

The Fisheries of an Ojibwa Community in Northern Ontario

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(Received 26 January 1990; accepted in revised form 13 February 1991)

ABSTRACT. Subsistence fishing provides an important source of food for the remote Ojibwa community of Webequie, located along the Winisk River in northern Ontario. Field observations during the summer of 1988 were combined with a recall survey to estimate catches from October 1987 through September 1988. Of 133 potential fishermen, 90 were surveyed. The total community harvest was estimated to be 83 810 fish, round weight 108 210 kg. After adjustments, this provided 118 kg round weight/person/year, or 0.21 kg/person/day edible fish for consumption. Lake whitefish (*Coregonus clupeaformis*), walleye (*Stizostedion vitreum*), northern pike (*Esox lucius*) and suckers (*Catostomus commersoni* and *C. catostomus*) were dominant in the catch. Lake sturgeon (*Acipenser fluvescens*) attracts special fishing effort. Older males (> 40 years old) are the primary fishermen. Fixed gill nets take 95% of the harvest, most of which is consumed. Commercial fishing seems to be disappearing. Recreational fishing is a potential source of revenue. Subsistence fishing tends to be overlooked in development and management schemes but is clearly an important activity.

Key words: subsistence fishing, Ojibwa, native harvest survey, northern Ontario fisheries

RÉSUMÉ. La pêche de subsistance est une source alimentaire importante pour la communauté isolée d'Ojibwa de Webequie située le long de la rivière Winisk au nord de l'Ontario. Des observations sur place de l'été 1988 furent combinées avec un sondage de rappel pour estimer le nombre de prises pendant la période d'octobre 1987 à septembre 1988. Des 133 pêcheurs possibles, 90 furent sondés. Le total de prises effectuées fut estimé à 83,810 poissons, totalisant un poids rond de 108,210 Kg. Après des ajustements, cela fournit 118 Kg de poisson entier/personne/année ou 0.21 Kg/personne/jour de poisson comestible. Les prises dominantes furent le Grand Corégone (*Coregonus clupeaformis*), le Doré (*Stizostedion vitreum*), le Grand Brochet (*Esox lucius*) et le Meunier (*Catostomus commersoni* et *C. catostomus*). L'Esturgeon de lac (*Acipenser fluvescens*) attire des efforts spéciaux de pêche. Les hommes plus âgés (> 40 ans) sont les principaux pêcheurs. Les filets maillants fixés sont responsable de 95% des prises, dont la plupart sont consommées. La pêche commerciale semble disparaître. La pêche sportive est une source potentielle de revenu. La pêche de subsistance a tendance à être négligée dans le développement et dans les plans de gestions, mais est clairement une activité importante.

Mots clés: pêche de subsistance, Ojibwa, relevés des prises effectuées par les aborigènes, les pêches du nord de l'Ontario

INTRODUCTION

Indigenous people in northern Canada rely on food from the wild, although they live in permanent settlements patterned after those in southern Canada for at least part of the year. Native harvest studies are carried out to estimate the quantities of fish and wildlife used over periods of time by groups of indigenous people (Usher *et al.*, 1985; Usher and Wenzel, 1987). Native, in this context, is an inclusive term for status and non-status Indian, Inuit and Metis (Usher and Wenzel, 1987). Native subsistence fisheries capture a substantial proportion of the fish harvested in the North. These fish are used locally for human consumption, dog food and trap bait. They may be given away or exchanged in the community but, in principle, not sold externally for cash (Usher and Wenzel, 1987; Berkes, 1988). This definition may be broadened to include sales to neighbouring villages (Craig, 1989). Subsistence fishing has been carried out for generations, while commercial and sport fisheries are recent introductions. Quantifying the harvest is one way of portraying the importance of fish to a northern community.

Most estimates of the fish harvest of northern native Canadians (Berkes, 1983; Boivin *et al.*, 1989; Berkes, 1990) are recent and were carried out in connection with development proposals. In neighbouring Alaska more has been accomplished (Wheeler, 1987; Andrews, 1988; Walker *et al.*, 1989; Craig, 1989), in part because of conflicts between subsistence and commercial use of valuable salmon species. Post-harvest questionnaire ("recall") surveys are the commonest method of collecting data and were used in Alaska, the Northwest Territories (Gamble, 1984) and in large-scale projects in northern Quebec (James Bay and Northern Quebec Native Harvesting Research Committee, JBNQNHRC, 1982). Most subsistence fishing and hunting by registered native

people in Canada is not subject to statistical reporting. In recent years, however, non-native Canadians have expressed concern about the effects of native harvesting on northern fish and wildlife stocks (Usher, 1987). Northern development and the need to conserve fish stocks for local harvest have precipitated a need to measure harvests to document native dependence on local renewable resources and assess the consequences of the development (Pearse, 1988; Berkes, 1990).

