

The Bush Harvest in Pinehouse, Saskatchewan, Canada

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ABSTRACT. Hunting, trapping, fishing, and gathering provide an important source of food and fuel for the Cree-speaking Métis of Pinehouse on the Churchill River in northern Saskatchewan. This paper reports the findings of a harvest survey based on one-year recall. The village's total harvest of fish, mammals, birds, berries, and fuelwood is documented by species from April 1983 through March 1984. Virtually all 145 adult male residents were interviewed. Respondents reported their harvests in units of their choice such as fish tub and truckload of fuelwood. Studies based on participant observation, monitoring programs involving short recall periods of a few days, and empirical measurement were done to determine conversion factors. These were used to translate harvesters' reporting units into numbers of animals by species (cords for fuelwood), and then to whole and edible weights. The total harvest was 84.5 tonnes of edible meat or 0.342 kg per day for each of the 676 residents. Three tonnes of berries and 682 cords of fuelwood were harvested. The village's gross income for the survey period is assessed and a dollar value assigned to the harvest. The bush harvest (income-in-kind and commodities) accounted for one-third of total village income, which contradicts the prevalent stereotype that resources from the land do not significantly contribute to the Pinehouse economy.

Key words: native harvest survey, northern Saskatchewan Métis, subsistence harvests, domestic fisheries, subarctic village economy

RÉSUMÉ. La chasse, le piégeage, la pêche et la cueillette fournissent une importante source de nourriture et de combustible pour les Métis de langue cri habitant Pinehouse sur la rivière Churchill, dans le nord de la Saskatchewan. Dans cet article, on rapporte les relevés des prises en se fondant sur le rappel d'une année. On donne par espèces le total des prises effectuées d'avril 1983 à mars 1984 pour le poisson, les mammifères, les oiseaux ainsi que les baies et le bois à brûler. Pratiquement tous les 145 résidents adultes de sexe masculin ont été interviewés. Ces répondants ont rapporté leurs prises en unités de leur choix telles que les baquets à poissons et les charges de camion pour le bois à brûler. On a effectué des études fondées sur l'observation des participants, des programmes de contrôle utilisant de courtes périodes de rappel de quelques jours, et des mesures empiriques, afin de déterminer les facteurs de conversion. On a utilisé ces derniers pour traduire les unités rapportées par les répondants en nombre d'animaux par espèces (en cordes pour le bois à brûler), puis en poids total et en poids comestible. Le total des prises était de 84,5 tonnes de chair comestible, soit 0,342 kg par jour pour chacun des 676 résidents. Trois tonnes de baies et 682 cordes de bois à brûler ont été recueillies. On évalue le revenu brut du village pour la période couvrant les relevés et on donne au total des prises une valeur exprimée en dollars. Les prises provenant de la nature (revenu non financier et denrées) comptaient pour un tiers du revenu total du village, ce qui contredit l'idée couramment admise que les ressources de la terre ne contribuent pas de façon significative à l'économie de Pinehouse.

Mots clés: relevé de prises par les autochtones, Métis du nord de la Saskatchewan, prises visant à assurer la subsistance, pêche domestique, économie de village subarctique

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INTRODUCTION

The people of Pinehouse (380 km north of Saskatoon) rely heavily on bush food from hunting, trapping, fishing, and gathering. Their unrestricted access to renewable resources altered rapidly after 1978, the year the first all-weather road linked the village to the south. The community's land base was now accessible to mining and pulp companies, tourist outfitters, outside hunters, anglers, and wild rice (*Zizania aquatica*) farmers. Village consensus about restriction of access to resources arising from the subsequent alienation of traditional Pinehouse land defined the context of this research (Tobias, 1988).

Soon after the road was completed a number of planning processes were undertaken that virtually ignored the village's dependency on bush foods and portrayed the community economy

as dependent on an over-sized transfer payment sector and under-developed wage sector. The commodity sector was cautiously acknowledged as being important while income-in-kind (food, fuel, medicine, water and construction materials from the bush) was ignored (Tobias, 1993). This stereotypical profile moved Pinehouse Council to initiate its own planning surveys. This paper presents the findings of one of those surveys; a study that measured the amount of income-in-kind harvested over the 1983-84 annual food cycle.

Community Profile

The community is located on Pinehouse Lake (55°31'N, 106°34'W) in the Churchill River system. Most scholars accept that, as a consequence of the fur trade, Cree moved west into the

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Churchill Basin in Saskatchewan at the expense of the Chipewyan (McNab, 1992). As a result of trade opportunities and epidemics, the Chipewyan, beginning in the late eighteenth century, moved south into the Pinehouse area. They dominated trade on Pinehouse Lake until the first decade of this century when, inexplicably, they were replaced by Cree speakers (Jarvenpa and Brumbach, 1985). During that first decade Cree families moved back into the area from communities such as Ile a La Crosse. A few white male immigrants intermarried with Indians and these families created a number of small settlements around Pinehouse Lake (Annie Johnston, village elder, pers. comm. 1983). After World War II a rapid gravitation into what is now Pinehouse occurred, and by 1950 the village had a church, school, and government store.

Pinehouse is in the boreal forest region where upland sites are usually covered with jack pine (*Pinus banksiana*) or aspen (*Populus* sp.) and lower areas are dominated by black spruce (*Picea mariana*) and tamarack (*Tsuga canadensis*). The village straddles the divide between the rocky shield to the north and gravelly, sandy, or silty tills to the south. Extensive areas of outcrop are interspersed with poorly-drained low areas covered with muskeg. The area is rich in the renewable resources that support hunting, trapping, gathering, and fishing. It also supports wild rice farming, a relatively new activity in the region. Many plant materials are used for food, medicinal purposes, construction materials, fuelwood, and smokewood for drying meats. Pinehouse Lake has a high biological productivity (Chen, 1973) and supports many species such as northern pike (*Esox lucius*), lake whitefish (*Coregonus clupeaformis*), walleye (*Stizostedion vitreum*), and white sucker (*Catostomus commersoni*).

The village's mixed economy is dependent on both the harvest of resources for direct consumption by villagers (i.e., income-in-kind) and cash. The surrounding crown lands sustain the long-established commercial fishing and trapping industries and the younger wild rice industry. Besides bush products (fish, fur, rice), other sources of cash are government transfer payments and remuneration for the sale of labour. There are few permanent jobs in town and most of these are in the service sector. Provincial agencies provide work for another few individuals and a few men commute to the Key Lake Uranium Mine. Fire fighting and, rarely, guiding provide seasonal employment, as do government make-work programs. Almost all wage earners harvest income-in-kind.

At the time of the harvest survey the village consisted of about 100 wood frame and log dwellings; residents also maintained over 30 permanent harvesting cabins in the bush. There is a church, co-op store, cafe-confectionery, child care centre, health clinic, fire hall, police station, school, and community centre. Most of these facilities were built since 1978 when the road was completed. In 1976 an airstrip was constructed, in 1977 the first micro-wave installation began operation, and in 1978 the advent of television occurred. Until 1984, the village was dependent on diesel fuel generators for electricity but it is now connected to the provincial power grid.

In May 1985 a census was conducted for the purpose of the study and the data were adjusted to account for all births, deaths, and migrations of the preceding 12 months. The May 1984 population consisted of 676 residents, 50% of whom were under

16 years (Fig. 1). A resident is an individual who has lived in Pinehouse for at least seven years, or who has been cohabiting and sharing children with a person of seven years tenure, or who is a child of an adult resident. With the exception of prolonged absences of three adult males, all were present during the survey period of April 1983 to March 1984. All but four residents were of partial aboriginal ancestry and, apart from a couple of Treaty families, the village residents were Métis. The first language was Cree, with virtually all residents speaking it. The 676 residents inhabited 98 dwelling units or households, with an average of 6.9 ± 3.9 SD persons per unit. A household is a collection of individuals who, when in the village, regularly sleep and eat under the same roof. Few households consisted of only single persons. The group of "non-residents," whose average residency was 2.1 years, was predominantly white and consisted of 34 adults and 11 minors.

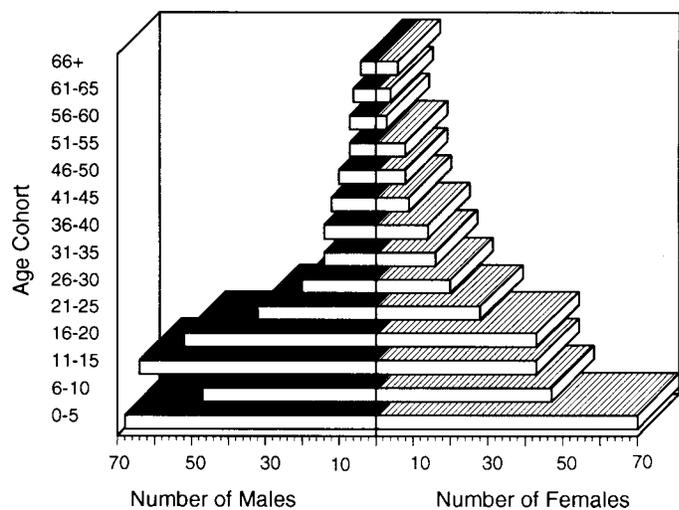


FIG. 1. Pinehouse resident population age-sex pyramid for May 1984.

