survey dates were January 8 (one plot only), 24, 29, and 31. Temperatures during the survey averaged -23.7°C. Snow cover at Pickle Lake during the last week of January was between 61 and 71 cm, with a moderate crust.

De Havilland Otters flown by experienced Ontario Ministry of Natural Resources pilots were used for all but one plot (in which a turbo-Beaver was used). Spotting was done by a three-man survey crew, but involved six different individuals. Four of these had extensive previous experience.

1980b Transect Survey

The 1980b survey was similar to the 1978 and 1979 surveys insofar as it was based on north-south transects, 600 meters wide and spaced at 10 km intervals. The lines, however, were located 2.5 km east of those flown in 1978. The entire Band Area was sampled at a rate of 5.92 per cent. This approach was selected as providing the best overview of conditions within the study area given limitations on time and money available to sample this large area (Caughley, 1977). Also important was the fact that the method was comparable to that of the 1978 transect survey; no plot survey data were available for the area north of the 11th baseline. Survey dates were February 2, 15, 17 and 25.

Survey temperatures averaged -18°C. Snow cover was generally old and drifted, with mean depths (at Pickle Lake) ranging from 71 to 73 cm.

A chartered Cessna 180 from Green Airways, Red Lake, was used. The pilot had not previously flown moose or caribou surveys, but was a very experienced bush pilot who performed quite competently. Spotting was done with a navigator (the author) and one or two rear-seat observers (two flights with one rear observer, two flights with two rear observers). All observers had considerable previous aerial survey experience.

Analysis of Aerial Survey Data

Stratification of the study area into low and high density areas was according to the scheme described by Hamilton (1979a; 1979b) for caribou and moose, respectively (Figures 3, 4). For uniformity, these strata were applied to all survey results to reduce the confidence limits associated with population estimates.

Estimates of moose and caribou densities, along with their associated confidence limits, followed Caughley (1977):

Figure 3. Relative caribou densities.

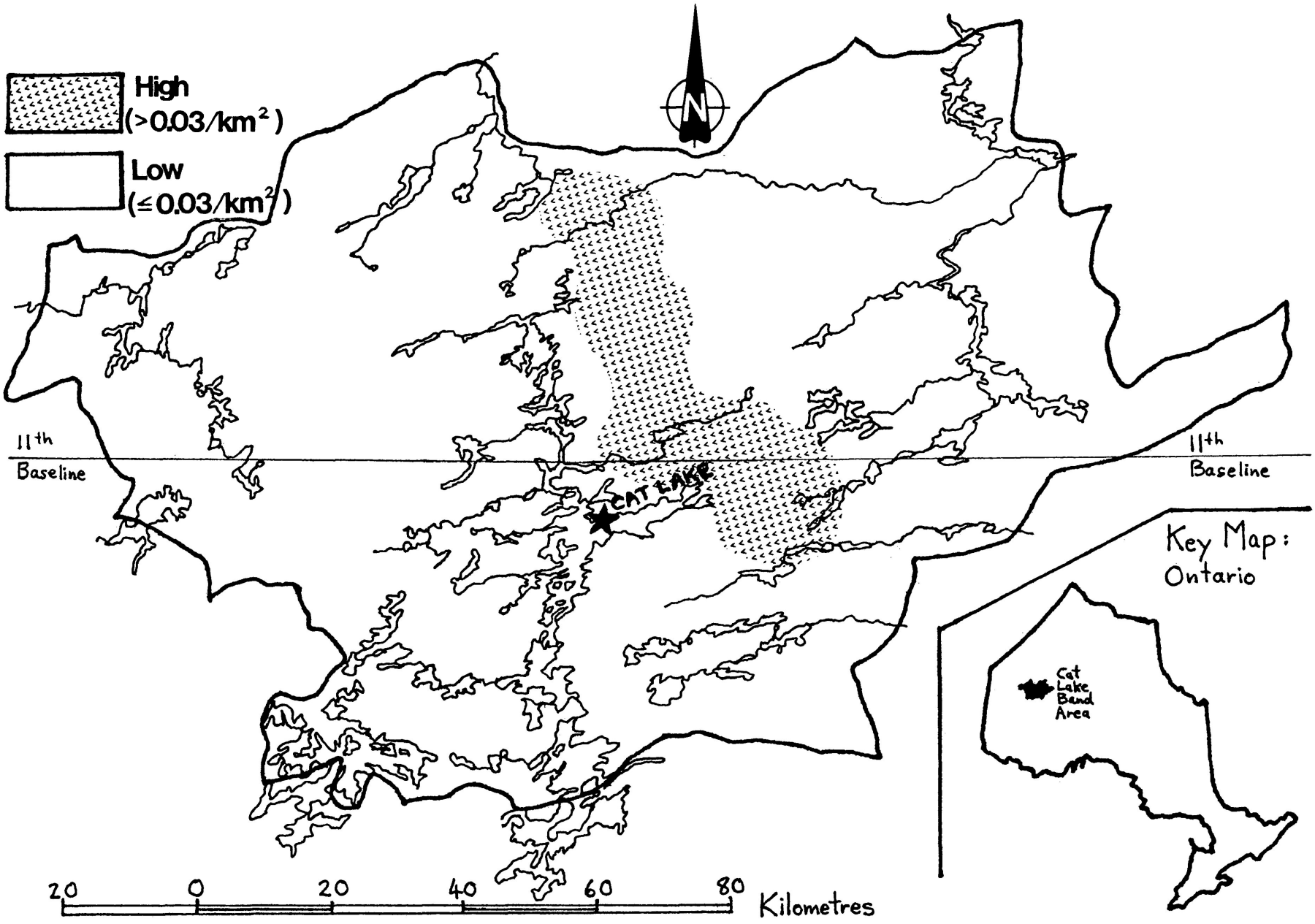
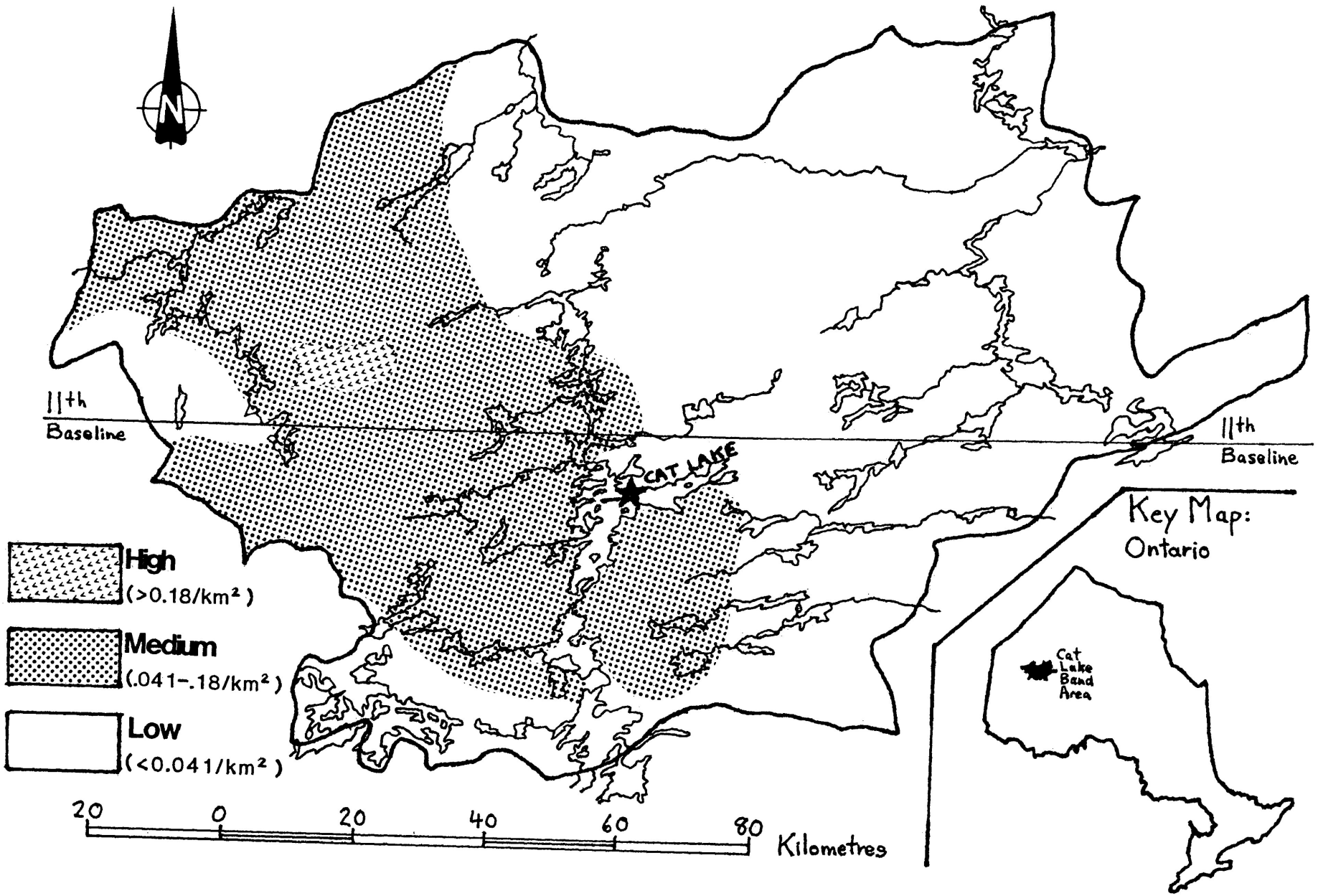

High
(>0.03/km²)
Low
(≤0.03/km²)
N
11th
Baseline
11th
Baseline
CAT LAKE
Key Map:
Ontario
Cat
Lake
Band
Area
20
0
20
40
60
80
Kilometres

Figure 4. Relative moose densities.


N
11th
Baseline
11th
Baseline
CAT LAKE
High
(>0.18/km²)
Medium
(.041-.18/km²)
Low
(<0.041/km²)
20 0 20 40 60 80
Kilometres
Key Map:
Ontario
Cat
Lake
Band
Area

$$Y_h = N_h \bar{y}_h$$

where Y_h was the estimated total number of animals in the stratum h, N is the total number of sampling units (plots or transect segments) available for sampling in stratum h, and $\bar{y}_h$ is the mean number of animals observed per sampled unit in stratum h.

The estimated total for the whole area was then:

$$Y = \sum Y_h$$

The standard error of Y was given as:

$$S.E._Y = \sqrt{\sum \frac{N_h(N_h - n_h)}{n_h} s^2_{yh}}$$

where n was the number of units (plots or transect segments) sampled, and s^2_{yh} was the variance of numbers between sampled units.

The variance is given by:

$$s^2_{yh} = \frac{1}{n_h - 1} \left(\sum Y^2_{hi} - \frac{(\sum Y_{hi})^2}{n_h} \right)$$

where Y_{hi} was the number of animals on the i^{th} unit.

Confidence intervals at the 95 per cent level were calculated as $Y \pm 1.96 \times S.E._Y$.

For unequal-sized sampling units (transects of varying length),

$$Y = \left(\frac{\sum N_h \bar{y}_{hi}}{\sum N_h \bar{z}_{hi}} \right) Z$$

where $\bar{y}_{hi}$ was the mean number of animals observed per sampled unit in stratum h, Z was the total area actually surveyed and $\bar{z}_{hi}$ was the average area of sampled units in stratum h.

The standard error of Y was given by

$$S.E._Y = \sqrt{\sum \frac{N_h(N_h-n_h)}{n_h} (s^2_{yh}-2Rs_{hzy}+R^2s^2_{zh})}$$

where $R = Y/Z$,

and $$s_{hzy} = \frac{1}{n_h - 1}\left[\sum z_{hi}y_{hi} - \frac{(\sum z_{hi})(\sum y_{hi})}{n_h}\right]$$

and s^2_{yh} was the variance of numbers per sampled unit in the h^{th} stratum, and s^2_{zh} was the variance of the areas of the sampled unit in the same stratum.

Government Records of Big Game Harvest

The second and third objectives of this study were to determine the level of native hunting of moose and woodland caribou, and to assess (non-native) fly-in hunting for moose. Government records of harvest data were used to provide part of this information.

The Ontario Ministry of Natural Resources has collected data regarding big game harvest in the study area by both native and non-native hunters. Records of woodland caribou harvest by Cat Lake residents date from the 1960-61 season, while similar records of native moose harvest date from 1973-74. These data have been collected by wildlife management officers from the Sioux Lookout District Office during community visits made usually in June of each year. Registered trappers are asked to submit completed questionnaires pertaining to the harvest of big game and furbearers during the preceding 12 months (see Appendix I).