The Ojibwa of northern Ontario have traditionally depended on a regular harvest of fish (Rogers, 1962). Whitefish (*Coregonus clupeaformis*), walleye (*Stizostedion vitreum*), northern pike (*Esox lucius*), suckers (*Catostomus commersoni*, *C. commersoni*) and sturgeon (*Acipenser fluvescens*) were important components of their diet. Webequie was stated to have been established on the site of a traditional fishing camp. There are no estimates of the subsistence harvest by the community or any commentary on the current state and prospects for commercial and sport fisheries. This study concentrates on the subsistence fishery, since the other fisheries were of minor importance in 1987-88. It also discusses some of the problems the community is facing in regard to its fisheries.

MATERIALS AND METHODS

Webequie (53°59'N, 87°23'W) is located about 520 km north of Thunder Bay, Ontario, on Eastwood Island, Winisk Lake (Fig. 1). The Winisk River flows through the lake and empties into Hudson Bay. The community consists of approximately 535 Ojibwa Indians and about 12 non-native teachers, nurses and the Hudson Bay Store manager. The Indians are engaged in a subsistence-based economy in the surrounding Hudson Bay lowlands, hunting and trapping along the northern margin of the boreal forest and fishing in the larger lakes

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and rivers. In the last 20 years the settlement has undergone considerable change and it now has many of the facilities found in the South, including an airport, school, nursing station, community centre and council offices.

Study of the subsistence fishery was encouraged by the Band Council following an investigation of the sports fishery in 1987 by Henschel (1989). We were assisted by a community advisor, an experienced fisherman who was known and respected in the community. A combination of recall survey, catch diary and direct observation was used. Field work and interviews were conducted between 16 June and 18 August 1988. The community advisor served as translator, participated in interviews as required and liaised with the Band Council. The Council advised us that the inclusion of all adult males (> 18 years) would account for the community's fish harvest. Any contribution by females and younger persons would be reported in the adult male total. To launch the project, daily broadcasts were made over the local radio station for a week. These described the study, raised interest and encouraged participation.

Ideally, all potential subsistence fishermen should be included in any investigation to avoid bias in the data, but results of previous harvest studies showed this to be impractical. Therefore, following discussions with the community advisor, a stratified sampling procedure was adopted based on the level of fishing activity. Fishermen were divided into four groups labelled high, medium, low and no fishing. The high group contained those who fished throughout the year, whenever conditions allowed, using predominantly fixed gill nets. The medium group also used gill nets but concentrated their fishing effort in the open water season and were less active at other times. The low group fished only in open water, mainly with rod and reel on weekends; the remainder did not fish. We spent more time collecting data from the high group because it was assumed they harvested the bulk of the community's catch (Rogers, 1962; Berkes, 1979; JBNQNHRC, 1982; Gamble, 1984; Boivin, 1987; Andrews, 1988).

A recall survey was used to estimate the community's catch for a one-year period. Ninety (67.7%) of 133 potential fishermen were interviewed. Questions were designed to establish the types and amounts of fishing equipment available, where

and when it was used and the species and quantities of fish captured. The initial interviews ranged from 5 to 75 min (average 20 min); subsequent interviews were shorter. The duration depended on whether translation was needed, how interested the participants were in elaborating on the questions, whether they volunteered additional information and how much time they had available. Most interviews (86%) were in the individuals' homes and the rest at mutually convenient locations. About 60% were conducted in English; the remainder were in Ojibwa and translated. The majority of the 43 individuals not interviewed were unavailable due to temporary employment (mostly firefighting) away from the community; only one refused to be interviewed. These fishermen were assigned to groups on the basis of the community advisor's knowledge of their fishing activity. It was considered more accurate to do this than to assign them to groups in the same proportions as those fishermen who were interviewed. This is partly because they tended to be younger men, with fewer dependents, who were still establishing themselves as fishermen.