The Study

In 1982 T. Tobias was invited to work with villagers in undertaking land use studies. During three years in the village, Tobias worked closely with the Harvester Advisory Committee, a group of 13 men who gave on-going advice concerning the design and administering of research instruments. A number of projects were undertaken but only the materials pertaining to the harvest survey have been released to the public domain (Northern Village of Pinehouse (NVP), 1987a, 1987b; Tobias, 1988). The main objective of any native harvest study is to establish the numbers of each species or species groups taken over a given period by a particular group of people, and to do this using harvester recall. For most species such studies are the only feasible method of enumerating harvests (Usher *et al.*, 1985). Many Alaskan and Canadian studies rely on native harvester recall and 60 were reviewed and summarized (NVP, 1987a, section 2) to help design the Pinehouse survey.

The main objective was to record the quantities of bush resources harvested by villagers over a one-year period (1983–

84). Because another objective was to determine the relative contributions of four sectors that generate a flow of wealth into the village, we translated bush resources into units of measure which could be compared with the monetized sectors. For commodities, wages, and transfer payments, statistics are routinely kept. However, research that includes locally-derived harvest estimates for a one-year period and a comparison with other sectors is quite rare. Only a handful of analyses have been done (e.g., Usher, 1971; Bodden, 1981; Dimitrov and Weinstein, 1984).

We report on the procedures used to assess dollar value to income-in-kind and to construct the comparison of income sectors. Several conversion factors needed to translate the survey data into dollars were derived from empirical measurement and participant observation. Harvest studies seldom produce conversion values and species weights specific to the locale under investigation, and there tends to be a heavy reliance on the James Bay research (JBNQ, 1982) in this regard. Apart from Ballantyne *et al.* (1976), this is the only study of its kind in the prairie provinces. Hence, the locally determined conversion values may be of use to future researchers in the region. We also address some previously untreated methodological issues, such as evaluation of fuel wood harvest.

METHODS

The harvest survey recorded the quantities of mammals, birds, fish, fuelwood, and berries harvested. To reduce response burden (Usher and Wenzel, 1987), the survey solicited data in locally meaningful reporting units or species groups when warranted. To convert such data into number of animals by species, conversion factors were derived from participant observation, field measurements, and detailed monitoring of harvesting activities. Whole (live or round) weights from the literature were adjusted where possible to reflect the documented compositions and species weights of the Pinehouse harvest and the numbers of animals by species were converted to whole weight. Next, a set of edible weight conversion factors from the literature was applied and the total edible weight was calculated. The replacement cost of this total was then calculated by applying Pinehouse Co-op Store prices of "similar" meats.

Harvest Interviews

The area covered by the interviews corresponds closely to the Saskatchewan Environment and Resource Management's (SERM) Pinehouse Fur Block N-11. However, harvests taken on lands adjacent to N-11 (e.g., fish from commercial nets) were included if they were brought back for local consumption. Harvest was defined as that portion of the kill that was retrieved. Animals procured for sale on a commodity market (e.g., fish from commercial nets) for consumption outside the community were excluded, while meat from edible trapping mammals for domestic use was included. We define target species as those that residents consider warrant regular harvesting effort or, in the case of those that are relatively uncommon, deliberate effort when encountered. The list (excluding plants) totals 53, including

33 waterfowl, 4 upland game birds, 6 fish, 4 big game mammals, 3 edible trapping mammals, and 3 small game mammals (NVP, 1987a, section 2).

The interview guide (NVP, 1987a, section 3.1.7) requested each respondent to recall in a single interview what he or she harvested over the preceding 12-month period, between 1 April 1983 and 31 March 1984, for each of 14 harvest categories. Every respondent was told what each category (e.g., waterfowl) included, and each was cautioned to report only what he or she killed. When a hunter needed to give considerable thought to a particular category, a detailed series of questions helped to construct estimates for shorter periods within the survey year. With these data in hand a calculation of the year's harvest was made, and the respondent was asked if he felt the figure was reasonable. Two categories, garden produce and construction logs, were not covered by the interview, and estimates of these were based on observations.

The Respondents

Males under 18 years were not interviewed. Although youth and children do some harvesting, the Harvester Advisory Committee believed that the great bulk of the harvest would be accounted for by full participation of all adult males. Pinehouse women do virtually no hunting or trapping and very little fishing. The basic criterion was that the person most responsible for killing and retrieving an animal report it, because that individual was most likely to recall it best. We made one exception to this. Women do virtually all the berry picking, but male household heads were asked to report the household berry harvest. For households with no adult males, the female household heads were added to the harvester interview list. The final list consisted of 145 adult male and 14 female household heads.

Of 159 eligible participants, 158 completed interviews. In addition, six of the village's 14 seventeen-year-old males, who were encountered during interview rounds, participated. Because harvesters sometimes volunteered information and names of those they had accompanied in harvesting, a portion of the domestic fish harvest and probably all of the moose harvest of the man who did not participate were recorded. Also, the man's household wood consumption and berry harvest were reported by his wife. Full census coverage was thus achieved.

Data Analysis

Local reporting units (e.g., tub of fish, waterfowl, truckload of wood, quart of berries) were converted to number of individuals per species (cords for wood and kilograms for berries). Species weight and composition data for fish and waterfowl were collected. Also, some truckloads of wood were measured and some of the berry harvest was converted to kilograms using conversion factors determined through weighing.

Respondents were free to consider their fish harvest as consisting of either all species, including cisco (*Coregonus* sp.) and burbot (*Lota lota*), which are usually discarded, or all individuals of only the four species commonly consumed. Harvesters were encouraged to report their catch in whatever

units (tubs or numbers of fish or round weight) they preferred. To convert all reports into numbers of fish by species, data on catch composition, species weights, and tub weight were obtained.

Composition for all species was recorded for a total of 214 domestic net lifts, or 20% of all lifts. All were lake lifts (210 from Pinehouse Lake) and all involved 100 yd (91.4 m) 5-inch mesh (12.7 cm stretched measure) gill nets. A total of 17 different family nets were involved, but 180 (84%) of the 214 lifts were recorded from four nets monitored every few days. Species' weights were determined using a spring balance Hanson milk scale (model #8910, maximum 45.4 kg, accuracy ± 0.2 kg), checked for accuracy every couple of weeks against commercial retail scales. Fish were weighed by species, usually 10 or more individuals at a time when weighed in a boat and 25 or more if the scale could be suspended from a railing on land. Pinehouse fishermen typically place their catches in plastic tubs and many respondents chose to report their harvest in tubs. There are two types used, both distributed by Freshwater Fish Marketing Corporation. One is an all-plastic tub (81 L) while the other is a deeper plastic tub with steel handles (64 L). Twenty-one of the weighed tubs were the all-plastic style. Forty-one full tubs were weighed, "full" having been defined by the fisherman's perception. An average fish tub contained 35 fish and weighed 47 kg. The derived values for fish species' weights, catch composition, and fish tubs were used (NVP, 1987a, section 3.1.5.1) to convert all reported fish harvests to numbers of fish by species.

The standard reporting unit for waterfowl was, simply, number. The composition of the harvest was determined by monitoring the harvest of 20 hunters over the entire 1984 open-water period. These men did not constitute a random sample, although an attempt was made to represent a wide range of ages and harvesting effort. They represented 18% of the 109 waterfowl harvesters in 1983. Each man was interviewed three times per month over a six-month period for a total of 357 waterfowl reports. The average recall interval was 10.1 days, but during the most productive period, September and October, the average interval was 5.5 days. The harvest composition for the 20 hunters was used to convert the number of waterfowl reported in the harvest interviews to number by species.

The standard reporting unit used to document fuelwood consumption was the "truck load". Almost all the wood burned in Pinehouse was trucked into town as logs. During the winter of 1983-84 five crews were responsible for fuelwood cutting and delivery to residents. Nine truckloads from three different crews were measured. For each of these the number of logs was recorded and the length and circumference of each log at mid-point measured. The typical load of uncut logs delivered in half-ton pick-up trucks was equivalent to 0.5 cords, calculated by applying a standard forestry formula (NVP, 1987a, section 3.1.5.4) to the circumference, length, and number of logs.

Although harvesters were asked to recall their berry harvests in pounds, 13 preferred other units (gallons, 9; quarts, 3; bread bags, 1). A gallon container held 2.3 kg of berries; a quart, 0.6 kg; a standard bread bag, 2.7 kg. Twenty-two percent of the harvest was converted to kilograms using these values.