Records of moose harvest by sport hunters were available from export permits and game check station data, beginning with the 1968 hunting season. Export permits are mandatory for non-residents of Ontario (these make up the great majority of the non-natives hunting in the study area). Check station data provide a valuable cross-reference, but reporting at such facilities is voluntary. Specific data from both sources regarding the location and date of kills are recorded in Wildlife Management Unit "Data Books" by mercator map grid. These blocks are generally 100 km^2 in area (10 km x 10 km) and are delineated on maps of the 1:250,000 National Topographic System. This method of data storage was initiated in 1975. Earlier data were transferred post facto from existing maps and records. "Data Book" information was tabulated for all blocks falling wholly or partially within the study area to give a gross estimate of sport harvest by year. These totals were then adjusted by pro-rating the harvest of peripheral blocks according to the proportion of their areas actually within the Band Area.

The author attempted to corroborate the most recent (1979) data. Letters were sent to eight tourist outfitters known to have outpost camps in or near the study area, requesting information pertaining to moose harvest by their customers (Appendix II). An initial letter was sent in mid-June, 1980, a reminder in late August.

Trapper and Hunter Interview

A trapper and hunter interview was designed to address all five objectives of this study. Besides providing a basis for comparing government harvest records and aerial survey data, it constituted the sole means for assessing the importance of big game to the people of Cat Lake, and for examining the attitudes of local hunters towards wildlife management and conservation.

Structured interviews (i.e. following an ordered list of pre-determined questions) were conducted between June 17 and 22, 1980, reaching 44 Cat Lake trappers and hunters. Thirty-five of the interviewees held trapping rights in the Cat Lake Band Area; three were retired, while four were active trappers registered in other band areas. Another two had hunted, but were non-trappers.

The first-mentioned 35 interviewees represented 70 per cent of the 50 trappers associated with Cat Lake Band Area traplines. Fourteen of the others were out of town at the time, and one refused to participate in the study.

A structured interview was chosen because of the need for personal explanation and clarification, and also to obtain the greatest possible coverage. The small target population made it possible for one interviewer to complete the project in a relatively short period of time. An interpreter recommended by the Band Council was hired to translate between English and Ojibwa when necessary.

The interview schedule (Appendix III) contained sixty items in ten sections. Answers were pre-coded and transferred from the interview schedules to punched cards. These were processed by the

IBM 360 computer at Lakehead University, using the SPSS program to generate tabulations and cross-tabulations.

Section 1 of the interview schedule (items 1.0 to 1.3) was designed to determine how many men actively trapped, during which months, and on which traplines.

Section 2 (items 2.0 to 2.4) was designed to determine how many moose and caribou were taken by community members, during which months, and on which traplines. Item 2.3 asked if the interviewee was with anyone else when the second party killed a moose or caribou, while item 2.4 asked for the names of any non-trappers who were said to have killed moose or caribou. These questions allowed a cross-referencing between subjects, and provided a means for contacting relatives and friends of those not in town for the direct solicitation of information concerning big game kills.

Section 3 (items 3.0 to 3.5) was designed to extract information on the relative abundance of wolves, and the trappers' impressions of the effects of wolves on local ungulate populations.

Section 4 (items 4.0 to 4.44) solicited the interviewees' perceptions of population trends of moose and caribou, and reasons for such trends.

Section 5 (items 5.0 to 5.3) pertained to the use of snowmobiles, and was designed to determine the extent to which these machines have altered traditional patterns of trapping and hunting.

Section 6 (items 6.0 to 6.3) asked for the interviewees' impressions of trends in big game hunting by local residents, and their opinions on whether present levels of harvest were appropriate.

The author had been aware that a harvest of caribou during the 1976-77 season was surprisingly high given the overall low population densities of this species in the general area. Section 7 (items 7.0 to 7.5) included questions which were designed to determine the magnitude and circumstances of this event, and to solicit opinions regarding its appropriateness.

Section 8 (items 8.0 to 8.3) was designed to obtain a profile of family use of various dietary protein sources, and especially to

assess the subsistence value of wild foods. Interviewees were asked to rank six protein items according to the relative importance of each in the diet of his immediate family (item 8.0). Importance indices were then calculated by assigning 5 points for each first choice, 4 points for each second choice, and so on, down to 0 points for the last choice. These items were: moose, caribou, beaver, small game, fish and store-bought meat.

An attempt was then made to quantify the contribution of each item. The numbers of moose and caribou consumed by villagers were estimated from Section 2 of the interview. Edible weights of 159 kg per moose and 75 kg per caribou were assigned, calculated as 40 per cent of the estimated average live weights of harvested animals (Colinvaux and Barnett, 1979; Peterson, 1974).

Weights of fresh and canned store-bought meats were tallied directly from Hudson's Bay Company shipping records at the Cat Lake store.

No direct attempt was made to estimate the number of beaver carcasses used as human food. Rather, this was assumed to be 80 per cent of the average number of pelts registered between the 1976-77 and 1979-80 trapping seasons (unpublished Ontario Ministry of Natural Resources data). This value compares conservatively with the findings of Novak (1975). The average live weight of harvested beaver was taken to be 12.1 kg (James Bay and Northern Quebec Native Harvesting Research Committee, 1976), and the edible portion was assumed to be 5.44 kg, or 45 per cent (Novak, 1975). No allowance was made for other furbearers, although certain of these were known to be eaten at least occasionally.

The small game category consisted mostly of waterfowl, grouse, and snowshoe hare, although a wide variety of other birds and small mammals may be included here as well. Goose and duck harvests were estimated from Ontario Ministry of Natural Resources data on harvest by native trappers between 1956 and 1973 within the Sioux Lookout District (Brown and Melnyk, 1979). The Cat Lake portion of

this estimate was simply pro-rated according to its proportion of the District's total Indian population. Edible weights per bird were taken as 1.8 kg and 0.45 kg, for geese and ducks, respectively (Tanner, 1979); these were the most conservative published estimates available. The combined contributions of grouse and hare were estimated arbitrarily as 1 per cent of the total wild food harvest, a figure which compares conservatively with the scanty literature available (James Bay and Northern Quebec Native Harvesting Research Committee, 1978; Tanner, 1979).

Consumption of fish was chosen as 4.5 kg per day for the whole community (or 5.5 kg per capita per year), slightly below the national average of 5.7 kg (Statistics Canada, 1979).

Section 9 (items 9.0 to 9.9) was designed generally to obtain information regarding hunting attitudes, and partly as a cross-reference to sections 6, 7 and 8. Specifically, hunters were asked to name which big game species they preferred, and to describe their hunting methods (items 9.0 to 9.3). Items 9.4 to 9.8 attempted to draw out the operating principles of wildlife conservation. Item 9.9 solicited opinions on the effect of sport hunting in the Band Area.

Section 10 (item 10.0) asked for the interviewee's age. This information was used for cross-tabulation to assess any chronologically-related trends.

An effort was made to ensure that each interview was carried out in the most comfortable and convenient setting. In most cases, this was the interviewee's home. Seven interviews were conducted outdoors, and four were carried out in the Band Office. (This was to accommodate men working on a nearby house-construction site).

As suggested by Gorden (1969), some attempt was made to interview first those persons with the highest apparent status, followed by those most willing to participate. The overriding determinant in the interview order, however, was the immediate availability of the subjects. The interpreter was largely responsible for arranging the order and specific times for interviews. Interviews usually required an average of approximately 45 minutes (range: 25 minutes to 2 hours).

A pre-test study was carried out on June 5, 1980, involving a prototype interview schedule and eight subjects. The interviewees were all adult Indian males from a variety of isolated communities in north-western Ontario (but not Cat Lake) who were attending a language class at Lakehead University. No interpreter was used or required. As a result of this pre-test, the order of several questions was changed.

RESULTS

Aerial Survey

Population estimates varied considerably from year to year, but there were two relatively consistent findings:

(i) moose outnumbered caribou by more than 2:1, and

(ii) the more recent surveys produced lower estimates.

A graphic representation of all aerial survey results is presented in Figure 5.

The 1977 plot survey resulted in estimates of 565 ± 344 moose and 0 caribou for the southern portion of the Band Area. This was by far the largest estimate of moose for the southern portion. The survey period was generally the earliest of those covering this portion. Snow depth was also the least. There were no caribou seen on plot during the survey. While this is not too surprising (there are apparently few caribou in the southern portion of the Band Area), it should be noted that this was intended as a moose survey, and special efforts to locate caribou were probably not made.

The 1978 transect survey resulted in estimates of 425 ± 189 moose and 186 ± 239 caribou for the entire study area. For comparison with the partial surveys, these estimates can be apportioned as follows: 229 moose and 126 caribou in the northern portion; 196 moose and 60 caribou in the south. Ratios of moose:caribou were calculated to be 2.3:1 for the entire Band Area, 1.8:1 in the north and 3.3:1 in the south (Table 2). This survey was flown over a generally later time period than that conducted in 1977, and the snow was an average of approximately 10 cm deeper than during the previous year's flying.

The 1979 transect survey resulted in estimates of 426 ± 385 moose and 591 ± 598 caribou, by far the highest estimates for the northern portion of the Band Area (Table 3). The ratio of moose: caribou from these estimates was 0.7:1. This survey was flown earlier

than any other covering the northern zone, and was accompanied by exceptionally clear, cold and calm weather, along with the lowest snow accumulations encountered.

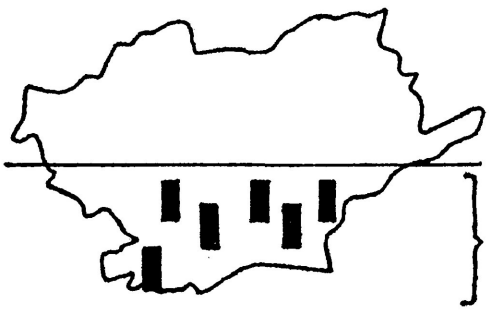
The 1980a plot survey resulted in estimates of 125 ± 94 moose and 0 caribou for the southern portion of the Band Area (Table 4). The timing was generally later, and the snow substantially deeper than during the 1977 plot survey, to which it is directly comparable. No caribou were seen on plot, resulting in an estimate of zero. A group of 3 caribou was noted "off plot" on January 31, however, and interestingly, a group of 3 was again seen on February 25 during the 1980b survey, only 1 km from the first sighting.

The 1980b transect survey produced the lowest estimates of both moose and caribou. Results were 219 ± 160 moose and 101 ± 193 caribou for the entire Band Area (Table 5). These estimates can be apportioned as follows: 124 moose and 62 caribou in the northern portion; 95 moose and 39 caribou in the south. Ratios of moose:caribou were calculated to be 2.2:1 for the whole Band Area, 2.0:1 in the north, and 2.4:1 in the south. The survey was flown over a generally later time period than all others, while snow depths encountered were highest, and may have been relatively severe in terms of hardness.

Figure 5. Summary of aerial survey results.

1977
Plot
Survey

6.2%
Sampling
Rate

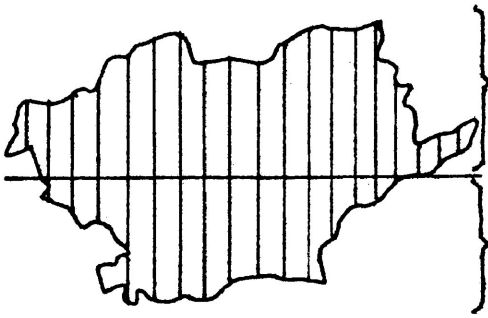


565 moose (±344)

0 caribou

1978
Transect
Survey

6.0%
Sampling
Rate



229 moose

126 caribou

196 moose

60 caribou

425 moose (±189)

186 caribou (±239)

(2.3:1)

1979
Transect
Survey

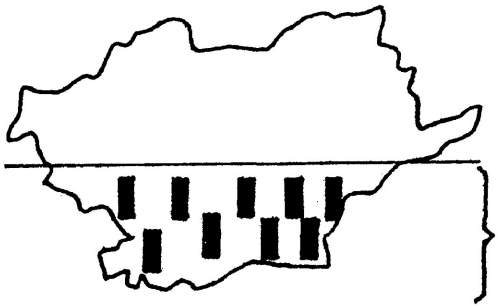
5.9%
Sampling
Rate

426 moose (±385)

591 caribou (±598)

1980a
Plot
Survey

9.7%
Sampling
Rate

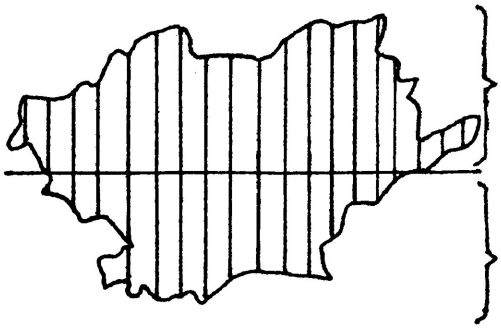


125 moose (±94)

0 caribou

1980b
Transect
Survey

5.9%
Sampling
Rate



124 moose

62 caribou

95 moose

39 caribou

219 moose (±160)

101 caribou (±193)

(2.2:1)

Table 1. Summary of observations from the 1977 plot survey of the southern portion of the Cat Lake Band Area.