The longest recall periods were 8-9 months, depending on the date of the first interview. Subsequent interviews were shorter and planned on a weekly basis to update catch and effort records and encourage participants to complete their catch diaries. All information was given on a voluntary basis and no authority or forms of remuneration were used. Care was taken to avoid excessive burden on respondents (Tobias, 1987). Questions were committed to memory and answers were recorded on blank paper rather than on official-looking forms. Respondents were encouraged to recall fish harvests by species in measures with which they felt most comfortable. Individuals uncertain about a response (e.g., 25-30 walleye) were advised to choose the lower value. This ensures that the survey findings are conservative (Tobias, 1987). Double counting can be a major problem if attempts are not made to minimize this error (Usher *et al.*, 1985). Therefore, specific instructions were given prior to an interview to avoid this. Fishermen were asked only to report catches from nets under their direct and constant care (Tobias, 1987). They were not to report any fish they took home when helping with another individual's net. The reliability of recalled information was checked by comparing recalled data with catch diary records and by comparing partners' recall of their companions' catches with companions' recalled catches.

The interview process provided records of the subsistence harvest from October 1987 to July 1988. For August and September 1988, catch diaries were intended to complete the records for the annual cycle. Unfortunately diaries were not returned. According to the community advisor, this was due to complexity of the diary, forgetfulness and declining interest in the study. Catches for these months were, therefore, estimated by the community advisor and checked against information provided during interviews on the usual fishing activity and success during this period. Fishing effort and catches were taken to be the same in August as in July but decreased in September because of migratory waterfowl hunting. Thus, September catches were estimated to be 80% of those of August. The weight of the harvest was estimated by converting numbers to weights of fish using the average round weights of each species obtained from field measurements. Observing fishing trips in the field allowed us to verify information provided in diaries and at interviews. Ten gill-net sets and nine angling trips were witnessed. At each gill-net fishing

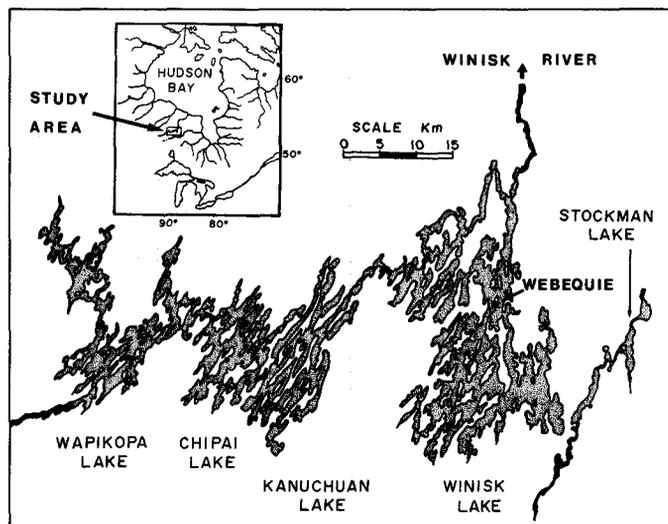


FIG. 1. Map showing the location of Webequie and the lakes generally used for subsistence and commercial fishing.

site, net length, mesh size and the way the net was fished were recorded. The numbers and species of fish caught were noted (including any discarded) and fork lengths (± 0.5 cm) and round weights (± 25 g) measured. Similar information was collected on angling trips. Nine sturgeon fishing trips took place from the community while we were there; records of these were obtained from interviews.

No commercial fishing took place during the eight-week study period and only three individuals fished for a week after our departure. Catch records for 1970-90 were supplied by the Ontario Ministry of Natural Resources in Geraldton. Literature and comments made during the recall interviews provided some details about the decline in commercial fishing and also about problems associated with the sport fishery.

Calculation of the mean numbers and weights of fish caught by fishermen in the different activity groups was based on numbers reported caught in each month from October 1987 to July 1988. It was assumed these numbers were accurate. For calculation of the community ten-month totals, stratified finite population sample means and variances were calculated (Barnett, 1974) and confidence limits estimated as twice the standard deviation of the stratified finite population mean. This will provide approximate upper bounds on the true 95% confidence intervals and is required because no general rule for determining the appropriate number of degrees of freedom in stratified sampling problems exists.