Comparison of Income Sectors

To allow a comparison of sectors, income-in-kind must be given a dollar value. The replacement (substitution) costs of bush meats were determined using prices of "equivalent" food items. A one-day survey was conducted in the Pinehouse store to establish what meats would be most appropriate, from the villagers' perspective, for substitution purposes. Each household head who was shopping was asked to ignore prices and select from all available meat products those that he or she would choose to replace the moose or bear in their family's diet. The same question was asked about small game (grouse, hare, waterfowl) and trapping mammals (beaver, muskrat). Fifteen consumers, representing 15 households, participated. The store's shelf prices were applied to the 45 recorded substitution preferences, yielding replacement costs for bush meats in 1984 dollars. A replacement cost much lower than that of the only available fish product (cod-in-batter) was used for fish. Since the Pinehouse store did not stock berries, the lowest price of frozen blueberries in La Ronge, 210 km away, was used. The village's production of potatoes was valued using the store's price. The cost of white spruce (*Picea glauca*) logs used for construction was given an arbitrary value per cabin.

Income generated by bush commodities was calculated using SERM fur and fish records and those of the wild rice processing plant in La Ronge. Also included was a valuation of the handicrafts and clothing produced by one resident and sold externally. Numerous women were active in the production of crafts and clothing for local consumption but only one individual is known to have sold items to an outside market. Data concerning wage employment income were compiled through interviews and correspondence with employers. In the case of transfer payments, administering agencies supplied the necessary data. When an agency could not provide a program total, the transfer payment was calculated using eligibility criteria in conjunction with the village census. It was impossible to calculate village income from unemployment insurance benefits because disaggregated statistics were not available.

RESULTS AND DISCUSSION

Conversion Factors

The average whole weight of 2482 waterfowl, regardless of species, was 0.95 kg (Table 1). This weighted average reflected a catch composition (Table 2) that was 63% mallard (*Anas platyrhynchos*) and lesser scaup (*Aythya affinis*). The average round weight of fish kept from domestic nets was 1.39 kg (Table 3). This weighted average reflected catch composition and was equivalent to 0.88 kg edible weight, calculated by using an edible portion value of 63%. The 63% was a weighted average of the edible portion values for fish, excluding lake trout (*Salvelinus namaycush*), in Table 1.

TABLE 1. Whole and edible weight conversion factor.

Species group	Whole weight ¹ per animal (kg)	Edible ² portion (%)	Edible weight ³ per animal (kg)
Big game			
Moose	329	69	227
Black bear	136	70	95
Woodland caribou	155	61	95
White-tailed deer	75	61	46
Small game			
Snowshoe hare	1.32	64	0.84
Grouse & Ptarmigan	0.54	60	0.33
Waterfowl	0.95	70	0.67
Trapping mammals			
Lynx	7.7	50	3.9
Muskrat	0.91	70	0.64
Beaver	12.1	63	7.6
Fish			
Walleye	1.03	71	0.73
Lake whitefish	1.17	67	0.78
Northern pike	2.59	60	1.55
White sucker	1.47	59	0.87
Lake trout	2.99	57	1.71

¹ Details of how the whole weight numbers were derived:

Moose: Calculated using known age/sex determinations of 82 Pinehouse kills (12 calves, 7 yearlings, 30 bulls, 33 cows) and JBNQ (1982) component whole weights (calves 147 kg, yearlings 272 kg, bulls 400 kg, cows 344 kg). The Saskatchewan subspecies (*Alces alces andersoni*) is larger than the Quebec subspecies (*A. a. americana*) (Banfield, 1974). Substituting component whole weights from Banfield for bull (452 kg) and cow (348 kg) yields average whole weight per animal of 351 kg. Substituting component whole weights provided by Saskatchewan Wildlife Branch (SWB) for bull (476 kg) and cow (357 kg) yields average whole weight of 363 kg. The most conservative of the three whole weights, based on Quebec component weights, was used.

Black bear: The average whole weight provided by JBNQ (1982) (no component weights provided) is used. Age/sex determinations of 87 Pinehouse kills (2 cubs, 6 yearlings, 24 sows, 55 boars) indicates that 91% of the harvest was adult animals. Using the two component weights (sow 136 kg, boar 169 kg) in Banfield (1974), 91% of all bears (the adults) harvested had an average whole weight of 158 kg, making the 136 kg figure conservative.

Harvest

The 1983–84 harvest of animals (Table 4) was 84.5 tonnes edible weight (Table 5), which represented a daily production of 0.342 kg per capita for all residents or an annual production of 125 kg per resident. This was larger than the Canadian 1981 average per capita consumption of meat and fish of 117 kg (Statistics Canada, 1982). Fish, moose (*Alces alces*), black bear (*Ursus americanus*), snowshoe hare (*Lepus americanus*), and waterfowl made up 93% of the total. Fish comprised 55% of the Pinehouse harvest (Table 5), compared to 45% for four other Churchill River Basin villages in Saskatchewan (Ballantyne *et al.*, 1976). Big game was second in importance. Fish and big game combined made up 78% of all edible meats harvested in Pinehouse and 82% of all meats in the other four villages. Edible trapping mammals made up 5% of the Pinehouse harvest and small game 17%, compared to 13% trapping mammals and 5%

Woodland caribou: Calculated using JBNQ (1982) component whole weights for cow (132 kg) and bull (179 kg) and assuming a harvest composition of 50% bulls, 50% cows.

White-tailed deer: Age/sex determinations known for only 17 Pinehouse kills (10 does, 7 bucks). Calculated using Banfield's (1974) component weights for doe (59 kg) and buck (91 kg) and assuming a harvest composition of 50% bucks, 50% does.

Snowshoe hare, Lynx, Muskrat: Provided by JBNQ (1982).

Grouse & Ptarmigan: Calculated using species' whole weights provided by SERM, Wildlife Branch (sharp-tailed grouse, 0.9 kg; ruffed grouse, 0.7 kg; spruce grouse and ptarmigan, 0.5 kg) and assuming that the long-term Pinehouse harvest is 10% ptarmigan, 30% ruffed grouse, 60% spruce grouse.

Waterfowl: Calculated using the composition of the Pinehouse waterfowl harvest (Table 2) and species whole weights for ducks, geese, swans (Bellrose, 1976). Species whole weights determined by taking the mean of the average adult male weights and average immature female weights to account for the fact that over a period of years the fall populations are equally comprised of immature and adult birds (Bellrose, 1976). SWB provided whole weight used for coot (0.5 kg) and JBNQ (1982) value for loons (1.8 kg) was used. In the absence of any data on grebes, it was assumed that red-necked grebes weigh 0.9 kg and the smaller grebes 0.5 kg.

Beaver: Corrected JBNQ (1982) whole weight value of 12.1 kg (26.7 lb).

Fish: Derived from weighing of fish (131 walleye, 1094 whitefish, 154 pike, 442 suckers) taken from 5 inch (12.7 cm) mesh domestic gill nets in Pinehouse Lake. The edible weight of the average fish of these four species, weighted to reflect domestic catch composition, is 63% of round weight.

Lake trout: In 1983–84 three men reported harvesting 37 trout totaling 111 kg from domestic nets. There are no trout in Pinehouse Lake and these fish probably came from Gordon Lake, 30 km north of Pinehouse.

² Edible portions: From JBNQ (1982) except for white-tailed deer which does not occur in northern Quebec. This value is the lesser of those provided by the James Bay study for ungulates.

³ Raw, uncooked weight.

TABLE 2. Catch composition (%) of the 2482 waterfowl harvested by 20 hunters in 1984.

Mallard	35.8	Red-necked grebe	1.2
Unidentified scaup ¹	26.8	Northern shoveler	0.8
American coot	6.2	Unidentified grebe	0.5
Unidentified teal	4.7	Bufflehead	0.4
Unidentified scoter	4.0	Common loon	0.3
American wigeon	2.3	Ring-necked duck	0.2
Northern pintail	2.2	Unidentified merganser	0.2
Common goldeneye	2.2	White-winged scoter	0.2
Green-winged teal	2.0	Black scoter	0.1
Blue-winged teal	1.8	Tundra swan	0.1
Canvasback	1.8	Canada goose	0.1
Red-breasted merganser	1.7	Snow goose	0.1
Surf scoter	1.7		
Common merganser	1.4	Unidentified waterfowl	1.2

¹ Almost all lesser scaup *Aythya affinis*.

TABLE 3. Catch composition based on 214 domestic¹ net lifts and the average whole weight by species based on a sample of 2108 fish².

Species	Av. No. per net lift ± SD	% of all individuals	Av. Wt. of individual fish (kg)	No. of fish weighed
Target Species				
Lake whitefish	16.9 ± 12.1	37.9	1.17	1094
Suckers	13.6 ± 18.3 [†]	30.5	1.47	442
Walleye	3.1 ± 3.4 [†]	7.0	1.03	131
Northern pike	3.1 ± 2.9	7.0	2.59	174
Target species (4)	36.7 ± 28.4	82.4	1.39	1841
Non-Target Species				
Cisco	6.6 ± 7.6 [†]	14.8	0.79	220
Burbot	1.3 ± 1.7 [†]	2.9	1.84	47
All species (6)	44.6 ± 30.6	100.1	1.32	2108

¹ Domestic and food fisheries are synonymous. Nets are set to obtain fish for local consumption only.