MOOSE		CARIBOU	
Frequency of observation	# of moose on plot	Frequency of observation	# of caribou on plot
2	0	11	0
3	1		
2	2		
1	5		
1	6		
1	7		
1	11		
Totals: 11 plots	36 moose	11 plots	0 caribou

Table 2. Summary of observations from the 1978 transect survey of the Cat Lake Band Area.

MOOSE		CARIBOU	
Frequency of observation	# of moose on plot	Frequency of observation	# of caribou on plot
42	0	40	0
3	1	1	4
2	2	1	7
3	4		
1	5		
Totals: *51 plots	25 moose	*42 plots	11 caribou

* Moose and caribou surveying took place simultaneously, so the total areas surveyed were the same for each species. The number of plots (and their average size) varied because the transects were apportioned to low and high strata according to separate stratification schemes.

Table 3. Summary of observations from the 1979 transect survey of the northern portion of the Cat Lake Band Area.

MOOSE		CARIBOU	
Frequency of observation	# of moose on plot	Frequency of observation	# of caribou on plot
20	0	21	0
1	1	1	5
3	2	1	9
1	4	1	21
1	13		
Totals:*26 plots	24 moose	*24 plots	35 caribou

* Moose and caribou surveying took place simultaneously, so the total areas surveyed were the same for each species. The number of plots (and their average size) varied because the transects were apportioned to low and high strata according to separate stratification schemes.

Table 4. Summary of observations from the 1980a plot survey of the southern portion of the Cat Lake Band Area.

MOOSE		CARIBOU	
Frequency of observation	# of moose on plot	Frequency of observation	# of caribou on plot
12	0	17	0
1	1		
2	2		
1	3		
1	4		
Totals: 17 plots	12 moose	17 plots	0 caribou

Table 5. Summary of observations from the 1980b plot survey of the Cat Lake Band Area.

MOOSE		CARIBOU	
Frequency of observation	# of moose on plot	Frequency of observation	# of caribou on plot
32	0	27	0
3	1	1	6
2	3		
1	4		
Totals:*38 plots	13 moose	*28 plots	0 caribou

* Moose and caribou surveying took place simultaneously, so the total areas surveyed were the same for each species. The number of plots (and their average size) varied because the transects were apportioned to low and high strata according to separate stratification schemes.

Government Records of Big Game Harvest

Native harvest

Records of the native harvest of caribou have been made by Ontario Ministry of Natural Resources Wildlife Management Officers since the 1960-61 season. Similar records of moose harvest were not available for the period prior to the 1973-74 season. During the June 17, 1980 visit of the Wildlife Management Officer to the village, a total of 28 Cat Lake trappers submitted harvest reports. An additional report was received from a local trapper registered outside of the Band Area.

Native caribou harvest (Table 6) recorded by Ontario Ministry of Natural Resources wildlife officers between 1960-61 and 1979-80 averaged 12.2 per year (s.d. = 13.9). However, this figure was inflated by a kill of 65 animals in one year (1976-77). The median value was 9 caribou. Data for 1978-79 and 1979-80 were supplied by M. Eliuk (pers. comm.). All other data are from the summary of Gray (1978).

Native moose harvest (Table 7) as recorded by Ontario Ministry of Natural Resources Wildlife Officers between 1973-74 and 1979-80 has averaged 31.1 per year (s.d. = 10.2), substantially higher than the average caribou harvest. All data were obtained from unpublished Sioux Lookout District records (A. Stasus, pers. comm.; M. Eliuk, pers. comm.). During the interview, it was learned that 4 of the 26 moose reported in 1979-80 were taken from outside the Band Area.

Sport harvest of moose

Recording of moose harvest by mercator grid within the study area has been relatively consistent only since 1975 (see gross totals, Table 8). Moose harvest by sport hunters for the most recent 5-year period (1975-79) averaged 23.6 moose/year (s.d. = 8.0). All data were obtained from unpublished Ontario Ministry of Natural Resources records.

Table 6. Harvest of woodland caribou by natives from Cat Lake, as recorded by provincial wildlife staff, 1960-61 to 1979-80.

Season	Harvest	Season	Harvest
1979-80	6	1969-70	no record
1978-79	4	1968-69	3
1977-78	15	1967-68	8
1976-77	65	1966-67	5
1975-76	2	1965-66	19
1974-75	11	1964-65	17
1973-74	13	1963-64	9
1972-73	6	1962-63	4
1971-72	13	1961-62	4
1970-71	9	1960-61	18

Table 7. Harvest of moose by trappers from Cat Lake, as recorded by provincial wildlife staff, 1973-74 to 1979-80.

Season	Harvest	Season	Harvest
1979-80	26	1975-76	32
1978-79	13	1974-75	37
1977-78	37	1973-74	45
1976-77	28		

Table 8. Recorded harvest of moose by sport hunters in the Cat Lake Band Area, 1968-79.

Year	*Gross Total	*Adjusted Total
1979	32	21
1978	31	22
1977	37	36
1976	33	25
1975	27	14
1974	9	6
1973	15	10
1972	27	25
1971	8	8
1970	23	23
1969	12	12
1968	4	4

* Gross totals were calculated by summing data from all mercator map blocks falling wholly or partially within the Band Area. Adjusted totals were calculated by pro-rating data from the peripheral map blocks according to the proportion of their areas falling within the Band Area.

Three answers were received from 8 tourist outfitters in response to a request for information pertaining to the 1979 moose hunting season. Two outfitters responded to the initial request for information, one to the reminder. Of these, one reported "no moose", another reported "no information available" and the third provided a detailed list of hunting success at 12 outpost camps. One moose kill was judged to have been within the Band Area; it had not been listed in the Ontario Ministry of Natural Resources records.

Another moose was reported killed by a non-native trapper in the Cat Lake Band Area (according to his native trapping partner). This animal had not been recorded by the Ontario Ministry of Natural Resources, but has been included here as part of the 1979 sport harvest. The total non-native harvest was therefore estimated to be a minimum of 23 moose in 1979.

Trapper and Hunter Interview

The Band list as of December 31, 1977 (Department of Indian Affairs and Northern Development, unpublished data) recorded 263 treaty Indians registered with the Cat Lake Band. At any given time, the community includes some people registered with other Bands, and some non-status Indians. As well, there will be Band members living elsewhere.

Of the total on the Band list, 69 were males 18 years of age or older during the whole year preceding the survey (i.e., with birth dates prior to July 1, 1961). Forty-five of these held registered trapping licences for the Cat Lake Band Area. Three others held licences outside of the Band Area. This indicates that a minimum of forty-eight (or 69.6%) of the adult males listed with the Cat Lake Band were registered trappers.

Section 1: Trapping activity

From item 1.0, it was found that 32 of the 35 Cat Lake trappers (91.4 per cent) had actively trapped during the fall period (fall to Christmas), 11 during the winter (January to March), and 21 during the spring (April to May; item 1.1).

From item 1.2, it was found that all but four traplines (numbers 200, 201, 212 and 214, representing 15.0 per cent of the Band Area) were used. Six trappers reported using more than one trapline. Minimum distances from the village to each trapline were computed. These averaged 21.3 and 35.8 km for used and unused areas, respectively, but the difference was not significant ($t = 1.62$; $d.f = 3$; $p > 0.1$).

Of the 33 interviewees who reported trapping during the previous season, only 4 said they had gone alone (item 1.3). Non-trapping kin (range: 1 to 9) were reported to have accompanied eighteen trappers.

Section 2: Moose and caribou harvest

A total of 38 moose were claimed to have been killed by 18 interviewees (items 2.0, 2.1). By contacting friends and relatives of those out of town, and by cross-referencing with the Ontario Ministry of Natural Resources reports, this total was increased to 46. Four more moose were reported taken from outside the Band Area (these had been included in the Ontario Ministry of Natural Resources total of 26). Two Cat Lake trappers were left unaccounted for by these techniques.

Where responses could be cross-referenced, no major inconsistencies could be found. Minor inconsistencies involved such things as location of kill and the name of the hunter responsible (since more than one hunter was often involved).

Of the 46 moose believed to have been taken from within the Band Area by native hunters, 22 were bulls, 15 were cows, 2 were unidentified adults, 1 was a male calf, 2 were female calves, 2 were unidentified calves, and 2 were unidentified as to sex or age. The chronology of the harvest (Table 9) suggests that moose hunting was concentrated between October and April, corresponding to the most active trapping period.

Locations for 43 of the 46 moose reported by native trappers as taken within the Band Area showed moose kills for all traplines except those four which were untrapped. Thirty-eight of these were described by mercator block location as well.

By assuming that each moose kill was located in the centre of its respective mercator block, straight-line distances from the village were calculated. These averaged 35.1 km (s.d. = 19.1; range: 5.5 - 76.0).

From items 2.0 and 2.2, 5 caribou were reported killed by 4 hunters. Cross-referencing revealed some discrepancies regarding the

Table 9. Moose harvest within the Cat Lake Band Area by native hunters by month (July, 1979 to June, 1980).

	MONTH											
	7	8	9	10	11	12	1	2	3	4	5	6
Number of moose killed	3	-	1	6	4	5	4	6	5	8	3	1

names of the responsible hunters. One of the caribou was apparently claimed twice, so the actual total revealed by this method was therefore 4 animals. All of these had been reported to the Wildlife Management Officer. Another 2 caribou were reported by relatives of hunters not in town. These also had been reported to the Wildlife Management Officer.

In addition to the above, 2 hunters reported taking 4 caribou from outside the Band Area. Another man was said to have taken about 6 caribou from outside of the Band Area, but this could not be verified and so has not been included in the total.

Four of the caribou kills were located by mercator block. By assuming that the actual kill location was at the centre of its respective block, it was calculated that the average straight-line distance from the village was 24.5 km, excluding the significant portion of the caribou harvest from outside the Band Area.

Section 3: Importance of wolves

Of the 28 interviewees offering an opinion, 19 (69.7 per cent) felt that wolves were not killing too many moose (item 3.0). Similarly, 19 of 23 men (82.6 per cent) felt that wolves were not killing too many caribou.

Of the 36 respondents who had hunted in the Band Area during the previous year, 7 (19.4 per cent) reported seeing moose or caribou which had apparently been killed by wolves (item 3.1), involving 6 signtings of moose, and 3 of caribou. From the information given, it was apparent that one of the moose kills was seen and reported by 3 different men, so the total was reduced to 4 moose.

Six wolves and the remains of an unidentifiable big-game animal were seen during the author's (1980b) aerial survey, within 10 km of two small bands of caribou. This location was not mentioned during the interviews.

Of the 36 men who had hunted in the Band Area during the previous year, 29 (80.6 per cent) felt that the wolf population was stable or increasing (19 and 10 respondents, respectively; item 3.2).

Of those who believed wolves to be increasing, 2 felt this was due to higher moose and caribou populations, while 2 cited a lack of wolf control measures. The remaining 6 did not offer an explanation (item 3.3).

Only 12 of 35 men (34.3 per cent) reported trying to trap wolves, but 31 of 36 (86.1) said they would shoot wolves if the opportunity presented itself (item 3.4).

Three men reported killing a total of 8 wolves (item 3.5). The official record of fur harvest (Ontario Ministry of Natural Resources, unpublished data) shows 4 wolf pelts submitted for sale. Only one wolf was reported on the Ontario Ministry of Natural Resources trapper questionnaires. One interviewee, however, mentioned that "about six wolves" had been killed near the village during the previous winter.

Section 4: Perceived trends in moose and caribou populations

Of the 35 interviewees expressing an opinion, 17 (48.6 per cent) felt that moose numbers where they hunted were lower than usual, while another 14 (40.0 per cent) saw the situation as approximately stable (item 4.0). Only 3 interviewees considered moose numbers to be higher, while one man said he "didn't know". From cross-tabulation with subject's age (item 10.0), it was found that 62.5 per cent (15 of 24) of those 26 years of age or older believed moose numbers to be lower than usual, while 66.7 per cent (8 off 12) of the younger men reported the situation to be stable.

Only 15 hunters offered explanations for perceived changes: 9 blamed overhunting or disturbance by sport hunters; 2 blamed overhunting by local hunters; 2 blamed wolf predation; 2 perceived increases due to good habitat conditions (item 4.1).

Twenty-nine interviewees designated time periods during which they believed moose to have been much more abundant (either through personal experience or hearsay; item 4.41). Similarly, eight men named periods during which moose were believed to have been much less abundant (item 4.4, Table 10). These data do not consistently point to any one period of relatively high abundance. They do, however, underscore the notion that moose were not especially numerous at the time of the interview.