RESULTS AND DISCUSSION

Fishing Gear and Harvest Cycle

Fishing methods of the Ojibwa and Cree Indians are similar (Rogers, 1962, 1973; Winterhalder, 1977; Berkes, 1979) and were confirmed in interviews with experienced Webeque fishermen. We observed two methods in use, fixed bottom set gill-netting and angling. Multifilament nylon gill nets caught most of the fish harvested. Except for sturgeon fishing, mesh sizes were 102, 114 and 127 mm stretched measure (4, 4.5 and 5 inch), of which 87% were 114 mm. The nets were 26.8 ± 3 m (88 ± 10 ft) long and 0.9 m (3 ft) deep and several were often attached together. Sturgeon nets were 229 mm mesh and made of stronger twine. Materials to make nets are normally purchased through the Band Council at a 1987 price of \$60 per 100 ft of 4.5 or 5 inch mesh webbing and \$0.75 per lead or float. During the ice-free season nets are checked daily, usually in the morning, because most fish are caught at night. In late July and early August, when water temperatures reached a seasonal high of about 20°C, nets were checked twice a day to prevent fish spoilage (especially lake whitefish). In winter, nets are checked only once or twice a week.

Angling has become popular in the last 20 years and provides some harvest. It is the preferred method of young males and is used through the ice-free season. Artificial lures (spoons and plastic jigs) are used to catch walleye, northern pike and brook trout (*Salvelinus fontinalis*). The rod and reel are usually bought at the Hudson Bay Store, where prices ranged from \$75 to \$200 in 1987.

Several elders from the community mentioned the use of fish traps in the past but none has been constructed or used for many years.

Fish catches fluctuate over the year (Fig. 2), with about 52% of the harvest taken through the ice in winter. Peak catches occur in October, when trapping begins; at least 50

men were involved in 1987-88. Gill nets are set for trap bait and several trappers mentioned they ate more fish than normal while on their trap lines. Freeze-up occurred in the last week of October and for about 10 days nets could not be set. In anticipation of this, fishing effort was increased to obtain enough fish to last until the ice was secure. This was also noted among the Round Lake Ojibwa by Rogers (1962). These factors and, perhaps, fall movements and congregations of spawning lake whitefish (Scott and Crossman, 1973) contributed to the large October harvest.

Nets were set under the ice as soon as it was thick enough, and catches were high in November. The fishermen were replenishing depleted fish supplies and trapping was still occurring. December brought the trappers back to the community for Christmas. During the festive season, fishing was reduced and the harvest was smaller. Catches continued to fall through January and February, when winter storms and bitterly cold weather caused all but the most dedicated fishermen to abandon the activity.

March brought a sharp increase in the fish harvest. Spring spawning fish, such as suckers, walleye and northern pike, become more active as they congregate and move to the shallow margins of lakes and rivers where the nets are set (Winterhalder, 1977). Canada geese arrive in April and participation in the spring hunt has religious significance to the natives of the Ontario Hudson Bay Lowlands (Prevett *et al.*, 1983). The combination of goose hunting and ice break-up at the end of April was responsible for the lowest catches of the year. By mid-May, open water fishing was again possible and fish catches increased. The warmer weather of June encouraged anglers and gill-net fishermen to fish and the harvest continued to increase. During late June and early July, very

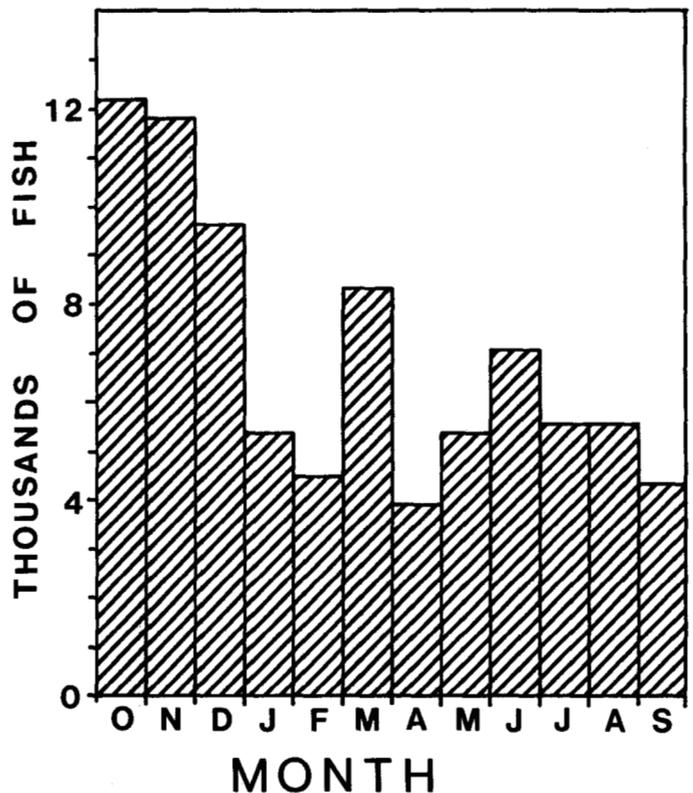


FIG. 2. Numbers of all species of fish harvested in the Webeque subsistence fishery, October 1987 to September 1988.