² Fish and net lifts from Pinehouse Lake April 1983 – March 1985. The estimated number of fish retrieved for use from domestic nets in 1983–84 is 39 817 (Table 4). The 2108 weighed (1983–85) fish, as a proportion of the harvest (1983–84), is 5%. Dividing the harvest of 39 817 by the average number of fish (target species only) per net lift, approximately 1085 net lifts were made.

[†] Large SD results from a multi-modal distribution.

TABLE 4: Target species and harvest numbers for Pinehouse, April 1983–March 1984.

Species (Common name)	(Scientific name)	Number of individuals harvested	Species (Common name)	(Scientific name)	Number of individuals harvested
Fish			Waterfowl (continued)		
Lake whitefish	<i>Coregonus clupeaformis</i>	27 270	Snow goose	<i>Anser caerulescens</i>	3
White sucker	<i>Catostomus commersoni</i>	17 076	Black scoter	<i>Melanitta nigra</i>	3
Northern pike	<i>Esox lucius</i>	4 604	Sandhill crane	<i>Grus canadensis</i>	(2) ⁵
Walleye	<i>Stizostedion vitreum</i>	3 379	Herring gull ⁶	<i>Larus argentatus</i>	(2) ⁵
Lake trout	<i>Salvelinus namaycush</i>	246	Brant	<i>Branta bernicla</i>	(1) ⁵
Longnose sucker	<i>Catostomus catostomus</i>	9 ¹	Pied-billed grebe ⁷	<i>Podilymbus podiceps</i>	0
Total (Fish)		52 584 ²	Greater white-fronted goose ⁷	<i>Anser albifrons</i>	0
Birds			American black duck ⁷	<i>Anas rubripes</i>	0
Grouse & Ptarmigan ³			Ruddy duck ⁷	<i>Oxyura jamaicensis</i>	0
Ruffed & Spruce grouse	<i>Bonasa umbellus</i> & <i>Dendragapus canadensis</i>	3 229	Wood duck ⁷	<i>Aix sponsa</i>	0
Willow ptarmigan	<i>Lagopus lagopus</i>	75	Unidentified waterfowl		102
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	1	Total (Waterfowl)		8 232
Total (Grouse & Ptarmigan)		3 305	Mammals		
Waterfowl			Big game		
Mallard	<i>Anas platyrhynchos</i>	2 949	Black bear	<i>Ursus americanus</i>	72
Greater and Lesser scaup ⁴	<i>Aythya marila</i> & <i>Aythya affinis</i>	2 202	Moose	<i>Alces alces</i>	52
American coot	<i>Fulica americana</i>	510	White-tailed deer	<i>Odocoileus virginianus</i>	10
Unidentified teal	<i>Anas spp.</i>	391	Woodland caribou	<i>Rangifer caribou</i>	4
Unidentified scoter	<i>Melanitta spp.</i>	332	Small game		
American wigeon	<i>Anas americana</i>	193	Snowshoe hare	<i>Lepus americanus</i>	9 310
Northern pintail	<i>Anas acuta</i>	183	Goundhog ⁸	<i>Marmota monax</i>	2
Common goldeneye	<i>Bucephala clangula</i>	179	American porcupine ⁸	<i>Erithizon dorsatum</i>	1
Green-winged teal	<i>Anas crecca</i>	165	Trapping mammals		
Blue-winged teal	<i>Anas discors</i>	148	Muskrat	<i>Ondatra zibethicus</i>	2 813
Canvasback	<i>Aythya valisineria</i>	146	Beaver	<i>Castor canadensis</i>	296
Surf scoter	<i>Melanitta perspicillata</i>	142	Lynx	<i>Lynx lynx</i>	31
Red-breasted merganser	<i>Mergus serrator</i>	139	Other		
Common merganser	<i>Mergus merganser</i>	119	Fuelwood (cords) ⁹		
Red-necked grebe	<i>Podiceps grisegena</i>	103	Jack pine	<i>Pinus banksiana</i>	682.5
Northern shoveler	<i>Anas clypeata</i>	63	Construction logs ¹⁰		
Horned and/or eared grebe	<i>Podiceps spp.</i>	39	White spruce	<i>Picea glauca</i>	420
Bufflehead	<i>Bucephala albeola</i>	36	Potatoes (kg) ¹¹	<i>Solanum tuberosum</i>	3039
Common loon	<i>Gavia immer</i>	23	Berries (kg)		
Unidentified merganser	<i>Mergus spp.</i>	16	Blueberries	<i>Vaccinium spp.</i>	982
Ring-necked duck	<i>Aythya collaris</i>	13	Cranberries	<i>Vaccinium oxycoccos</i>	611
White-winged scoter	<i>Melanitta fusca</i>	13	Raspberries	<i>Rubus spp.</i>	185
Tundra swan	<i>Cygnus columbianus</i>	10	Undetermined		1 256
Canada goose	<i>Branta canadensis</i>	10	Total berries		3 034

¹ Virtually all sucker harvested are white sucker. Of the 442 sucker weighed (Table 3), nine (2%) were longnose sucker. This suggests that perhaps 340 of the fish shown as white sucker were longnose sucker.

² Fish retrieved for use from domestic nets total 39 817 and fish from commercial nets (but consumed locally) total 12 767 (209 lake trout, 8973 whitefish, 1225 pike, 2360 sucker). These numbers were calculated by applying conversion formulae (NVP, 1987a, sections 3.1.5.1 and 3.1.5.2) to survey data. Virtually all domestic nets were set in Pinehouse Lake. During 1983-84 Pinehouse commercial fishers set nets in the

following lakes: Airriess, Bar, Besnard, Costigan, Cotter, George, Gordon, Hardy, Jean, Kirkpatrick, McKillop, Miners, Pinehouse, Russell, Sandfly, Sandy, Yost.

- ³ Harvesters were not asked to report by species. Sixteen respondents volunteered that they had harvested a total of 75 ptarmigan (which indicates the relatively low numbers of this species in the Pinehouse area in 1983-84). One man mentioned the sharp-tailed grouse he had retrieved. The numbers for these two species are minimums. The number of ruffed and spruce grouse is probably overstated, since it likely includes small quantities of the other two species.
- ⁴ Virtually all lesser scaup. One greater scaup was identified by T. Tobias in a harvester's 1982 catch.
- ⁵ The composition of the 1983 harvest was calculated using 1984 composition data (Table 2). No individuals of these three species were reported in the 1984 data and therefore the five birds involved do not appear in the total for waterfowl harvested in 1983.
- ⁶ Only immature birds (having dark plumage) are eaten on rare occasions.
- ⁷ Individuals of these species were brought by hunters to the researcher to be identified. These species are rare in the Pinehouse area and none were harvested during the 1983 season.
- ⁸ No data solicited on these two species since they are uncommon in the study area and rarely harvested. Two respondents volunteered having killed and eaten these three animals.
- ⁹ The households that use only wood for heating averaged 9.5 cords, and those that burned a mix of wood and fuel oil averaged 5.7 cords.
- ¹⁰ No data solicited on construction materials. In 1983-84, three bush cabins and three log houses were built in Pinehouse. We assumed that 70 logs are used for a cabin.
- ¹¹ The interview guide did not solicit garden produce data. Field notes show that in 1983 residents had four gardens. The two smallest produced an average of 760 kg of potatoes. We assumed this average for each of the four gardens.

small game in the four-village study. The results of the two studies are not directly comparable because Ballantyne *et al.* (1976) interviewed 30 harvesters over one 16-week period (February to April), collecting data for only a portion of the annual food cycle. Despite methodological differences, both studies suggest that domestic fishing and big game hunting are the crucial income-in-kind producers in Churchill River Basin villages.

An average of 69 kg of fish (edible weight) was available to every Pinehouse resident, which is 10 times what the average Canadian consumes in a year (Berkes, 1990). This is higher than the 25% of harvested meats in the James Bay Cree communities (Berkes, 1990), and also exceeds the average of 42 kg of fish per person per year in 93 Canadian villages (Berkes, 1990). For another 93 villages in Alaska, 116 kg of fish was available per capita (Wolfe and Walker, 1987). The Alaskan coast may be more biologically productive than interior Canadian waters (Berkes, 1990). Pinehouse Lake, the source of virtually the entire domestic harvest, has a very high biological productivity (Chen, 1973) which may help explain why the Pinehouse harvest is high relative to the Canadian average.

There is considerable overlap between the domestic and commercial fisheries, with 24% of the locally-used harvest coming from commercial nets (Table 5), the great majority of which were set in Pinehouse Lake. Based on SERM records, it is calculated that as many as 647 572 whitefish, suckers, walleye and pike were caught in commercial nets on Pinehouse Lake in 1983-84 (Table 6, footnote 1). Of this total, 87% may have been discarded, 11% sold, and 2% consumed by residents. The startling amount of discarded fish is largely a result of market conditions; there being no market for suckers and a very low price for whitefish. Very small proportions of the total were used for trapping bait and pet food. (Five households' nets were closely monitored for a one-year period and of all whitefish, suckers, walleye and pike caught, 0.4% were used for bait and 0.4% for dog food.)