Thirty-three interviewees offered an opinion with respect to the relative abundance of caribou in the areas where they hunted. The largest proportion (n = 14; 42.4 per cent) suggested that populations were stable. Those perceiving an increase (n = 10; 30.3 per cent) or a decrease (n = 9; 27.3 per cent) virtually balanced (item 4.2).

Six different explanations were given by 12 hunters for perceived changes in the abundance of caribou (item 4.3). Reasons given by those who noted increases were: a reduction in local hunting (3 respondents); lower wolf predation relative to moose (1); favourable habitat conditions (1).

Reasons given by those who noted decreases were: habitat destruction by fire (3); hunting pressure by local hunters (2); wolf predation (2).

Twenty-one interviewees were able to designate time periods during which they believed caribou to be much more abundant (either through personal experience or hearsay; item 4.43). Similarly, 7 hunters named periods during which caribou were believed to have been much less abundant (item 4.4; Table 11).

Section 5: Snowmobiles

Twenty-seven of 33 men (81.1 per cent) reported using snowmobiles for trapping purposes, while 25 of 34 (73.5 per cent) used them for hunting (item 5.0).

Table 10. Time periods named by Cat Lake hunters as having a much higher, or much lower abundance of moose.

MUCH HIGHER	MUCH LOWER
-from about 1910 - 1960	-from before grandmother's birth (1868) extending to 1880s
-about 1920	-1890s and earlier
-from about 1920 - 1960	-before interviewee was born (1906)
-about 1925	-1910 - 1920
-about 1930	-early 1920s, and earlier
-1930-1940	-before 1930
-1938, when interviewee first arrived	-1948-49
-1940	
-about 1940 - 1950	
-from before 1950 to 1974-75	
-1950	
-1954	
-1955	
-about 1960 (named three times)	
-1960-1965, before non-resident hunting	
-late 1960s	
-prior to about 1970, before tourist hunting, and before outboard motors and skidoos became widely used (named twice)	
-about 1970 (named three times)	
-1972	
-1974-75, before fire	
-1975 (named twice)	
-1976	
-about 1977, prior to tourist hunt	

Item 5.1 was designed primarily to determine when snowmobiles came into widespread use. One interviewee claimed to have owned the first machine in Cat Lake in 1968 or 1969. A total of seven trappers reported having used snowmobiles for at least 7 years (i.e., since the winter of 1973-74). The average length of snowmobile use by 30 Cat Lake trappers was 4.5 years.

Snowmobiles were reported used for the following purposes (item 5.2): transporting equipment (n = 31); checking traps (n = 29); travelling to hunt area (n = 28); tracking moose or caribou (n = 10); chasing moose or caribou (n = 6); other: gathering firewood (n = 2); recreation (n = 1). Although no tally was kept, it is worth noting that several men commented that chasing or tracking moose with a snowmobile was virtually impossible because of the tendency for these animals to inhabit areas of dense bush. It was also said that chasing of caribou would generally be possible only on open areas such as lakes.

Item 5.3 asked hunters to describe the relationship between snowmobiles and personal hunting success in exclusive categories. Six of 30 interviewees (20.0 per cent) said that snowmobiles helped them to kill more moose or caribou. Four of these commented that this was due to easier bush access. Twenty-one (70.0 per cent) reported that snowmobiles simply reduced the amount of effort involved. Two of these stated in item 6.1, however, that hunting pressure by Cat Lake residents had increased because of the greater access provided by these machines. Three men (10.0 per cent) answered only that snowmobiles allowed hunters to cover more ground.

Section 6: Perceived trends in the level of local big game hunting

(i) Moose

Twenty-five of 33 interviewees (75.8) per cent) offering an opinion reported that moose hunting by local residents was stable (n = 11; 33.3 per cent) or declining (n = 14; 42.4 per cent; item 6.0). Eight 24.2 per cent) felt that it was increasing.

Table 11. Time periods named by Cat Lake hunters as having a much higher, or much lower abundance of caribou.

MUCH HIGHER	MUCH LOWER
-about 1880 to 1910, when moose were scarce	-from before grandmother's birth (1868)
-about 1910	-about 1875 (i.e. 30 years before interviewee's birth)
-1930-1940	-1910-1930
-1940-1945	-1960
-1950	-about 1970 (named twice)
-1953	-prior to about 1975
-1955	
-prior to about 1960, when there were severe fires	
-about 1960	
-before 1961	
-about 1970 (named twice)	
-1974-1975, before fire	
-1975	
-1976	

Of those who perceived a declining trend, 7 said this was due to a reduced abundance of animals, while 2 cited less interest in hunting due to opportunities for wage employment or welfare (item 6.1). Of those who perceived a stable situation, 2 cited less interest in hunting (item 6.1). Of those who perceived an increasing trend, 5 said this was due to the greater access provided by snowmobiles and motor boats, while 2 cited more or better hunters (item 6.1).

Seventy per cent of those expressing an opinion (21 of 30) felt that the level of moose hunting by local hunters should stay the same (item 6.2). One of these commented, however, that the total harvest was too high when the sport hunt was included.

Five hunters (16.7 per cent) believed that the local harvest could be higher. One of these made this comment conditional on the cessation of sport hunting. Another believed that local hunting could be increased, because it was now largely a weekend pursuit, especially for the younger men (item 6.2).

Four hunters (13.3 per cent) felt that the local moose harvest was too high. One of these explained that there were presently too many hunters (item 6.2).

(ii) Caribou

Twenty-nine of 32 respondents (90.6) offering an opinion reported that caribou hunting by local residents was stable (n = 13) or declining (n = 16; item 6.0). Three (9.4 per cent) believed that it was increasing.

Eight of those who perceived a declining trend offered explanations. Three said there were fewer animals, two said there was little interest in caribou hunting, two referred to negative reactions (from both native and government sources) following a very large caribou harvest in 1977, and one man cited wage employment opportunities (item 6.1).

Two of those who believed caribou hunting to be relatively stable said there was generally less interest in hunting due to opportunities for wage employment or welfare (item 6.1).

The three men who believed the level of caribou hunting to be increasing all offered explanations. Two said this was due to the greater access afforded by snowmobiles, while one said simply that more animals were being seen (item 6.1).

Fourteen of 24 men (58.3 per cent) expressing an opinion said that the level of caribou hunting by local hunters should stay the same (item 6.3). Two of these commented that caribou hunting had been restrained since 1977 (item 6.3).

Ten interviewees (41.7 per cent) felt that caribou hunting could be increased. Five of these offered explanatory comments. Three said this was because caribou were not much sought after. One said that caribou hunting had been restrained since 1977. One said that caribou were vulnerable only in late winter (item 6.3).

In addition to the above, 11 hunters replied that they did not know whether the present level of caribou hunting was appropriate. One of these explained that caribou hunting was largely an opportunistic by-product of some other activity. None suggested that caribou hunting was presently too high.

Section 7: Caribou harvest of 1976-77

Seven interviewees were not asked any questions regarding the large caribou harvest of the 1976-77 season. This total includes retired men, and one subject who appeared to be growing hostile to the interview (this man participated in the harvest in question). The remainder (37) all reported that they were aware of this event (item 7.0).

The majority of those interviewed were not asked to provide an estimate of the number of caribou killed in the winter of 1976-77,

since it soon became apparent that a definitive answer was not to be obtained by this technique. This was primarily because only a handful of hunters was directly involved, and the rest had to rely largely on hearsay information. Another point that emerged was that most of the harvest took place on a series of 4 large lakes, 3 of them just south of the Band Area. Although some caribou were also taken independently from an area to the east of Cat Lake, it was the southern harvest that was remembered as being particularly significant. Two of the three men who admitted their involvement said that a total of four hunters had participated (items 7.5, 7.3).

Ten interviewees offered estimates ranging from 32 to 110 caribou killed (item 7.1). The number recorded on Ontario Ministry of Natural Resources trapper questionnaires for that season was 65. This was assumed to provide a reliable minimum estimate.

The three participants who were interviewed all agreed that many caribou had escaped, but could give no definite estimates (item 7.2). One said that he saw about 200 animals that winter. Another reported that over 50 caribou escaped in one herd alone.

Everyone in the village who was asked about it was aware of the incident, and there was a clear consensus that the hunt had been excessive. Of 36 men interviewed, 28 (77.8 per cent) felt that too many animals had been killed. This included all three of the participants who were asked.

Although some details remain unclear, the following description was assembled. Four men from one family group killed a large number of caribou on several lakes along the southern fringe of the Band Area during March or early April, 1977. At least 65 caribou were taken, possibly as many as 110.

Two men referred to deep snow that year, one of them adding that very warm weather led to an early spring. This presumably accounted for the relatively sudden appearance of large numbers of

caribou on lake ice. A sudden warming trend under deep snow conditions will result in crust formation in open areas, accompanied by soft, thawing snow in the bush. In these circumstances, caribou can be expected to shift their activities to lakes, where they can seek out a variety of foods associated with rocky shorelines, while staying close to the crusted ice which affords the best travelling and escape conditions (Bergerud, 1974a; Miller, 1974). Two men reported that there seemed to be a large-scale movement of animals from the west and northwest of Cat Lake to the south. Two of the lakes just south of the Band Area (Kezik and Fry) were identified by one man as caribou summering areas.

Snowmobiles were used effectively in this instance. Two of the participants said that they were able to chase the caribou on the lake ice with snowmobiles and approach them to within shooting distance. The caribou did not respond by escaping into the bush, indicating to one of the hunters that snowmobiles did not frighten the animals.

One interviewee said that the hunters had tried to dispose of some of their harvest by selling it in the village. Two said that some carcasses were allowed to spoil. One of the participating hunters denied both of these claims, although the author had not mentioned. them. In any case, the Band Council felt that something improper had been done, and asked the Ontario Ministry of Natural Resources to investigate. Although no charges were laid, the Wildlife Management Officer strongly advised the hunters to restrain themselves in the future. This apparently had the desired effect, since the author was repeatedly told of the subdued character of caribou hunting since 1977.

Section 8: Subsistence value of wild food

Rankings of the relative importance of six protein sources in family diets were obtained from 37 men (item 8.0). Each ranking

corresponded with a score ranging from 0 to 5; summing these values for each food category yielded the importance indices presented in Table 12. Beaver and moose received the highest ratings. The contribution of caribou meat was apparently insignificant. Store-bought meats were given a median value.

From item 8.1 it was found that the "average" family of the thirty-seven trappers who participated in ranking protein sources consisted of 2.73 adults (range: 1 to 6) and 2.16 children (range: 0 to 8).

In item 8.2, hunters were asked to state their two most important reasons for hunting moose or caribou. Of the 29 men giving a primary reason, 17 (58.6 per cent) named the getting of meat. Many of these seemed surprised or amused at the question, indicating that they felt the answer should have been perfectly obvious. Other answers suggesting a subsistence value were "providing for family" and "saving money", each given as first reasons by two men (6.9 per cent each). All 9 interviewees over the age of 40 gave one of the above as their main reason for hunting.

To substantiate these findings, estimates were made of the actual contributions from these six food sources to the protein intake of the whole community (Table 13). Estimates were based on information obtained from the interview itself (moose and caribou), from shipping records (store-bought meats), or from conservative assumptions derived primarily from other studies (beaver, fish, and small game). Wild foods were estimated to have provided 58.8 per cent of the total animal protein used by Cat Lake residents during the previous 12 months. The most important components were moose (28.2 per cent) and beaver (20.9 per cent); caribou provided only 2.0 per cent of the total. In spite of the high overall use of wild foods, the largest single protein source was store-bought food (41.2) per cent.

Eight hunters (27.6 per cent), all between the ages of 17 and 40 (item 10.0), gave first reasons which went beyond simple

Table 12. Importance indices of 6 protein sources in the family diets of 37 Cat Lake trappers.

ITEM	SCORE	ITEM	SCORE
beaver	127	store-bought meat	93
moose	123	small game	71
fish	111	caribou	20

subsistence. The enjoyment of wild meat (as being natural, fresh, tasty, or a change from purchased food), and the enjoyment of what may be called the aesthetic aspects of hunting (relaxation, being in the bush, hunting for its own sake, enjoyment of a traditional role) were each given by four men (13.8 per cent).

Fifteen hunters gave secondary reasons for big game hunting. Six of these fell into the subsistence category: saving money - 3; getting meat - 1; providing for family - 1; obtaining the hide - 1. Nine were suggestive of non-subsistence values: enjoyment of aesthetic aspects of hunting (as above) - 6; enjoyment of wild meat - 4.

Item 8.3 was a further attempt to assess the non-subsistence value of big game hunting by directly asking if the interviewee would reduce his hunting effort if he could afford to buy all his food from the store. Twenty-three of 32 men (71.9 per cent) said they would not reduce their moose hunting efforts (18 to 25 years old: 58.3 per cent 26 to 40 years old: 72.7 per cent; and over 40 years old: 88.9 per cent). Sixteen of 23 men (69.6 per cent) said they would not reduce their caribou hunting efforts. The number of men answering with respect to caribou was lower, since hunting for these animals was often purely opportunistic (i.e., a man who has shot a caribou may not originally have been seeking one).