dry weather contributed to an outbreak of forest fires and many of the men were occupied fighting fires. Seasonal employment also peaks during summer. These factors were responsible for the moderate July and August fish harvest. Several older fishermen mentioned that summer had been the time of greatest harvest in the past. In the fall, many fishermen hunt geese and waterfowl, which conflicts with fishing. Participation in this hunt is less than the spring hunt (Prevett *et al.*, 1983) and fish harvests do not decline as much.

Fishing Locations

The distances travelled to fish varied according to whether the fishermen returned to Webequie to sleep or camped overnight and whether gill nets were used or if it was an angling trip. All gill-net fishing recorded between 18 June and 18 August that did not involve overnight camping was within 15 km of Webequie and was confined to Winisk Lake (36 locations). Twenty-seven of 33 locations in which overnight camps were used for gill-net fishing were beyond 15 km from the community. Usually fishermen took their families and camped for several days. Fishermen using rod and reel would travel farther to fish, up to 25 km on day trips, often to locations along the river. They would usually camp overnight (4 out of 5 trips) if distances were beyond 25 km.

After the lakes have frozen, gill nets are moved closer to the community. All locations mentioned during interviews were within 10 km. An exception to this is when nets are set from overnight cabins by Indians tending trap lines. These are spread over a wide area and some were up to 60 km distant.

Cost of Fishing

An investment of capital is required for an individual to fish in northern Ontario and income often dictates the amount of fishing that can be done.

The canoe and snowmobile are the major forms of transportation and a large portion of a fisherman's income is needed to acquire them. Canoes cost an average of \$2800, while a typical 15 HP outboard motor costs \$2500. Approximately 86% ($n = 70$) of the individuals interviewed owned at least one canoe and motor. The average period of use for one of these boats and motors is 4-5 years. Snowmobile prices are higher, depending on the type of machine. No data were obtained on the number of operable snowmobiles per individual, but most households had at least one near their house. Their period of use is estimated at 5 years. It is difficult to prorate annual depreciation costs of a canoe or snowmobile for fishing because they are used for many purposes (general travel, hunting, fishing, trapping).

Gasoline costs \$1.10 per litre (\$5.00 per gallon), and each five-gallon tank requires 500 ml of oil (\$2.50 each). The average distance for a day trip using gill nets was 11 km ($n = 36$). This distance would be travelled in approximately 30 min; several individuals reported that a 15 HP motor uses a gallon of fuel an hour. Thus the fuel cost of a daily round trip would be \$5.50. The average distance travelled for a day trip of angling was 13 km, approximately a 40 min canoe ride at a cost of \$7.30.

A typical list of equipment taken on an overnight fishing trip during the summer includes: gasoline, oil, various tools for repairing equipment, spare motor parts, life jackets, paddles, rope, gill nets, rod and reel, rifle, ammunition, axe, cook-

ing utensils, Coleman lantern, naphtha gas, tent, tarpaulin, sleeping bag and extra clothing. If this equipment were purchased at one time, initial cost would be high. However, most items are acquired and replaced over time, so that annual investment is reduced to a few hundred dollars.

Only two purchases of groceries and miscellaneous supplies for an overnight fishing trip were observed. These averaged \$50, but from such a sample it is difficult to get a good indication of typical cost.

Lake sturgeon fishing is regarded as a special activity by the Webequie fishermen because if enough are caught there is the chance to sell the catch commercially and also because sturgeon are considered one of the best fish to eat. Nine trips in 1987 lasted 2-5 days and involved distances of 27-125 km (average 45 km). Fuel costs averaged \$55; food and supplies added \$100-150 to expenditures. A float plane was rented on three of the trips at a cost of \$1.75 per mile and an average cost of \$186 per flight. Sturgeon sold for \$7.06 per pound in 1987, and that year two men earned \$2500 from the catch of one trip.