The harvest totals are minimal and this is demonstrated by

TABLE 5. One-year (April 1983 to March 1984) harvest of bush resources for local consumption by Pinehouse residents.

Harvest category	Total number harvested	Equivalent edible kg ¹	% of total edible meat
Fish	52 584	46 108	54.6
Moose	52	11 817	14.0
Snowshoe hare	9 310	8 024	9.5
Black bear	72	6 858	8.1
Waterfowl	8 232	5 601	6.6
Beaver	296	2 256	2.7
Muskrat	2 813	1 786	2.1
Grouse & Ptarmigan	3 305	1 049	1.2
White-tailed deer	10	458	0.5
Woodland caribou	4	379	0.5
Lynx	31	119	0.1
Total meats:		84 455	
Berries		3 033	
Potatoes		3 039	
Fuelwood (cords) ²	682.5		
Construction logs	420		

¹ Raw, uncooked weight.

² Does not include wood burned at bush cabins or camps.

considering omissions in data for the five major meat categories (Table 6). Fish are probably underestimated by at least 100 000 individuals, hare by 1000 animals, waterfowl by 500, moose by 5, and bear by 5 animals. Consumption of fuelwood is probably under-reported by at least 80 cords, and the berry harvest, by 450 kg. These numbers mean that the real 1983-84 berry and fuelwood harvests were likely 15% and 13% higher than shown in Table 4 and the harvest of meats was 107% higher, which translates into a daily per capita availability of meats of 0.71 kg.

Data Reliability

The Harvester Advisory Committee carefully reviewed the interview data on a harvester by harvester basis and identified

items that warranted clarification and follow-up, a process similar to that used in the James Bay research (JBNQ, 1982). The long-term availability of Committee members to the researcher means that, relative to other studies, the Pinehouse internal data verification was thorough (H. Feit, James Bay and Northern Quebec Native Harvesting Research Committee, pers. comm. 1985). The procedure resulted in net reductions of 7502 fewer fish, 1040 fewer small game and fur-bearers, and one additional big game mammal. The reductions are large and are probably explained by the fact that the primary concern was to have any refinement of data err on the side of caution. Over 75% of follow-up inquiries pertained to possible cases of double-counting (e.g., when trapping partners who fished a net together both reported sizable harvests) and overestimation. In addition, when clarification was not obtained, the report of the respondent in question was assigned a zero value. Only a handful of respondents accounted for virtually all the adjustment downwards of data. It is expected that, out of 165 respondents, there will be a few

TABLE 6. Probable omissions in harvest survey data.

Category	Number Omitted	Reason for Omission
Fish	100 000	commercial net discards ¹
	1 000	angling ²
	445	unconverted reporting unit ³
	350	male non-participant ⁴
	?	consumption at fish camps ⁵
Snowshoe hare	500	minors not interviewed ⁶
	250	male non-participant ⁴
	250	woman not interviewed ⁷
Waterfowl	200	minors not interviewed ⁶
	200	male non-participant ⁴
	100	item non-response ⁸
Moose	4	consumption at fish camps ⁹
	1	item non-response ¹⁰
Black bear	3	male non-participant ⁴
	2	consumption at fish camps ⁹
Berries (kg)	450	consumption while picking ¹¹
	?	item non-response ¹²
Fuelwood (cords)	65	wood burned at cabins ¹³
	15	wood burned at camps ¹³

¹ Participants were not asked about this. The 100 000 is a very conservative estimate. SERM Fisheries branch records show that Pinehouse commercial fishers landed 210 000 kg of walleye, pike and whitefish during 1983–84, 86 500 kg (41%) of which came from Pinehouse Lake. It is calculated that 55 079 walleye, 14 958 pike and 3364 whitefish from Pinehouse Lake were sold to licensed buyers in 1983–84 (A. Murray, SERM, pers. comm. 1993). Because walleye from Pinehouse was the most profitable species — \$3.17 per kg for a medium walleye compared to \$0.68–\$0.99 for pike, \$0.35 for whitefish and \$0.00 for suckers—virtually all caught were sold while other fish were often discarded. Assuming that all walleye were indeed sold and the composition of the commercial harvest was the same as the domestic harvest (Table 3), then the following 647 572 fish were retrieved from commercial nets in Pinehouse Lake: 297 427 whitefish, 239 987 suckers, 55 079 walleye, 55 079 pike. Subtracting the numbers sold as well as those eaten locally (Table 4, footnote 2), the following numbers were retrieved from commercial nets and discarded: 285 090 whitefish, 237 627 suckers, 38 896 pike. Thus, 561 613 fish, excluding cisco and burbot, may have been discarded from commercial nets set in Pinehouse Lake in 1983–84. This is probably a high estimate because the calculation assumes the compositions of the commercial and domestic harvests were the same, which is unlikely since commercial fishers deliberately set to catch walleye and domestic fishers set for whitefish.

² Though not asked about this, six men volunteered reports totaling 271 walleye and pike, excluding discards. Assumes this average of 45 fish per man and that 15% (22) of the 145 adult male participants angled. Adolescents were not interviewed.

³ Three participants reported a total of 998 kg of “pan-ready” fish. This was tabulated as 998 kg round weight, which omitted the equivalent of 445 fish.

⁴ From SERM fur statistics, the non-participant was the most productive of all Pinehouse trappers.

⁵ Participants were not asked about this. Many whitefish and pike are consumed at commercial fish camps, each worker usually eating two meals of fish per day.

⁶ During three winter months the researcher witnessed a trio of brothers harvest over 90 hare. There were 77 males between 10 and 16 years and each needed to snare 6.5 hare to obtain the estimated 500. Each needed to kill 2.6 waterfowl to obtain the estimated 200.

⁷ An older woman who trapped extensively and was belatedly reported to have killed large numbers of grouse and hare.

⁸ Two participants, both known to have regularly hunted waterfowl, reported none killed. The 109 successful waterfowl hunters averaged 75 birds per man, making it likely that an assumed average of 50 birds is conservative.

⁹ Four participants harvested totals of six moose and three bear while staying at remote fish camps. These animals were omitted because no meat was brought back to the village and it was not determined how much was consumed by Pinehouse residents at the camps.

¹⁰ One of the village’s most experienced hunters reported no moose. A reliable source subsequently reported that he had been with the hunter during the survey period, when the hunter had killed a moose. The animal was omitted because the hunter was not contacted for confirmation.

¹¹ Participants were not asked about this. During berry seasons virtually everybody consumes some while walking about the village or in the bush. Also, the portion of the harvest consumed during berry-picking was not recorded. There were 500 residents over 7 years old and each needed to eat 0.9 kg *in situ* to obtain the estimated 450 kg.

¹² Numerous participants make disparaging remarks to the effect that berry-picking is the work of women. This attitude almost certainly resulted in under-reporting in some cases.

¹³ Participants were not asked about this. Residents used 27 bush cabins and from November to February these were occupied for an aggregate total of 150 weeks. Assuming a wood consumption rate of .25 cord per cabin per week, 38 cords were burned during winter months. Assuming a consumption rate of 1.0 cord per cabin from March to October, another 27 cords were used. Also, 59 bush camps (tent sites) were each occupied at least one week and many of them were used over many weeks, especially for commercial fishing. Assuming a rate of .25 cord per camp, 15 cords were burned.

individuals who make unreliable reports due to recall failure or strategic response bias.

Verifications of all big game kills made between April 1984 and March 1985 were sought by getting two independent testimonies concerning each kill. The researcher approached the reputed harvester as well as any other person who participated in the hunt, helped to butcher or retrieve meat, or received meat. Of the 82 big game mammals killed in that 12 month period, 66 (81%) were verified in this manner. The researcher was unsuccessful in consulting a second source for the other 16 animals and in no instance was any reported kill contradicted by information collected. Though this verification procedure does not pertain to the 1983–84 survey data, it suggests that strategic response bias was not a factor.

Of the 214 domestic net lifts from which harvest composition (Table 3) was derived, 65 lifts (30%) were observed by the researcher. These involved 15 different nets (average 4.3 lifts; range 1 to 14). Table 7 compares the species frequencies for observed lifts with those based solely on harvester recall. The similarity between the two sets of composition data indicates good reliability of reported data and suggests that strategic bias was minimal. Since the usual recall interval for the 149 reported lifts was only a few days, the data indicate virtually nothing about recall failure. They do, however, suggest that fishermen under-reported during the 1983–84 survey. The average number of fish for the observed lifts was four higher than for the reported lifts (Table 7). This is consistent with other findings based on direct observation; that one-year recall surveys underestimate the real harvest of fish (Berkes, 1976, 1981).

The fish harvest was an order of magnitude larger than the SERM's 1983–84 estimate for Pinehouse Lake. Subsequent research, involving some Pinehouse fishermen, concluded that people of aboriginal ancestry in Saskatchewan typically have domestic fish harvests an order of magnitude larger than government estimates (Murray and Clouthier, 1986).

TABLE 7. Catch composition (% of individuals by species per lift) of domestic net lifts observed by researcher versus those reported by harvesters.