Section 9: Attitudes, methods, and principles of big game hunters

Only active hunters were asked to answer items 9.0 to 9.3. All 34 men responding to item 9.0 reported that they preferred hunting moose over caribou. Thirty-two of these gave primary reasons for their choice as follows: moose tastes better (n = 17; 53.1 per cent); moose hunting is easier or more enjoyable; caribou are hard to find (n = 7; 21.9 per cent); moose have more meat (n = 4; 12.5 per cent); won't eat caribou (n = 4; 12.5 per cent).

Table 13. Estimated weights of animal protein used as food by Cat Lake residents, July 1979 to June 1980.

ITEM	WEIGHT (kg)	% OF SUB-TOTAL	% OF TOTAL
Wild food			
50 moose	7,950.0	47.9	28.2
10 caribou	570.0	3.4	2.0
1,094 beaver	5,907.6	35.6	20.9
409 ducks	185.5		
91 geese	165.1	3.1	1.8
grouse, hare	165.9		
fish	1,642.5	9.9	5.8
Sub-total	16,586.6		58.8
Store food			
fresh meat	9,237.7	79.4	32.7
canned meat	2,391.4	20.6	8.5
Sub-total	11,629.1		41.2
Grand Total	28,215.7		

Six men also offered secondary reasons, as follows: moose tastes better (n = 3); moose have more meat (n = 2); caribou are hard to find (n = 1).

Since most men had hunted moose in more than one season, and using more than one method, item 9.2 was re-worded to ask for the subject's preferred season and method. It was not necessary to alter item 9.3, which simply asked each man to describe how he hunted caribou. Thirty-one of the active hunters gave a preferred season and method of moose hunting. Eleven (35.5 per cent) preferred hunting shorelines in the fall, while calling (i.e., imitating the sound of a female moose in estrus). Seven hunters (22.6 per cent) named shoreline hunting in the summer. Eight men (25.8 per cent) preferred winter hunting using a method which, according to Rogers (1962), was given the Ojibwa name "onatawahikewin". According to this method, a hunter encountering fresh moose tracks attempts to anticipate the bedding site of the animal. The hunter does not follow the tracks directly, but assumes that the moose will travel cross-wind for a ways, then double back on a track which is somewhat downwind of the original. Five men (16.1 per cent) said they preferred tracking in the winter time. These last two categories cannot be separated with any certainty, since they both involve tracking in the winter.

Twenty-one of the active hunters reported their method for hunting caribou. Eight (38.1 per cent) said simply that caribou were seen by chance. Five (23.8 per cent) stated that they anticipated the movements of caribou from tracks (in winter). Two (9.5 per cent) reported that they tracked caribou in the early winter, when the snow cover is shallow. Two (9.5 per cent) said they hunted caribou when the animals are restricted by deep snow in mid-winter.

From item 9.4 it was found that 20 of the 32 hunters (62.5 per cent) reported that they would not shoot as many moose as possible while hunting. Reasons given for this (item 9.41) were:

- to avoid waste and spoilage (n = 12; 60.0 per cent);
- to avoid overharvest (n = 5; 25.0 per cent);
- to avoid excessive work (n = 1; 5.0 per cent);
- because hunter selection was exercised (bull moose were considered to produce inferior meat) (n = 1; 5.0 per cent).
- because the respondent was told not to (this man participated in the major caribou harvest of 1977) (n = 1; 5.0 per cent).

Seven of 32 hunters (21.9 per cent) said that they would shoot as many moose as possible. Five more gave qualified answers, saying they would take as many as possible if:

- the animals were killed near the village (n = 2);
- people were in need (n = 2);
- hunting had been poor (n = 1).

With respect to caribou, 21 of 24 hunters (87.5 per cent) said they would not shoot as many as possible. Reasons given (item 9.41) were:

- to avoid waste and spoilage (n = 12; 57.1 per cent);
- to avoid overharvest (n = 6; 28.6 per cent);
- because of a lack of interest in caribou (n = 2; 9.5 per cent);
- because the respondent had been told not to (see above) (n = 1; 4.8 per cent).

Two hunters (8.3 per cent) said they would shoot as many caribou as possible, and one more said he would if he was near the village.

Twenty-three of 32 hunters (71.9 per cent) responding to item 9.5 stated that they never worried that they had killed too many moose. Eight (25.0 per cent) answered affirmatively, and one (3.1 per cent) said he didn't know.

With respect to caribou, 20 of 25 hunters (80.0 per cent) reported that they never worried that they had killed too many, while 5 (20.0 per cent) said that they sometimes did.

Of 33 hunters responding to item 9.6, 22 (66.7 per cent) stated that they would reduce their moose hunting efforts if overharvesting reduced the population level.

Five of these offered explanatory comments as follows: interviewee would adopt rotational harvesting, as with beaver (n = 2); this is why subject is not hunting at present (n = 1); interviewee would continue opportunistic hunting, but wouldn't go looking for animals (n = 1); it would depend on need (n = 1).

Four men (12.1 per cent) said they would not reduce their moose hunting efforts. One of these commented that he would continue opportunistic hunting, but wouldn't make special efforts.

Seven hunters (21.2 per cent) said they "didn't know". One of these commented that it would depend on need, another said the problem had never arisen.

Twenty four men responded to item 9.6 with regard to caribou. Sixteen of these (66.7 per cent) stated that they would reduce their caribou hunting efforts in the face of an overharvested population. Three (12.5 per cent) answered that they would not, while 5 (20.8 per cent) said they didn't know. No explanatory comments were made.

Items 9.7 and 9.8 asked individuals to name what they felt were the two best approaches to the conservation of moose and caribou, respectively. Thirty-nine men were canvassed in each case. With regard to moose (item 9.7), the greatest number (n = 18; 46.2 per cent) answered that they "didn't know". Ten hunters (25.6 per cent) suggested a reduction in hunting pressure (by area, for a time, or generally) as a first choice. Two of the foregoing gave second choices. One suggested wolf control, the other a restriction on the sport harvest. Five men (12.8 per cent) recommended a restriction on

sport hunting. One of these offered bulls-only hunting as a second choice. Four trappers (10.3 per cent) suggested continued harvesting as the best conservation method. Two men (5.1 per cent) offered bulls-only hunting as a first choice.

With regard to the conservation of caribou (item 9.8), the greatest number (n = 23; 59.0 per cent) answered that they "didn't know". Eight hunters (20.5 per cent) suggested a reduction in hunting pressure (by area, for a time, or generally). Four interviewees (10.3 per cent) said the problem didn't arise. Two men (5.1 per cent) recommended continued harvesting. One hunter (2.6 per cent) advocated bulls-only hunting, and another (2.6 per cent) favoured a simple continuation of the present ban on sport hunting.

Item 9.9 revealed that 17 (54.8 per cent) of 31 active Band Area trappers believed fly-in hunting to have hurt moose populations in areas where they hunted. Nine (29.0 per cent) perceived no detrimental effects, while 5 (16.1 per cent) said they "didn't know".

Section 10: Interviewee age

Item 10.0 documented the interviewee's age. The data were then split into convenient categories for purposes of cross-tabulation. Twelve men (27.3 per cent) were between the ages of 17 and 25; 13 (29.6 per cent) were aged 26 to 40, and 19 (43.2 per cent) were over 40 (maximum 86).

DISCUSSION

Aerial Survey

Population estimates

Strictly speaking, the calculation of confidence limits assumes random sampling. Since the transect surveys were based on systematic placement of flight lines, the calculation of confidence limits is technically invalid. However, as Caughley (1977:33) has said, "The validity or otherwise of a statistical procedure is not the most important consideration. We search for a robust test rather than a valid test, one that will give an answer close enough to the truth even when the data do not fully fit the axioms... A confidence limit calculated from non-random samples may be invalid but it is seldom much different from a confidence limit calculated from random samples. So long as the sitting of systematic transects is not biased with respect to what lies on the ground, the axioms of the statistical model are not grossly violated." Caughley's argument should apply here, since the terrain covered was highly unsystematic.

The 1977 plot survey produced an estimated moose density far higher than any other covering the southern portion of the Band Area. Relatively early timing and shallow snow probably contributed to this result (Lynch, 1975) but it is also possible that it actually reflected a high population which suffered a serious decline subsequent to the survey. Snow depth at Pickle Lake reached 100 cm by the end of February, 1977, and stayed above 70 cm through March. Rainfalls of 0.7 and 7.4 mm were recorded for these months, respectively, so very deep and crusted snows apparently characterized much of the late winter period. In other studies, such circumstances have been associated with high wolf predation (Peterson and Allen, 1974) followed by low herd productivity (Haber, 1977); these may have combined with substantial hunting mortality to produce a real decline, accentuated in subsequent aerial surveys by poorer survey conditions.

The 1978 transect survey was flown later than it should have been for optimum results (Lynch, 1975); this probably biased the estimates downwards as compared to the 1977 survey. Late-winter conditions in 1978 were also fairly severe. Snow depth reached 90 cm in early April, and significant snow cover persisted into May. Small amounts of rain fell in both March and April, so deep and crusted snow conditions must have characterized the late winter period for the second year in a row.

The 1979 transect survey produced very high estimates of both moose and caribou in the northern portion of the Band Area. Survey conditions, (early timing and exceptionally clear, cold and calm weather, with very shallow snow cover) appear to have been associated with a tendency for the animals to utilize open areas, and to maintain relatively large group sizes. One aggregation of 13 moose was found utilizing a regenerating burn, an event which is much less likely later in the winter or under deeper snow conditions (Peek et al., 1974). This one observation accounted for 54 per cent of the total moose seen, and without it, the estimate would have been only 231 (almost identical to the estimate for the northern portion resulting from the 1978 survey). Similarly, one group of 21 accounted for 60 per cent of the caribou seen. Without this one observation, the estimate would have been only 237.

The 1980a plot survey of the southern portion of the Band Area produced a moose estimate barely one-fifth that of the 1977 survey, to which it is directly comparable. Later timing and deeper snow are suspected to have exerted a downward influence on the estimate (Lynch, 1975). These, however, do not seem sufficient to explain such a wide discrepancy, especially since all post-1977 surveys produced estimates of less than one-half the number of moose suggested by the 1977 survey.

The 1980b transect survey produced the lowest estimates of both moose and caribou. It was also flown later and under deeper snow conditions than any other, factors which were likely associated with a tendency for animals to use areas of heavier cover, where they would have been much less visible (Lynch, 1975; Peek et al., 1974; Stardom, 1975).

Compared to the 1978 and 1979 transect surveys, stricter attention was paid to accurately estimating the transect boundary. More animals were actually recorded as being "off plot" than "on" (10 moose and 12 caribou "off", 13 moose and 6 caribou "on"). By contrast, no animals were recorded as being "off plot" during the 1978 and 1979 transect surveys, while the total numbers of animal observations were roughly comparable (25 moose and 11 caribou tallied in 1978; 24 moose and 35 caribou tallied in 1979). This comparison is not entirely valid, however, since in 1980, tracks were often followed a considerable distance away from the transect in order to be sure of the location and identity of animal groups, something that was not done in the earlier surveys. All of the "off plot" caribou, and 5 of the "off plot" moose recorded in 1980 can be accounted for in this way. However, a strong suggestion remains that the previous efforts were more lenient when it came to judging whether animals near the transect boundary should be tallied or not.

Timmermann (1974) suggested that transect surveys inherently tend to yield lower estimates than plot surveys. In fact, this survey did produce a lower estimate of moose numbers for the southern portion of the Band Area than the 1980a plot survey. The reverse was true for caribou, however. Conversely, Novak and Gardner (1975) and Novak (1981) argued that transect surveys should yield comparable results if the method involves intensive searching for animals by circling in the vicinity of fresh tracks. This was the method followed here, and during the previous (1978 and 1979) transect surveys. In general, the data cannot support any consistent differences between plot and transect surveys.

In general terms it would appear that the aerial survey data are so variable, and with such wide confidence limits, as to be almost meaningless. Upon closer inspection, however, certain interesting observations can be made.

First, timing and survey conditions may have strongly influenced the results. The surveys producing by far the highest estimates (1977 and 1979) were both the earliest and with the least snow depth. They were also the coldest, and so it appears that low temperatures by themselves did not inhibit survey efficiency. Conversely, the survey producing the lowest estimates (1980b) was the latest and encountered the deepest snow cover. The 1978 survey was intermediate in timing and snow cover, and produced an intermediate result. A progressive restriction to relatively small areas of suitable wintering habitat with increasing snow depth may be expected for both moose (Coady, 1974) and caribou (Bergerud, 1974a). In the Cat Lake Band Area, preferred late-winter habitats for moose are closed, and for caribou, partially open conifer stands. Needless to say, moose and caribou are extremely difficult to locate in such forest types.