Observed Catches and Disposition

Lake whitefish, walleye, northern pike, longnose sucker, common white sucker, burbot, cisco, and lake sturgeon were caught in gill nets by native fishermen. Walleye, northern pike and brook trout were caught by angling, the latter species only in the fast water and rapids of the Winisk and neighbouring rivers.

The average catch in ten summer gill-net sets was 27.6 (± 6.0 S.E.) fish; seven species, including two sucker species (longnosed and common white), were recorded (Table 1). The catch per net was quite variable, so the standard error was large. All lake whitefish and walleye were kept for consumption; eight (36%) of the northern pike were left ashore. Several individuals indicated that only northern pike > 60 cm were eaten. Most suckers (76%) were also placed ashore. These results are typical of summer catches in Winisk Lake. According to interviews, there is considerable variation with the time of year and among locations in catch rates and species composition but not in consumption patterns.

All lake sturgeon fishing was done some distance from the community. Sturgeon were caught on six of nine trips. The average catch was three per trip. The fishermen indicated that 1988 had been a bad year for sturgeon fishing but no explanation was offered.

Angling supplied all of the brook trout, 18% of the walleye and 5% of the northern pike caught and provided about 5% of the fish harvested. Nine angling trips were observed. The aver-

TABLE 1. Numbers and percentage of different species in ten gill-net catches from Winisk Lake, July-August 1988

Species	Number	Range	Percentage
Lake whitefish	175	0-55	63
Walleye	21	0-9	8
Northern pike	22	0-12	8
Sucker sps.	53	0-15	19
Burbot	3	0-3	1
Cisco	2	0-2	1
Totals	276	5-63	100

age catch and keep was nine walleye; all northern pike were released. Two trips to specific locations downriver yielded an average of three brook trout. Most brook trout are caught while guiding when expenses are paid by tourists.

Use of Catch

Fishermen selected from their gill-net catches fish for consumption. Species preferred for eating were lake whitefish and walleye. The relatively high fat content of lake whitefish may explain its popularity (Winterhalder, 1977). Suckers (both longnose and common white suckers) and northern pike were eaten to a limited extent. Neither burbot (*Lota lota*) nor cisco (*Coregonus artedii*) were eaten. Lake sturgeon and brook trout were rarely caught in regular gill-net catches but were considered a delicacy. Fish brought back to the community were shared primarily with family members and residents who could not afford to fish, were old or were in poor health. Excess fish were frozen whole, smoked and/or dried. Except for sturgeon, fish were not sold in the community.

Most of the catch is used for human consumption (the last sled dog team was killed by wolves in 1984). Only a small proportion is fed to family pets. Trapping is an important source of income for many men in the community. Suckers and other species not eaten are used for trap bait during the trapping season and in summer are left ashore to attract furbearing animals for later trapping. In the Northwest Territories, Corkum and McCart (1981) found that 73-78% of the domestic fish harvest was consumed even though there was considerable reliance on sled dogs.

Estimated Community Subsistence Harvest

The 90 fishermen interviewed were placed into groups on the basis of their level of fishing activity (Table 2). The 43 fishermen not interviewed were assigned to groups by the community advisor. The mean numbers of fish caught by each group were quite different, corresponding with the differences in fishing effort. Catches by the 90 interviewed fishermen for the ten months to the end of July 1988 (Fig. 3) show that in this period the high group caught >2000 fish, the low group <1000 fish. Ninety-five percent of the catch was taken in gill nets. The numbers and weights of fish harvested in this period by fishermen included in the survey and estimates for the community are given in Table 2. Fishermen in the high activity group caught 49% by weight of the catch, the medium group caught 26% and the low group 25%.

The annual harvest of each species by number and weight is given in Table 3. Almost 95% of the catch was composed of suckers, northern pike, lake whitefish and walleye in decreasing order by weight of catch. Brook trout and lake sturgeon contributed little to the totals, although they are valued by the community.