Species	Direct Observation (65 lifts)	Harvester Recall (149 lifts)	Combined (214 lifts)
Lake whitefish	41.5	36.1	37.9
Sucker	25.7	32.8	30.5
Walleye	6.6	7.2	7.0
Northern pike	7.0	7.0	7.0
Cisco	15.8	14.3	14.8
Burbot	3.4	2.6	2.9
Total number of fish	3 081	6 456	9 537
Average number of fish per lift	47.4	43.3	44.6

Participation in Harvesting Activities

The data reflect participation by males. Women's contribution to the procurement of meats is very small since they rarely kill

target species. The crucial contribution of women to such indispensable daily tasks as the butchering and preparation of meats, child care, and cooking remains invisible.

One hundred thirty-seven males (91% of potential hunters) obtained meat while 14 harvested no animals. The dominant activity was domestic fishing, with 80% of the potential fishers participating (Table 8). This 80% represented 85% of all village households having at least one adult male (Table 9). Over 40% of potential harvesters (54% of households) fished commercially and took fish home. Some of these also fished a domestic net. Small game hunting was the most widespread activity after fishing. At least 70% of males killed snowshoe hare, grouse and ptarmigan, and waterfowl. During the survey year 22% of potential hunters procured only small game, 20% obtained both fish and small game, and 20% killed fish, small game, edible trapping mammals, and big game. Another 12% harvested fish, small game, and edible trapping mammals while 12% killed fish, small game, and big game.

TABLE 8. Profile of successful hunters' participation.

Harvest category	Number of successful hunters	Successful hunters as % of adult males ¹	Average catch (# of animals) per successful hunter ± SD	Total number harvested
Fish (domestic) ²	121 ³	80	329.0 ± — ⁴	39 817
Fish (commercial) ⁵	62	41	206.0 ± 278 †	12 767
Waterfowl	109	72	75.5 ± 89.3 [†]	8 232
Grouse & Ptarmigan	108	72	30.6 ± 49 [†]	3 305
Snowshoe hare	111	74	83.9 ± 199 [†]	9 310
Lynx	10	7	3.1 ± 1.45	31
Beaver	45	30	6.6 ± 5.32	296
Muskrat	40	27	70.3 ± 78.3 [†]	2 813
Moose	26	17	2.0 ± 1.2	52
Woodland caribou	2	1	2.0 ± 1.41	4
White-tailed deer	9	6	1.1 ± 0.33	10
Black bear	40	27	1.8 ± 1.14	72

¹ Villager's adult males (potential hunters) here includes 151 men, 145 of whom were 18 or older as well as six of the village's fourteen 17-year-old males.

² Fish taken from domestic (family nets).

³ Includes 48 men who fished their own (or borrowed) domestic nets and 73 men who were helpers. Helpers traditionally take a few fish back to their own households each time a net is checked.

⁴ Not calculated because the 39 817 fish were recorded by only 48 of the 121 fishers. To avoid double-counting, net owners were asked to record all fish taken from their nets and helpers were asked not to report fish from others' nets.

⁵ Fish taken from commercial nets but used for local consumption.

† Large SD results from multi-modal distribution.

The interview guide obtained harvest output (not effort) and thus the numbers reflect only successful harvesting effort, thereby understating true participation as defined by pursuit regardless of success. This is especially the case for species like lynx (*Lynx lynx*) that have less predictable return per unit effort than small game or fish. Data for fish, small game, and muskrat (*Ondatra zibethicus*) probably reflect true participation since any hunter who attempted to obtain animals very likely succeeded. Data for

TABLE 9. Profile of household participation.

Harvest category	Number of successful households	Successful households as % of households ¹	Average # of animals per successful household ± SD	Total number harvested
Fish (domestic) ²	70	85	569 ± — ³	39 817
Fish (commercial) ⁴	44	54	290 ± 338 †	12 767
Waterfowl	67	82	123 ± 120	8 232
Grouse & Ptarmigan	65	79	50.9 ± 78.4 [†]	3 305
Snowshoe hare	61	74	153 ± 298 [†]	9 310
Lynx	7	9	4.43 ± 2.37	31
Beaver	33	40	8.97 ± 8.95	296
Muskrat	27	33	104 ± 149 [†]	2 813
Moose	23	28	2.26 ± 1.21	52
Woodland caribou	2	2	2.00 ± 1.41	4
White-tailed deer	8	10	1.25 ± 0.71	10
Black bear	33	40	2.18 ± 1.40	72

¹ There were 98 occupied dwelling units or households in the village in 1983-84 and 82 of these had potential hunters. This column shows successful households as a proportion of these 82 households.

² Fish taken from domestic (family) nets.

³ See Table 8, footnote 4.

⁴ Fish taken from commercial nets but used for local consumption.

† Large SD results from multi-modal distribution.

lynx and big game, excluding deer (*Odocoileus virginianus*) and caribou (*Rangifer caribou*), probably understate true participation. These two ungulates are usually not stalked, but killed on chance encounters.

Numerous studies (e.g., Finley and Miller, 1980; Behnke, 1982) document instances where a few households harvest disproportionately large amounts of meat. This is evident in Pinehouse and explains the large standard deviations in Tables 8 and 9. Two men each killed 7% of the bear harvest, and one hunter got 10% of all moose, while only one hunter killed more than a single deer, reflecting the fact that deer are seldom the object of deliberate hunting effort (Table 10). The 13 men who each retrieved over 200 waterfowl killed 43% of the harvest, with the most successful hunter getting 7%. The eight hunters who each killed over 100 birds accounted for 42% of all grouse and ptarmigan, with one man getting 8%. The most dramatic example of harvest specialization pertains to snowshoe hare. Just over 70% of all animals were snared by the 16 men who each killed at least 100. One man accounted for 17% of the total, his 1620 animals being more than double the next highest report. The monopolization of hunting success by a handful of harvesters also occurs with fishing. The 12 men who each made over 30 net-lifts accounted for 59% of the domestic harvest, with the most active fisher taking 8%. In one Ojibwa community in Ontario, 12 men accounted for almost half the village's domestic fish harvest (Hopper and Power, 1991). In that community much of the harvest of those top fishers was distributed to kin and people unable to fish, a distribution apparently characteristic of native domestic fisheries. One of the few studies to actually measure the flow of bush food gifts found that it serves to level the economic differences and imbalances among households. Kinship tends to guide the flow of food which is predominantly from younger to older households; to households with fewer potential earners

TABLE 10. Amount of small game, big game, and fish harvested, by production cohort.

Small Game cohort	Number of waterfowl harvesters	Total waterfowl harvested	Number of hare harvesters	Total hare harvested	Number of grouse ¹ harvesters	Total grouse harvested
1 – 99	80	2 797	95	2 776	100	1 923
100 – 199	16	1 881	7	875	5	596
200 – 299	9	1 939	1	250	3	786
300 – 399	3	1 040	1	345	0	0
400 – 499	0	0	3	1 290	0	0
500 – 599	1	575	0	0	0	0
700 – 799	0	0	3	2 154	0	0
1600–1699	0	0	1 ²	1 620	0	0
Total:	109	8 232	111	9 310	108	3 305

Big Game ³ cohort	Number of moose harvesters	Total moose harvested	Number of deer harvesters	Total deer harvested	Number of bear harvesters	Total bear harvested
1	13	13	8	8	23	23
2	4	8	1	2	7	14
3	6	18	0	0	7	21
4	2	8	0	0	1	4
5	1	5	0	0	2	10
Total:	26	52	9	10	40	72

Fish cohort fishers	Number of domestic lifts ⁴	Total net fishers	Number of commercial fishers	Total tubs ⁵
1 – 10	17	94	53	181
11 – 20	13	208	6	84
21 – 30	6	141	2	48
31 – 40	3	102	0	0
41 – 50	3	130	1	50
51 – 60	1	57	0	0
61 – 70	3	195	0	0
71 – 80	1	74	0	0
81 – 90	1	84	0	0
Total:	48	1085	62	363

¹ Ptarmigan are included here as grouse.

² This man, dubbed "Rabbit Man" by some villagers, snared full-time during some months, when he maintained a minimum of 300 snares. His most productive week during the survey period yielded 117 animals; his least productive, 70.

³ This category also includes caribou. Four were harvested, with one man getting one animal and another man getting three.

⁴ Each time a fisher lifts his net from the water to retrieve fish is a net lift. The average number of whitefish, suckers, walleye and pike per net lift was 36.7 (Table 3).

⁵ The average tub contained 35.1 whitefish, suckers, trout and pike. These fish were harvested from commercial nets but used locally.

either because they have only one adult or because members are old (Ballantyne *et al.*, 1976).

The flow of food gifts among Pinehouse households was not documented but its importance can be inferred from Table 11. Of nine households that produced no bush meats, six male household heads held full-time, year-round jobs and two were active harvesters, according to the Harvester Advisory Committee, who chose to report nothing during their interviews. Of all households having at least one potential hunter, 43% (37% of residents) produced less than 49 kg per capita, in contrast to the

40% of households (45% of residents) that harvested more than 117 kg per capita, which is the 1981 Canadian average consumption of meat, fish and poultry. The 13 households that harvested more than 300 kg per capita had a total of 21 adult male harvesters who accounted for 43% of the entire harvest of bush meats.