Second, this study emphasizes problems inherent in the general approach to aerial surveys as they have been conducted in the Cat Lake Band Area. Surveys aimed at animals living at very low densities, and yet which are usually found in small to medium-sized groups, cannot be expected to produce precise results unless their sampling rates are very high. For example, the caribou density estimated from the 1978 survey was $0.016/km^2$. However, only 2 of 42 plots contained any animals, and on these, the average density was $0.266/km^2$, or almost 17 times the mean. Unless such a survey covers a major proportion of the study area, the inevitable result will be a confidence interval so broad as to be valueless. Ironically, of course, the sampling rate never exceeded 6 per cent of the Band Area as a whole, due to its large size and the time and cost limitations associated with surveying it.

Third, there may have been important differences among the 3 transect surveys in determining whether or not an animal was "on plot". This problem is a weakness of the transect method particularly when applied to low animal densities and clumped distributions. This difficulty would not apply in any great extent to the plot surveys flown in 1977 and 1980 since the surface:edge ratio of the 25 km^2 plots was much higher.

Lastly, it has long been recognized that aerial survey is a crude tool, but one that continues to be used because there is no better alternative (Timmermann, 1974). According to Caughley (1977:36), "The error is usually large enough to invalidate aerial census totals, although they are useful, notwithstanding, as indices of abundance or as estimates of minimum numbers." While the data presented here cannot provide reliable population estimates, they do at least provide evidence of a downward trend.

Moose:caribou ratio

The moose:caribou ratios for the whole Band Area were 2.3:1 (1978) and 2.2:1 (1980b), remarkably close considering the generally high level of variability. Ratios for the northern portion alone were 1.8:1 (1978), 0.7:1 (1979) and 2.0:1 (1980b). Ratios for the southern portion alone were 3.3:1 (1978) and 2.4:1 (1980b). The separated ratios reflect both a higher level of internal variability and a combination of higher caribou and lower moose densities in the north.

While visibility bias (the inability to see all animals) is probably a serious problem for all aerial surveys, it seems almost assured that caribou (because of their smaller size and paler colouration) are more likely to be missed than moose. This means that if the true population sizes were known, the ratio would likely be lower than the average observed value of 2.2 moose: caribou.

Government Records of Big Game Harvest

Native harvest

Annual reported caribou harvests were quite variable, but usually less than 15 (Table 6). In general, the usefulness of these data is seriously limited by incomplete reporting (e.g. 56 per cent of the registered trappers reported for 1979-80). Several members of the Fish and Wildlife Branch commented that reporting was more complete in former times, when visitors from outside the community were rare, and alternative diversions were few. It can only be assumed that voluntary reporting results in a tendency to underestimate the harvest but the magnitude of the bias is unknown. In spite of this, the estimate achieved by interviewing trappers and their families was no higher than the 1979-80 government estimate, and must be considered to represent the best estimate for the Band Area.

Another flaw in the government reporting procedure must be mentioned, however. Trappers were never asked to differentiate between animals taken from within or outside of the Band Area. In 1979-80, residents of Cat Lake apparently took at least 4 caribou from outside the study area which did not appear in government records. Conversely, the large harvest of 1976-77 included many animals taken from another Band Area. In summary, data such as these may provide an index of caribou harvest when taken over a very large area such as the entire Sioux Lookout District, but may prove to be quite misleading for individual Band Areas.

Harvest of moose by Cat Lake trappers as reported to the Ontario Ministry of Natural Resources has shown a variable but generally declining trend since 1973-74 (Table 7). The significance of this is obscured, however, by the fact that there are 2 plausible but opposing

explanations. First, the rate of reporting may have declined. Alternatively, the data may indicate a real trend, as supported by the trappers during the interview.

Once again, the value of these data is further limited by the fact that trappers were not asked whether or not their animals were taken from within the Band Area. Information obtained from the interview suggested that 4 of the 26 moose reported to the government for 1979-80 were taken from adjacent areas. Interview data also resulted in an estimate of at least 46 moose taken from within the Band Area by local trappers and hunters. This suggests that less than 50% of the actual harvest was tabulated using the voluntary reporting technique employed by the Ontario Ministry of Natural Resources.

The foregoing discussions exemplify Usher's (1976) comments regarding government data on native harvest. He wrote (p. 109),..."one can only be assured that estimates derived from [government statistics], providing all considerations have been taken into account, are at least of the correct order of magnitude, and may even be within 50 per cent of the true figure. It is also safe to assume that government statistics consistently underestimate the true figures; but the degree to which they do so is of limited and variable predictability.".

Sport harvest of moose

The accuracy of the recorded sport harvest of moose (calculated through export permits and voluntary check station data) cannot be properly evaluated. Certainly, it represents a minimum estimate. One line of evidence, however, suggests that it represents less than half of the actual total. Ontario Ministry of Natural Resources data from mailed questionnaires sent randomly to 20 per cent of those purchasing moose licences indicated that 189 moose were taken from Wildlife Management Unit 16 in 1979. (This Unit includes the southern 38 per cent of the study area.) Information obtained from

export permits and check stations, however, contained records of only 80 moose (Ontario Ministry of Natural Resources, unpubl. data).

Through the interview procedure, and by canvassing local tourist outfitters, it was determined that at least 2 unrecorded moose had been taken by non-Indians in the study area, bringing the total for 1979 to a minimum of 23.

Trapper and Hunter Interview

Section 1: Trapping activity

The level of interest in trapping by Cat Lake residents was apparently quite high. There were 50 native trappers associated with 17 registered traplines, and over 90 per cent of the trappers interviewed claimed to have actively trapped during the preceding season. Trapping was conducted on traplines making up over 85 per cent of the Band Area. It must be remembered, however, that trapping is a seasonal occupation, usually capable of supplying only a supplemental income. Most trappers were inactive during the severe winter period (January through March).

During summer, the trapping season is closed. All the same, trapping must be considered an important industry in an area where costs are inflated by the necessity to transport almost everything by air, and sources of local employment are severely limited. It was estimated by Carlson (1979) that Cat Lake trappers earned above-average incomes when compared with their counterparts from surrounding areas in northwestern Ontario, producing a total harvest worth approximately $55,000 during the 1976-77 season.

Trapping evidently served other important economic, social and cultural functions as well. Harvests of big game (and presumably other important food species) were largely associated with peak trapping periods (Table 9). Few trappers worked alone, and most were accompanied at one time or another by non-trapping kin, maintaining to some extent the pattern of former times.

Section 2: Moose and caribou harvest

The interview yielded estimates of native moose harvest approximately double those obtained through the voluntary reporting

method used by the Ontario Ministry of Natural Resources (i.e. 50 moose, including 46 from within the Band Area, compared with 26 moose, including 22 from the Band Area, according to the latter method). Both methods produced estimates of 6 caribou taken from within the Band Area, but the interview uncovered another 4 taken from outside. The intensive interview procedure that was followed is believed to have produced data at least as consistent as those gathered from sport hunters at game check stations elsewhere in northern Ontario (Timmermann, 1975).

Big game kills took place on traplines representing 85 per cent of the Band Area. Distance from the village apparently did not influence effort or success. Estimated average kill distances were 67 per cent greater than those reported by Winterhalder (1977) for Muskrat Dam.

Section 3: Importance of wolves

Data regarding the relative abundance of wolves, the number of big game animals taken by wolves, or the number of wolves taken by trappers were not substantial enough to support biological evaluations. They do show, however, that wolves were a regular, and presumably important, part of the human - wildlife relationship operating here. While most hunters believed wolves to be stable or increasing in numbers, the predominant opinion was that they were not killing too many moose or caribou. This sentiment was somewhat weaker with respect to moose, and could be a reflection of the general perception that the moose population was under pressure, especially from hunting.

Section 4: Perceived trends in moose and caribou populations

The predominant opinion was that moose populations were in decline, or, at best, stable. Sport hunters were the most commonly-named cause of a perceived decline. Those over 25 years old were much more likely to consider moose as declining, possibly a

reflection of personal experience long enough to recall a time when moose were significantly more abundant. Most respondents, in fact, named a time when moose populations were much higher than at present (Table 10). These times fell within every decade from the 1910s to the 1970s, a finding which makes it difficult to draw any meaningful conclusions. It does, however, re-inforce the notion that moose were not presently considered to be especially abundant. Winterhalder (1977), noted that moose populations in the vicinity of Muskrat Dam (180 km to the north) were generally believed to have been higher during the time of his study (1975) than they were during the 1920s and 1930s. It is possible that moose may have reached peak populations somewhat later in this more northerly location.

Of more interest was the naming by eight interviewees of times when moose were much less abundant (Table 10). The earliest of these was clearly a reference to the "fish and hare period" (Rogers and Black, 1976) which began to fade in the 1890s (Bishop, 1974). This reference was from a man of 86 who had learned it from his grandmother. The next 3 designated time periods also suggested the same era, but are less definitive. These reports not only reflect long memories, but are also supported by historical data and therefore lend credibility to other statements made by these individuals.

In contrast to moose, caribou numbers were generally perceived as being stable. This finding is significant primarily because it shows that the opinions of Cat Lake trappers were based on something other than the simplistic notion that things were better in the past.

Fewer men could designate times when caribou numbers differed significantly from those of the present (Table 11). This continued a trend seen throughout the interview in which subjects showed themselves to be less specific, less knowledgeable, and less interested with respect to caribou, as compared to moose. The period 1976-77 was named by 7 of 21 interviewees as being a time of relatively great abundance.

This was undoubtedly associated with the large caribou harvest of early 1977. The two earliest references to periods of caribou scarcity referred to the "fish and hare period".

Section 5: Snowmobiles

Since their introduction in the late 1960s, snowmobiles have become widely used at Cat Lake, and were strongly associated with both trapping and hunting. The net effect of snowmobile use on big game populations is, however, difficult to assess from the variety of sometimes conflicting responses received. Despite their pervasive use, only a small percentage of the trappers believed that they actually brought home more game with the help of snowmobiles. In the light of other studies, this may reflect the true situation. For example, Jarvenpa (1979) found that increasing use of modern technology (including snowmobiles) was correlated with declining use of big game and other wild foods in a northern Saskatchewan community. Usher (1972) studied snowmobile use by Banks Island trappers (reputed to be the most efficient and aggressive in the Arctic) and found no evidence of overtrapping nor any reason to expect increased hunting pressure on big game. He concluded that snowmobiles were not cost-efficient, but were presumably worth the expense for the convenience and leisure they provided. Finally, Hall (1971), studying an Alaskan Inuit community, reported that snowmobiles greatly increased caribou-hunting efficiency, by cutting down travelling time and by allowing hunters to pursue animals to within rifle range. He believed, however, that the impact on total harvest would only be slight, primarily because of social constraints against overharvest and wastage. He concluded that the strongest influences of snowmobile use were social in nature, because of increased travel, and because they made weekend hunting possible, therefore allowing men to participate in both wage labour and subsistence hunting.

In the rough terrain and forested conditions of the Cat Lake Band Area, tracking or chasing big game with snowmobiles would presumably be more difficult than in arctic Alaska. There is also an important difference in the game species involved. Caribou, when pursued, tend to seek open areas where they can attain high speeds (Miller, 1974). Clearly, snowmobiles could be used to advantage in such a situation, as they were in the large caribou kill of early 1977. Moose, however, are more secretive, and use forest cover to avoid predators (Geist, 1974). As several trappers in fact commented, snowmobiles are probably not effective tools for the direct hunting of moose. Unfortunately, the two questions in the interview relating to tracking or chasing of big game did not ask the subject to be specific as to species, so the foregoing must remain speculative.

However, the overall effect of snowmobiles in the Cat Lake Band Area is a product of opposing factors, the net result of which is that big game hunting pressures may not have changed substantially since before their introduction. First, the greatest hunting effort by far is directed towards moose, not caribou, and snowmobiles are not effective for tracking or pursuing these animals. Second, snowmobiles provide rapid access to distant hunting areas, and have undoubtedly contributed greatly to the maintenance of big game hunting in the face of other social trends, such as settlement in permanent villages, day schools which keep family units off the traplines in winter, and wage labour.

Section 6: Caribou harvest of 1976-77

In spite of the foregoing, it appears that snowmobiles played a significant role in the major caribou harvest of 1976-77. Under the particular circumstances encountered (late winter, deep snow, sudden warm weather) the anti-predator strategy of caribou would be to stay out of the bush, where they could become bogged down, and remain on the ice

where they could watch the approach of their enemy, and rely on speed for escape. This strategy is presumably appropriate against wolves, but it can render caribou notably vulnerable to human hunters using high-powered rifles (Bergerud, 1974a; Muller-Wille, 1974).