Large quantities of meats were regularly given by highly productive households to less productive ones, often blood relatives. The distribution of the harvest points to a limitation in this study's definition of household: the dwelling unit does not functionally define the basic kinship unit of production, exchange and consumption. This limitation may be especially pertinent to the Pinehouse case because of the severe housing shortage during the early 1980s.

Participation by age cohort is summarized in Table 12. The 73 hunters 20 to 39 years of age harvested an average of just under a half tonne of edible meat, while the 40 hunters over 40 years of age procured well over one tonne each. This drastic difference is probably primarily due to access to harvesting equipment. A gear survey indicated that a much higher percentage of those over 40 years own a full complement of harvesting gear.

TABLE 11. 1983–84 per capita production of bush meats in households having potential hunters.

Kg per capita	Number of households	% of households ¹	Number of individuals in households	% of population ²
0	9	11.0	49	8.1
1 – 49	26	31.7	175	28.9
50 – 99	13	15.9	94	15.5
100 – 149	9	11.0	90	14.8
150 – 199	4	4.9	36	5.9
200 – 249	5	6.1	69	11.4
250 – 299	3	3.7	25	4.1
300 – 349	2	2.4	9	1.5
350 – 399	5	6.1	32	5.3
400 – 449	0	0.0	0	0.0
450 – 499	1	1.2	4	0.7
500 – 550	2	2.4	10	1.7
750 – 799	1	1.2	3	0.5
>1000	2	2.4	10	1.7
Total:	82	100.0	606	100.1

¹ There were 98 occupied dwelling units or households in the village and 82 of these had potential hunters (one or more adult males). This column shows number of households as a proportion of these 82. Of the 16 households that had no potential hunters, nine were headed by single mothers, five by widows, one by a widower, one by the Oblate priest. The 16 households had 70 members or 10% of the resident population.

² Expressed as a proportion of 606 which is the total resident population less the 10% residing in households with no potential hunters.

Although the higher average harvest for older men is real, there is almost certainly a distortion that is accounted for in the survey design. To minimize double counting, only those men who personally assumed responsibility for the care and use of the net they fished were asked to report harvests. They were asked to report all fish harvested, including those that their helpers customarily took back to their households, and thereby the production of the 57 helpers was recorded as production of the

net owners. The men who owned domestic nets were considerably older than the helpers. A village-wide harvesting gear survey determined that 38 residents owned at least one net. The average age of these 38 men was 43.5 years (SD ± 13.6) while the average age of the 57 helpers was 28.3 years (SD ± 11.6). This means that the degree of participation of the 40–49 cohort, relative to the 20–29 and 30–39 cohorts, is over-stated.

The quantity of fish involved was estimated as follows: domestic nets yielded 39 817 fish (Table 4) and the average number of fish per lift was 36.7 (Table 3). Thus fishers made 1085 net lifts. Assuming that helpers took five fish per lift for themselves, then roughly 18% (5425) of the harvest was distributed to different households by the younger helpers. The average edible weight per domestically harvested fish was 0.88 kg. Thus, approximately 4750 edible kg reported by 40–49 year olds (18% of the cohort total) was likely taken home by men between 20 to 40 years of age. Men under 40 years caught 40% (42% if domestic fish are excluded) of the total (Table 12). Adjusting cohort totals to account for the above 4750 kg, harvesters under 40 accounted for 46% of the harvest.

TABLE 12. Profile of participation of successful hunters by age cohort.

Age cohort ¹	Successful hunters	Successful hunters as % of cohort	Average catch (kg) ² per successful hunter ± SD	Total amount (kg) harvested	% of total harvest
17 – 19	24	89	210 ± 367 [†]	5 044	6.0
20 – 29	51	90	381 ± 530 [†]	19 442	23.0
30 – 39	22	88	420 ± 392	9 227	10.9
40 – 49	21	91	1256 ± 878	26 375	31.2
50 – 59	9	100	1284 ± 1113	11 552	13.7
60+	10	100	1282 ± 1291 [†]	12 818	15.2
17 – 60+	137	91	617 ± 792	84 457	100.0

¹ Village's adult males (potential hunters) here includes 151 men, 145 of whom were 18 or older as well as six of the village's fourteen 17-year old males.

² Raw, uncooked edible weight.

[†] Large SD results from multi-modal distribution.

Use of Harvest

Our definition of harvest included all individuals killed and retrieved, regardless of whether some were discarded. The survey did not ask about quantities actually consumed although some pertinent information was collected. We do not assume that Pinehouse consumption patterns pertain to other villages, but present the information because wildlife biologists often have incorrect perceptions about what animals Pinehouse residents eat (Tobias, 1993).

The 46 108 kg of fish harvested (Table 5) included 11 302 kg of whitefish, pike, sucker, and trout caught in commercial nets but kept for local consumption. Some were likely used for dog (pets) food and there was probably some spoilage. Not recorded in the harvest survey were the very large quantities of fish, particularly suckers, that were discarded from commercial nets. Virtually all cisco and burbot were thrown away while all walleye were marketed.

Table 13 summarizes the use of 8290 fish from four family nets (total 190 lifts). Sizable portions were distributed to other households. Fish given away, bartered, or peddled were likely used for food, with a small quantity lost due to spoilage. All pickerel and whitefish harvested were used for food while cisco and burbot were discarded. The 10% of pike not kept for eating were usually simply too small. The proportion kept for consumption appeared typical for most Pinehouse households except sucker, which was likely higher than 63%. This is because 49% of all suckers were caught by one man whose net location yielded so many that he only kept 32%. Data for 59 lifts by 13 other families showed 77% of sucker were kept: this figure is probably more representative of the community.

TABLE 13. Use of fish from domestic nets harvested by four households during 1984–85.

Fish species	Total harvest ¹	Discards	Trapping bait	Dog food ²	Human food	Proportion (%) consumed by people
Walleye	608	2	0	0	606	100
Lake whitefish	3 063	15	2	0	3 046	100
Northern pike	567	43	2	10	512	90
White sucker	2 968	1 063	24	17	1 864	63
Cisco	918	807	35	76	0	0
Burbot	166	109	4	49	4	2

¹ The total harvest of 8290 fish, including cisco and burbot (both non-target species), was taken in 190 net lifts.

² For pets, not sled dogs.

During T. Tobias's three year residency only two instances of wasted waterfowl were witnessed. No cases of wasted upland game birds, hare or beaver were witnessed or heard of. No cases of discarding good muskrat meat were documented, although two dozen carcasses were discarded after spoiling while the harvester attended to an emergency in the village. Of 31 lynx harvested, 21 were eaten, 5 discarded, and the fate of 5 was unknown.

The meat of big game is so highly prized that wastage and spoilage are very rare. One very emaciated moose was not eaten. Of 108 bear harvested in a two-year period, 88 were eaten, 5 were discarded (2 were shot at the dump, 2 were too thin, and 1 was left by a hunter who snared 3 in one night) and the use of the other 15 animals remained undetermined. Of the 93 bears for which end uses were determined, 95% were used for food. T. Tobias observed the procurement of five bear, three moose, three caribou, and two deer. All 13 animals were eaten. Hence, virtually all meat harvested is consumed.

Comparison of Income Sectors

The 1983–84 income-in-kind sector has a replacement value (1984 dollars) of \$559 614 (Table 14). However, the procedures used to assign dollar values to income-in-kind have severe shortcomings. Hunting, trapping, fishing, and gathering have been the historical root of native culture and experience, and remain a basis of northern native economy. They remain key features of northern native life, despite adaptation to external forces of change (Usher, 1987). There are no ways to translate the

whole complex of cultural and social benefits inherent in harvest procurement and all its attendant activities into dollars. The replacement costs presented here are also conservative, because no adjustment was made for the fact that wild foods are nutritionally superior (higher protein and less fat) to store products (Usher, 1976). A number of replacement cost studies adjust values upwards 33–100% to account for this (e.g., Shindelka, 1978; Usher, 1982). Due to difficulties involved in measuring production costs (Usher, 1976), the valuation does not subtract the costs of producing the harvest. Thus, dollar values are gross and in this respect overstated.

The substitution cost for fish is particularly conservative. The price of the only locally-retailed fish product was adjusted downward by 38% to compensate for its added value. In one assessment of the value of fish from Pinehouse domestic nets, consultants used a value 75% higher than \$4.41 per kg (Hilderman Feir Witty and Associates, 1981).

Few studies (e.g., Usher, 1982) have recorded quantities of fuelwood harvested, and wood valuation procedures were not available. The replacement cost (Table 14) assumes that one cord of seasoned (20% moisture) mixed hardwood has an energy equivalence of 414.1 litres of fuel oil (Schell and Rogoza, 1982). The appropriateness of this value is questionable on three counts. First, is the wood used by residents seasoned? All wood harvested in 1983–84 originated from a burn area where it had been standing as deadwood for a decade. Second, is the heating value of jack pine, used exclusively in Pinehouse, at least equal to that of mixed hardwoods? This is probable since the gross calorific value of jack pine is 22% higher than that of aspen (Stobbs and Verma, 1977). Third, do the wood burning stoves in Pinehouse operate at the same efficiency (65%) assumed by Schell and Rogoza? Energy, Mines and Resources Canada advised us that 65% is an appropriate value for brand new stoves and suggested that 50% would be more realistic for Pinehouse, resulting in an adjusted value of 318.51 (B. Rooks, Energy Mines and Resources Canada, pers. comm. 1986).

For the comparison of income sectors we used a very simple model. Wealth flows from external sources into the village from four sectors: 1) income-in-kind is the portion of bush harvest locally produced and used and not sold; 2) simple commodity production refers to what is produced locally and destined for sale in external markets; 3) transfer payments are federal or provincial subsidies; 4) wages are monetary remuneration for the sale of labour to sources outside the community. Other research (e.g., Wolfe *et al.*, 1984; Quigley and McBride, 1987) has shown that village economies are characterized by strong inter-sector dependencies and the division here is made solely for analytical purposes. Income is also acquired through daily intra-community transactions among residents, and economic profiles often include income generated by such exchanges. In Pinehouse these activities include: wages that locally-owned businesses pay village residents; cash remuneration and income-in-kind that licensed commercial operators (fish, fur, rice) pay helpers; income received for locally-peddled bush products (e.g., fish, wood, crafts and clothing); items received through bartering, sharing, gifting; income received through the sale of bootlegged alcohol; winnings of bingo games. These transactions

TABLE 14. Replacement costs (1984\$) of 1983–84 harvest of income-in-kind.

Harvest Category	Unit price	Basis of unit price	Replacement Cost
Big game	7.39 /kg	consumer preference survey ¹	144 111
Trapping Mammals	7.17 /kg	consumer preference survey	29 816
Small game	5.05 /kg	consumer preference survey	74 082
Fish	4.41 /kg	value assumed ²	203 298
Berries	4.17 /kg	price of LaRonge berries ³	12 638
Potatoes	1.10 /kg	village store price	3 350
Construction logs	7.15 /log	value assumed	3 000
Fuelwood	130.87 /cord	price of equivalent oil ⁴	89 319
Total:			559 614

¹ Fifteen households participated during a one-day survey in the Pinehouse Co-op Store. Other research (e.g., Dimitrov and Weinstein, 1984) commonly uses local prices of beef, pork, chicken as replacement costs for, respectively, big game, small game and trapping mammals, and waterfowl. That approach produced a replacement cost for all meats (excluding fish) that is \$16 000 higher than the above figures for meat.

² The only fish product sold in the local store was cod-in-batter at \$7.14/kg. One earlier study used a replacement value for domestically-harvested Pinehouse fish of \$7.72/kg (Hildeman Feir Witty and Associates, 1981). The assumed value of \$4.41/kg for fresh fish is conservative.

³ Fresh or frozen berries were not sold in the local store. Prices of frozen blueberries in the three largest stores in La Ronge were \$4.17, \$4.78, and \$5.49 per kg.

⁴ Determined by substituting the cost (\$0.41/L) of a calorie equivalent amount of fuel oil (318.5 L) delivered from La Ronge.

constitute the internal circulation of wealth brought into the community through the above four sectors. Our analysis excludes these activities to avoid double-counting wealth, be it dollars or bush meat.

Total gross income to all residents from outside sources between April 1983 and March 1984 was \$3 236 570 (Table 15). Combining the two sectors that involve harvesting activities (income-in-kind and commodities), approximately one-third of the village's income came from each of bush harvest, wages, and transfer payments. Each household earned an average of \$5710 of income-in-kind and \$5874 from selling fish, fur, and rice.

Commercial and domestic fishing constitute a lynch pin of the local economy. Fish account for 45% of the \$451 307 in bush meats, or 36% of all income-in-kind. Fish payments account for 86% of the commodities sector, with fur at 8% and wild rice at 6%. Village income from commercial fishing is far larger than from any single employer or transfer program, representing 45% of the transfer payment total and 49% of the entire wage package. For many households fish from domestic nets is the critical resource. For example, five households selected for monitoring in 1984–85 harvested 6727 kg of fish or 70% of their harvests of all meats. For one household fish accounted for 86% of all meat procured (NVP, 1987b, section 6.3).

Many studies emphasize the importance of fish to economic security (e.g., Power, 1979; Berkes, 1990). Although big game

TABLE 15. Total gross income to Pinehouse residents, April 1983 – March 1984.

Sector	Amount (1984\$)	% of Total
Income-in-kind		
Bush Meats	451 307	13.9
Fuelwood	89 319	2.8
Berries	12 638	0.4
Garden produce	3 350	0.1
Construction materials	3 000	0.1
Subtotal	559 614	17.3
Commodities		
Fish payments ¹	493 078	15.2
Fur payments	44 231	1.4
Wild rice payments	35 433	1.1
Handicrafts & clothing	2 925	0.1
Subtotal	575 667	17.8
Wages		
Key Lake Mining Corporation	240 700	7.4
Northern Lights School Division	175 658	5.4
Northern Village of Pinehouse	119 063	3.7
Saskatchewan agencies ²	278 588	8.6
Make-work programs ³	98 676	3.1
Pinehouse Development Corporation	56 261	1.7
North-Sask Electric Limited	16 808	0.5
Miscellaneous ⁴	23 037	0.7
Subtotal	1 008 791⁵	31.1
Transfer Payments⁶		
Saskatchewan Assistance Plan	375 900	11.6
Saskatchewan Family Income Plan	365 160	11.3
Federal Child Tax Credit	133 770	4.1
Federal Family Allowance	133 269	4.1
Federal Old Age Pension and Supplements	60 624	1.9
Saskatchewan Day Care Subsidy Payments	17 175	0.5
Saskatchewan Senior Citizen Pension Plan	6 600	0.2
Subtotal	1 092 498	33.7
Total:	3 236 570	99.9

¹ Includes provincial fish subsidies of \$49 371.

² Includes Social Services, \$98 773; Highways, \$111 175; Health, \$58 140; Supply and Services, \$10 500.

³ Includes federal programs, \$64 071 and provincial programs, \$34 605.

⁴ Includes Canada Post Corporation, \$6696; La Ronge Region Community College, \$6441; stevedore at Churchill Manitoba, \$3500; Pinehouse RCMP detachment, \$3200; Pinehouse Airways Limited, \$3000; guides for American anglers, \$200.

⁵ The \$1 008 791 that 292 adult residents collectively earned contrasts to the \$700 200 earned by the 23 non-residents employed in the village.

⁶ Does not include Unemployment Insurance Commission because no disaggregated statistics were available.

may be more prestigious, fish provide greater security because they are more steadily available from year to year (Shindelka, 1978). For example, in 1983–84 Pinehouse men harvested 72 bears, compared to 36 in 1984–85. This 50% reduction was due to a dramatic decrease in abundance noted by regional biologists and local conservation officers (NVP, 1987a). Any families that experienced a shortage of bear meat in 1984–85 could increase their consumption of fish to compensate. Unlike hare and grouse, fish are not subject to cyclic population swings (Dimitrov and

Weinstein, 1984). As villages grow, the most accessible resources such as fish are likely to be most heavily used relative to other harvest categories (Shindelka, 1978). In many northern communities fish are the most reliable and persistent aspect of the economy (Wolfe *et al.*, 1984) and we believe this holds for Pinehouse.

This sectoral comparison has its limitations. The findings do not represent a fixed profile of the Pinehouse economy. Many researchers (e.g., Behnke, 1982; Wolfe, 1986) caution against assuming that a single year's harvest reflects the long-term pattern. The commodity sector is subject to the vagaries of external markets and resource management decisions. Transfer income and wage opportunities are subject to government policy changes and investment decisions of outsiders. Northern village economies can alter drastically over a relatively short period of years, even from one year to the next (Berkes, 1990).

CONCLUSIONS

The income-in-kind sector played a crucial role in the Pinehouse economy during the early to mid 1980s. These findings contradict the prevalent assumption that harvesting activities make only a minor contribution to the well-being of northern natives; an assumption that characterizes virtually all government and industry planning documents pertaining to Pinehouse (Tobias, 1993). This assumption can have serious consequences. Many northern village economies, including that of Pinehouse, have income-in-kind and cash sectors that can coexist only if there is a stable mechanism that transfers funds into the domestic sector (Wolfe *et al.*, 1984; Quigley and McBride, 1987). Over many decades the fur trade provided this mechanism, but in Pinehouse the commercial fishery is now the critical activity, given the apparent decline of trapping since 1984 (McNab, 1992). Policies based on poor information concerning the role of harvesting can jeopardize northerners' access to wild foods. Decreased access to these resources would need to be compensated through imported substitutes at considerable social and economic cost (Wolfe and Walker, 1987).

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