This incident was informative in two respects. First, it showed that even while interest in caribou hunting was low, circumstances were able to combine in such a way as to produce what was clearly judged to be an overharvest. Second, it showed that corrective pressure could be effectively brought to bear, both by government managers and by the Indian community. This incident provides us with one example, at least, of a case in which Indian and government views and actions on a wildlife management problem were in harmony.

Section 7: Subsistence value of wild food

The calculated relative importance indices (Table 12) were not based on a random community sample, but rather constructed of subjective rankings supplied by trappers. As such, they probably exaggerated the contribution of wild foods, particularly beaver. However, they did provide a basis for checking certain assumptions made for the estimation of actual edible weights (Table 13). A detailed discussion of each item follows.

Moose and Caribou:

The estimates of moose and caribou harvest were probably quite reasonable. All information received was cross-checked and generally found to be consistent. In any case, errors were probably due to information missed or withheld and would result in an underestimate. The edible weights used were near the minima reported in the literature and substantially lower than those used for the James Bay study (James Bay and Northern Quebec Native Harvesting Research Committee, 1976),

which were themselves supposedly conservative. The relative amounts of moose and caribou meat available were confirmed by their importance indices (Table 12).

Beaver:

No direct estimate of the subsistence value of furbearer meat was obtained. While the calculated weight was substantial, it may well be conservative for five reasons:

1) The registered harvest always underestimates the actual harvest to some degree. For example, pelts may be damaged or used for domestic purposes and not recorded as part of the commercial harvest. In the James Bay native harvesting study (James Bay and Northern Quebec Native Harvesting Research Committee, 1976), it was a fairly consistent finding that actual beaver harvest was 1.4 times that registered by the Quebec government. If the same factor applied at Cat Lake, the number of carcasses used in the estimate would represent only 57 per cent of the actual harvest.
2) A 1975 Ontario Ministry of Natural Resources study (Novak, 1975) of the use of furbearers as meat indicated that the number of beaver carcasses consumed by trappers of the Sioux Lookout District approximated the recorded harvest. Other workers (Rogers, 1962; Winterhalder, 1977) also reported the use of beaver flesh as human food in northern Ontario, but did not specify proportions.
3) Novak's (1975) study showed a similar pattern for muskrat (Ondatra zibethica) and substantial use of lynx (Lynx lynx). A Cat Lake trapper referred to human use of otters (Lutra canadensis). Allowances have not been made for other furbearers here.
4) The trappers interviewed ranked beaver as the most important single protein item in their families' diet. While it must be emphasized that this was a subjective rating based on a non-random sample, it clearly indicates that substantial amounts of beaver meat were consumed.

5) The average edible weight of harvested beaver used in this analysis (5.4 kg or 12 lb.) corresponds to the lowest reported in the literature (Tanner, 1979).

Small Game:

Although there was some basis for estimating the contribution of waterfowl, the overall estimate for small game was arbitrary. Usher (1976) stated, in regard to making estimates from government native harvest statistics, that the only things one can be fairly sure of are that the data underestimate the true situation and that they are likely of the same order of magnitude.

There are 3 additional comments that should be made regarding the small game estimates:

1) The corresponding estimate made for two inland Cree communities in the James Bay Study (James Bay and Northern Quebec Native Harvesting Research Committee, 1978) represented almost 9 per cent of the total wild food harvest.
2) Small game received a higher importance index than caribou (Table 12).
3) Since the assigned value represented less than 2 per cent of the total, an overestimation of even 100 per cent would not affect the overall conclusions.

Fish:

The value used to represent the contribution by fish was deliberately chosen to be conservative, while recognizing that it was not insignificant. As Winterhalder (1975:35) stated, "Records indicate that fishing has been a basic subsistence practice throughout the boreal forest for at least the historic period." The assigned value for fish represented per capita consumption slightly below the national average (Statistics Canada, 1979). Trappers accorded fish a higher importance index than store meat (Table 12).

Store-Bought Meat:

Although these estimates were directly measurable from shipping records, there are two counteracting biases involved which must be considered.

First, there was one other locally-owned outlet which did a small business in canned goods. It was a tiny operation which kept irregular hours and was said to be more expensive than the Hudson's Bay Company store. No attempt was made to obtain data from this source.

Second, there were 6 'outsiders' associated with the reserve. These included 4 teachers and 2 Hudson's Bay Company employees. This small group could safely be assumed to account for a disproportionate amount of the fresh meat brought into the community for 3 reasons:

1) Their eating habits were representative of North Americans in general, with a high demand for fresh, not canned meat.
2) They could afford the very high cost of fresh meat on a regular basis.
3) Since they were employed full time and non-native, they did not have the same access to wild food as permanent residents.

General:

Neither the importance indices nor the estimated protein weights will support precise quantitative conclusions. Unfortunately, as Usher (1976:108) has said, "The data on which exact calculations can be based are not only unavailable at present, but will never become available."

However, the estimations of weight were designed in every case to stay on the conservative side. The large-scale study of wildlife use by the James Bay Cree (James Bay and Northern Quebec Native Harvesting Research Committee, 1976; 1978) also claimed to yield minimal values and was purportedly criticized for underestimating. The assumptions used in the present analysis were generally even more conservative. In addition, and perhaps of more significance, was the evidence of the

importance indices (Table 12). These data clearly support the conclusion that wild sources supplied more than half of the community's protein, and that big game, especially moose, was a key component.

Reasons for hunting moose or caribou:

Most hunters (including all of those over 40 years of age) claimed to have hunted moose or caribou primarily for basic subsistence reasons, such as the getting of meat, or saving money. Non-subsistence motivations, however, including appreciation of aesthetic values were important as secondary reasons. Since those giving non-subsistence values as their primary reason were all under 40 years of age, a trend related to age and/or cultural change is indicated.

The non-subsistence component of moose and caribou hunting was further emphasized by the measurement of what could be called "consumer loyalty." Few men suggested that they would reduce their hunting efforts if they could afford to buy all their food from the store. Interestingly, it was the older men (i.e., those who claimed to hunt primarily for subsistence reasons) who showed the greatest reluctance to curtail their hunting. This seems to support the comments of Rogers (1963:83) that "food habits are notable for their resistance to change." A question that should have been asked is whether a subject would cease hunting entirely if the economic incentive were removed. It can only be presumed that this would have received an even smaller positive response.

Section 8: Attitudes, methods and principles of big game hunters

The overwhelmingly disproportionate attention paid to moose over caribou as game animals was firmly supported in the literature pertaining to the Canadian Shield portion of northern Ontario. For example, Winterhalder (1977) concluded that moose was the most important

and most sought after game animal, and added (p. 293), "All accounts indicate that caribou are rare in northern Ontario and of minimal importance in the diets of contemporary populations."

The preferred methods reported for hunting moose and caribou substantiated the foregoing. Moose hunting was more refined and based on a more intimate knowledge of the animal's habits. Caribou hunting was obviously a less directed and predictable affair.

Most hunters reported that they would not shoot as many moose or caribou as possible. The primary reasons given were the desire to avoid waste or overharvest. It was impossible to determine whether these motives arose partially or wholly from a desire to please the interviewer, fear of legal sanctions, traditional beliefs, or what may be called a "common-sense" approach to game management. With regard to interview bias, it should be noted that a substantial number were not afraid to report that they would not be inclined to show restraint. Fear of legal sanctions (as discussed in regard to the large caribou harvest of 1976-77) and traditional approaches (as discussed below) probably played some role, at least. The "common-sense" approach may, however, have been the single most important factor. Most men reported that they would reduce their hunting efforts if populations became depressed by overhunting. Of greatest significance here was the simple fact that most hunters recognized overharvest or the wasteful killing of game as wrong. This was further borne out by the statements of a substantial number of men that they had sometimes worried that they had personally killed too many moose or caribou.

A wide variety of suggestions was received as to the best approach for the conservation of moose or caribou (items 9.7 and 9.8). A general reduction in hunting pressure, a reduction in sport hunting, bulls-only hunting, and wolf control are all standard methods which have been applied by game biologists at one time or another, and which are often called for by the general public (Connolly, 1978; Denney, 1978).

Temporary or rotating spatial restrictions in hunting pressure could fit the above category, but are also related to traditional and familiar methods of game conservation. The Cree and Ojibwa of the subarctic boreal forest region have long practised a rotational method of game and fur management which involves leaving a particular area "fallow" from time to time to allow animal populations to rebuild (e.g. Feit, 1973b; Rogers, 1963; Tanner, 1979).

By far the greatest number of subjects, however, gave no answer to this area of questioning. This could indicate that: 1) they had not thought of the abstract question as having any particular significance to themselves, i.e. they saw no problem with respect to their own hunting, and were not prepared for such a question, or 2) they had definite ideas which they were reluctant to express. In this regard, it may be noted that four men saw wildlife management in a truly traditional context which was culturally and logically foreign to the author, namely that it is necessary to continue harvesting animals in order to ensure a continued supply. This notion was formerly widespread among Cree and Ojibwa groups, and is based on the premise that animals are gifts to man from the Creator, and will be withdrawn if not used (Bishop, 1974; James Bay and Northern Quebec Native Harvesting Research Committee, 1976; Martin, 1978).

Bishop (1974) in his study of Indians from the Osnaburgh-Cat Lake area, found a similar mix of philosophies expressed with regard to beaver conservation. He noted, in particular, three general approaches: 1) harvesting based on a sustainable quota (the approach suggested by government officials); 2) allowing depleted local populations to be replenished from surrounding areas; 3) conservation measures unnecessary, since animals were given by God whenever they were needed.

One theme which was not stridently stated, but which did recur, was that fly-in moose hunting was harming local populations. A small majority of the active trappers stated that they believed moose inhabiting areas where they hunted to have suffered from this activity.

Assessment of Big Game Populations

A number of pieces of evidence have been presented that suggest that moose populations within the Cat Lake Band Area have declined. Although none of these is conclusive, they all point in the same direction.

First there are the aerial survey results. Although these are admittedly crude, two paired comparisons strongly suggest a downward trend. The 1977 and 1980a surveys of the southern portion of the Band Area both involved plots flown by Ontario Ministry of Natural Resources personnel, and yielded estimates of 565 and 125 moose respectively. The 1978 and 1980b surveys sampled the entire Band Area with transects, and produced estimates of 425 and 219 moose, respectively.

Second are the moose harvest data collected by the Ontario Ministry of Natural Resources (Tables 7 and 8). While the annual records of harvest do not yield reliable total estimates, they provide some indication of trend. Table 7 appears to show a downward trend in native harvest, especially as the two most recent seasons (1978-79 and 1979-80) in the seven-year sequence exhibited the lowest values. Although the sport harvest data (Table 3) show no clear trend, the two most recent years (1978 and 1979) were well below the peak harvest of 1977. Decreasing annual harvests are considered to be one of the best indicators of overharvest (Cumming, 1974).

The third line of evidence comes from the Cat Lake trappers themselves. The balance of opinion was that local moose populations were lower than usual (item 4.0) and that harvest by local hunters was in decline (item 6.0).

A reduced moose population would not be at all surprising. The Ontario Ministry of Natural Resources (1982) concluded that "over the past decade and a half there has been a significant decline in the moose population" within the West Patricia Planning Area, which

includes the Cat Lake Band Area, with overall sport harvests substantially reduced from previous years. This was attributed primarily to overhunting; declining habitat quality and wolf predation were named as secondary factors. Native harvest was recognized as a factor of local importance.

It was impossible to assess precisely the effects of hunting (both native and sport) on moose populations within the Band Area, since both the aerial survey and harvest data were subject to so much uncertainty. But if the available figures were taken at face value, the government estimate of total harvest for the 1979-80 season (Tables 7 and 8) would be 47 moose, taken from a population estimated during the winter of 1979-80 (1980b survey) at 219 animals. This crude exercise yields a harvest rate of 21.5 per cent, far above the sustained yield level of about 14 per cent assumed by the Ontario Ministry of Natural Resources (1982). While it is likely that the 1980b aerial survey substantially underestimated the true population there is evidence to suggest that the harvest figures themselves were low by as much as one-half.

With regard to caribou, no clear trend could be discerned. The aerial survey data showed total estimates of 186 in 1978 and 101 in 1980(b). No significance should be attached to these data at this time primarily because of their huge confidence intervals. The plot surveys of the southern portion of the Band Area estimated 0 caribou in both 1979 and 1980a.

Government records of native harvest (Table 6) have been erratic, reflecting at least in part the opportunistic nature of caribou hunting. The two most recent years (1979-79 and 1979-80), however, showed estimates decidedly lower than the 20-year average. This could be due to both the restrained nature of caribou hunting since the large kill of 1976-77, and the possibility that caribou populations were significantly depressed by this event. There can be little doubt that the removal of at least 65 animals represented an overharvest, insofar as local populations could not be expected to sustain this level of hunting for long.

From the trapper interview, the balance of opinion was that caribou populations were stable, while hunting was in decline. It should be noted that interviewees were asked to discuss caribou populations in their usual hunting areas (most of which would be within the Band Area). Most of the large harvest of 1976-77 probably took place farther to the south, and may have had a limited effect on caribou densities in the majority of the Band Area.

Based on the 1978 and 1980b aerial surveys, the moose:caribou ratio in the Band Area was estimated to be no higher than 2.2:1. Native harvest ratios were estimated from the interview to be 46 moose:6 caribou, or 7.7:1, clearly showing the disproportionate attention given to moose. If moose harvest by sport hunters was included, the total harvest ratio would be 69 moose:6 caribou or 11.5:1.

To summarize, the trend in woodland caribou numbers continues to be uncertain. It is clear that caribou densities were generally low and their distribution patchy and largely unpredictable. While interest in hunting them was slight, one recent instance of overharvest is known to have taken place. It would seem safe to conclude that native harvesting is at least capable of exerting a controlling influence on the local caribou population, and prudence would suggest little or no room for an allocation to sport hunters. This is based on the assumption that caribou reproduction rates are normally barely sufficient to keep them ahead of natural and man-induced mortality (Bergerud, 1974b).

Native Harvesting and Wildlife Management

It should be apparent from the foregoing discussions that Indians exerted substantial pressure on big game populations in the Cat Lake Band Area. It should also be clear that moose and caribou, along with other fish and wildlife resources, were important to the Cat Lake people for a variety of reasons. These included obtaining cash income (from trapping), obtaining high quality food at low cost, and an

appreciation of the cultural aspects of harvesting wild food. These circumstances should be expected to continue, given the limited social and economic opportunities available.

In this situation, it should not be surprising that a desire for effective wildlife management was expressed. A wide mix of conservation attitudes was apparent, spanning both scientific and traditional views. The most basic approach suggested was a simple restriction on sport hunting. Regardless of the validity of this view, it seems only logical that a full assessment of native harvesting should be made before allocations to other hunters are made in a case such as this.

The present study shows that some of the fundamental obstacles confronting such an effort can be overcome. Although some hostility and distrust were encountered, the data obtained appeared to be at least as reliable as those obtained from sport hunters. In general, the interviewees were co-operative and concerned about the wildlife resource. Solutions to the dilemma of the management of native harvesting should be possible if the desire on the part of both native groups and government agencies is strong enough. There appear to be two difficult problems remaining. On the native side is the question of how rights guaranteed by treaty can be maintained, and yet altered to allow some form of reasonable overall control. On the government side is the problem of granting consideration for native views and concerns and providing for native participation in wildlife management issues. While solutions to these issues do not seem to be immediately forthcoming, it is apparent that the status quo will not be satisfactory to either side. Flexibility and a willingness to compromise will be required if real progress is to be made.

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APPENDIX I

TRAPPER'S QUESTIONNAIRE SPRING 19....

NAME..... BAND .....

ADDRESS ..... TRAPLINE AREA NO. .....

No. of live beaver houses on your part of the trapline .....

Fill out below total number of pelts trapped

Beaver	Mink	Marten	Otter	Fisher	Lynx	Muskrat	Squirrel	Weasel	Col. Fox	Arctic Fox	Timber Wolf	Black Bear	Wolverine

Fill out below for each herd of CARIBOU seen or CARIBOU KILLED

Total in Herd	Caribou killed (use one line per animal or herd).					
	None	Adult Male	Adult Female	Calf Male	Calf Female	Date Killed

Fill out below for each MOOSE KILLED

Adult Male	Adult Female	Calf Male	Calf Female	Date Killed

APPENDIX II

TELEPHONE 345 2121
AREA CODE 807

Lakehead University

THUNDER BAY, ONTARIO, CANADA, POSTAL CODE P7B 5E1

PARTMENT OF BIOLOGY

I am a graduate biology student at Lakehead University in Thunder Bay, ıd I am involved in a study of the wildlife resources in a central portion : what has been called the "Reed expansion area." I would find it very ɛlpful if you could provide some information regarding the extent of fly-in ɔose hunting operations in this area. Specifically, the area in question is ɛtween 90°30' and 93°10' W longitude, and 51°20' and 52°30' N latitude.

I apologize for asking for your help during a busy time of the year, but would greatly appreciate your co-operation. If you find it convenient, ɔu may simply return this letter to the above address with a few notes ɔtted down on the back.

Could you please list the camps you operated during the 1979 hunting ɛason (by lake name) within the above area, and the number of moose claimed ɾ your guests at each (1979 only). Please list a camp even if no moose ɛre taken there.

Thank you very much.

George D. Hamilton
Dept. of Biology

APPENDIX III

Deck I

Moose and caribou Interview

Respondent: ----------

Roll #: _____ (1) (2)

Trapper: Yes (Lic. #: _____) 1
No 2 (3)

1.0 I understand that some trappers do not trap every year. When was the last time you went trapping?

last year	1	
2 years ago	2*	*skip to 2.00
more than 2 yrs. ago	3*	

(4)

1.1 At what times were you trapping?

fall to Xmas	-1	(1+2) -5
Jan. to Mar.	-2	(1+3) -6
Apr. to May	-3	(2+3) -7
other _____	-4	(1,2,3) -8

(5)

1.2 Where did you go trapping? (see map)

1st _____ (6,7)
2nd _____ (8,9)
3rd _____ (10,11)

1.3 Were you trapping with someone else?

yes 1
no 2

Trappers _____ (12)

_____

_____

# of non-trapping kin _____ (13) (14)

2.0 Did you kill any moose or caribou last year?

	Moose	Caribou	
yes	1	1	
no *	2	2	(skip to 2.3)

(15) (16)

2.1 How many moose did you kill?

Sex Age Date Location (17) (18)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2.2 How many caribou did you kill?
Sex Age Date Location

_____ (19) (20)

_____

_____

_____

_____

_____

_____

_____

_____

_____

2.3 Were you with anyone else whan they killed moose or caribou last year?

	Moose	Caribou
yes*	1	1
no	2	2

(21) (22)

*names_____

_____

2.4 Do you know of anyone who was not a trapper, but who killed moose or caribou last year?

	Moose	Caribou
yes*	1	1
no	2	2

(23) (24)

*names_____

_____

3.0 People sometimes say that there are too many wolves, and that ~~they~~ are killing too many moose or caribou. Do you think that wolves are killing too many moose or caribou where you hunt?

	Moose	Caribou
yes	1	1
no	2	2
don't know	3	3

(25) (26)

3.1 Did you see any moose or caribou that had been killed by wolves last year?

	Moose	Caribou
yes *	1	1
no	2	2

*(list on next page)

(27)

3.11 Moose

Sex Age Date Location

_____

_____

_____

(28)

3.12 Caribou

Sex Age Date Location

_____

_____

_____

(29)

3.2 In the area where you hunt, do you think that wolf numbers have changed in recent years? Are they:

higher	1
lower	2
about the same	3
don't know	4

(30)

3.3 Can you think of any reason for this? (Item 3.2)

_____

_____

_____

(31) (32)

3.4 Do you try to trap or shoot wolves?

	Trap	Shoot
yes	1	1
no	2	2

(33) (34)

3.5 How many wolves did you kill last year?

none	1
one	2
two	3
three	4
more than 3	5

(35)

4.0 I understand that the numbers of moose and caribou in an area often change. Do you think that moose populations where you hunt are:

more than usual	1
same as usual	2
lower than usual	3
don't know	4

(36)

4.1 Can you think of any reason for this? (Item 4.0)

_____

_____

_____

(37) (38)

4.2 Do you think that caribou populations where you hunt are:

more than usual	1
same as usual	2
lower than usual	3
don't know	4

(39)

4.3 Can you think of any reason for this? (Item 4.2)

_____

_____

_____

(40) (41)

4.41 Do you know if there was ever a time when there were a lot more moose?

yes	1	(Time:_____)
no	2	

(42)

4.42 Do you know if there was ever a time when there were a lot fewer moose?

yes	1	(Time:_____)
no	2	

(43)

4.43 Do you know if there was ever a time when there were a lot more caribou?

yes	1	(Time:_____)
no	2	

(44)

4.44 Do you know if there was ever a time when there were a lot fewer caribou?

yes	1	(Time:_____)
no	2	

(45)

5.0 Snowmobiles have brought many changes for people living in the north. Do you use a snowmobile for trapping or hunting?

	Trapping	Hunting
yes	1	1
no	2	2

(46) (47)

5.1 How many years have you been using a snowmobile?

one--1	six--6
two--2	7-9--7
three-3	10-15--8
four-4	over 15--9
five-5	

(48)

5.2 A snowmobile can be used for many things. Can you tell me what you use your machine for when you are out in the bush?

Transporting equip't	1
Checking traps	2
Travelling to hunt area	3
Tracking moose/caribou	4
Chasing moose/caribou	5
Other(specify_____)	6

(43) (50) (51) (52) (53) (54)

5.3 Do snowmobiles help you to kill more moose or caribou, or do they just make the work easier?

Kill more animals	1
less work	2
other(specify_____)	3

(55)

6.0 I have counted moose and caribou from airplanes in this area for the last 3 years, but this is the first time that I have asked the people how many they hunted. Do you think that hunting of moose and caribou by Cat Lake people is:

	Moose	Caribou
increasing	1	1
holding steady	2	2
decreasing	3	3
don't know	4	4

(56) (57)

6.1 Can you think of any reason for this? (Item 6.0)

Moose:_____

_____

Caribou:_____

_____

(58) (59) (60) (61)

6.2 Do you think that moose hunting by Cat Lake people:

is too high	1
should stay the same	2
could be higher	3
don't know	4

(62)

Comments:_____

_____

_____

_____

(63) (64)

6.3 Do you think that caribou hunting by Cat Lake people:

is too high	1
should stay the same	2
could be higher	3
don't know	4

(65)

Comments:_____

_____

_____

_____

(66) (67)

7.0 I understand that quite a few caribou were killed near the the community about 3 years ago (1976-77). Were you aware of this?

yes	1
no	2
don't know	3

(65)

7.1 Could you tell me how many animals were killed? (69) (70)

7.2 How many escaped? (71) (72)

7.3 How many people took part in the shooting? (73) (74)

7.4 Do you think there were too many killed?

yes	1
no	2
don't know	3

(75)

7.5 Did you take part in this?

yes	1
no	2

(76)

Deck II (1) (2)

8.0 Of all the meat that your family eats during the year, how would you rank the following in order of importance?

Moose	1	2	3	4	5	6
Caribou	1	2	3	4	5	6
Beaver	1	2	3	4	5	6
Small game	1	2	3	4	5	6
Fish	1	2	3	4	5	6
Store bought	1	2	3	4	5	6

(3) (6) (4) (7) (5) (8)

8.1 How many are in your family?

	Adults	Children
None	1	1
One	2	2
Two	3	3
Three	4	4
Four	5	5
Five	6	6
Six	7	7
Seven+	8	8

(9) (10)

8.2 People have different reasons for going hunting. Could you tell me your 2 most important reasons for hunting moose or caribou?

1. _____

_____

2. _____

_____

(11) (12)

8.3 If you had enough money to buy all your food from the store, would you still hunt moose or caribou just as much?

	Moose	Caribou
Same	1	1
Less	2	2
Don't know	3	3
N.A.	4	4

(13) (14)

9.0 Some people like to hunt moose while others prefer to hunt caribou. Which do you prefer?

Moose	1
Caribou	2

(15)

9.1 Why? (Item 9.0)

Moose: _____

_____

Caribou: _____

_____

(16) (17)

9.2 There are many different ways of hunting. Could you describe how you hunt moose? _____

_____

_____

_____

(18)

9.3 Could you describe how you hunt caribou? _____

_____

_____

_____

(19)

9.4 When you are hunting, do you try to shoot as many moose or caribou as possible?

	Moose	Caribou
yes	1	1
no	2	2
don't know	3	3
N.A.	4	4

(20) (21)

9.41 Why? _____

_____

(22)

9.5 Do you ever worry that too many animals have been killed?

	Moose	Caribou
yes	1	1
no	2	2
don't know	3	3

(23) (24)

9.6 If too many animals were killed, the numbers of moose and caribou could go down. If this ever happened, would you try to hunt less to give the animals a chance to come back?

	Moose	Caribou
yes	1	1
no	2	2
don't know	3	3

(25) (26)

Comments: (moose) _____

_____

(caribou) _____

_____

(27) (28)

9.7 What do you think are the best ways to make sure that there are always enough moose? _____

_____

_____

(29) (30)

9.8 What do you think are the best ways to make sure that there are always enough caribou? _____

_____

_____

(31) (32)

9.9 I understand that there is some fly-in moose hunting in the Band Area. Do you think this is hurting moose populations where you hunt?

yes	1
no	2
don't know	3

(33)

10.0 Age at last birthday _____

(34) (35)