The total harvest is not a valid estimate of fish used for human consumption. Of this total, no burbot or cisco were kept and, based on observed summer gill-net catches and observations and interviews in the community, only about 60% of the northern pike and 25% of the suckers were eaten. When these are subtracted, 54 860 fish, weighing 66 180 kg, were available for consumption during the year. This represents 103 fish (124 kg) per person. An estimated 5% of this

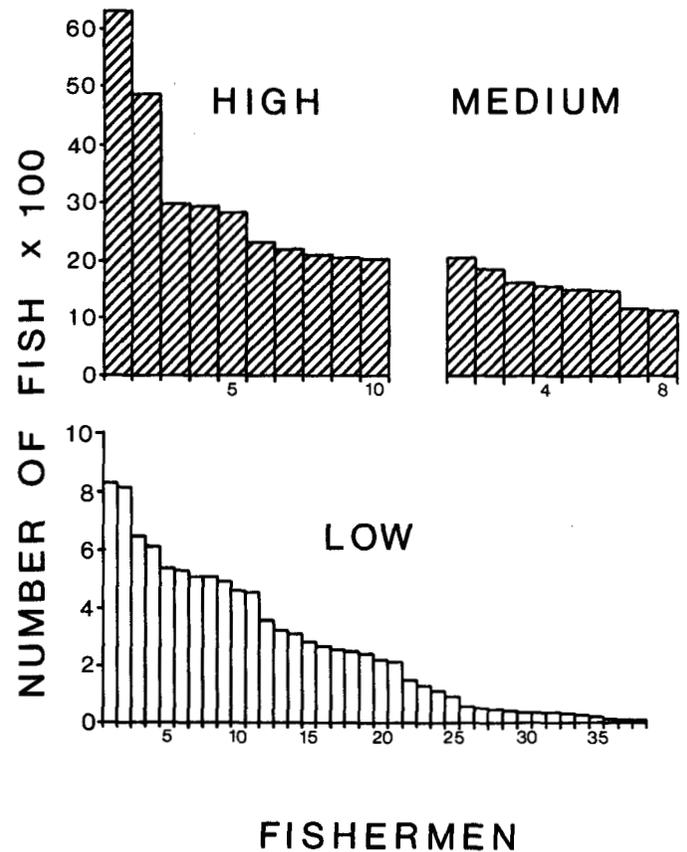


FIG. 3. Numbers of fish caught by fishermen in the high, medium and low fishing activity strata between October 1987 and July 1988.

TABLE 2. Distribution of Webequie fishermen by fishing activity and the contribution of each group to the community fish harvest during the 10 months October 1987 - July 1988¹

Fishing activity group	Number of fishermen		Mean annual catch of 90 surveyed fishermen		Community harvest	
	According to recall survey	Estimated community total	Number of fish	Weight of fish (kg)	Number of fish	Weight of fish (kg)
High	10	12	2974	3865	35 688	46 380
Medium	8	12	1531	2043	18 372	24 516
Low	38	75	264	323	19 800	24 225
No fishing	34	34	0	0	0	0
Total	90	133	556	715	73 948	95 095
Limits			± 44	± 57	± 5 852	± 7 581

¹Total and limits are based on rounded stratified means ± 2 standard deviations, which do not equal arithmetic stratum means in the rest of the table.

fish was used for pet food and trap bait. To convert round fish weight into edible food portions, the conversions used were: lake whitefish, 67%; walleye, 71%; northern pike, 60%; suckers, 65%; brook trout, 60%; and lake sturgeon, 65% (JBN-QNHRC, 1982). The harvest provided an estimated 77 kg per year (0.21 kg per day) edible fish per person.

Reliability and Accuracy

Native people rely on oral transmission of their culture, which places great emphasis on accurate recall (Arima, 1976; Usher and Wenzel, 1987). The recall of fish (and small game) has been found to be less accurate than for rare or large game animals. This is because harvesters do not usually count their fish and thus they have no number to remember (Berkes, 1983; Usher and Wenzel, 1987).

Several methods were used to check the reliability of the recalled information. Four partially completed catch diaries distributed in December 1987 were compared with recalled data from interviews in June-July 1988. Recalled data were within 20% of recorded data and all underestimated it. During interviews, the names of individuals who accompanied fishermen were obtained. Fishermen would often comment on their partners' catch. At a later date, partners were interviewed and asked to recall their companions' catch. This was done on 12 occasions. In four cases, agreement was exact; the maximum discrepancy in the rest was 12%. These comparisons suggest that our recall data is quite reliable. Since interviews were designed to give minimum totals where there was doubt and fishermen showed no tendency to exaggerate, any bias in the harvest estimate would tend to make it low.

Commercial and Sport Fisheries

No commercial fishing occurred between 16 June and 18 August 1988 and very little occurred during 1988. This conforms with the generally depressed state of northern Ontario native-run commercial fisheries in recent years. Commercial records for Webequie (Table 4) provided by the Ontario Ministry of Natural Resources (OMNR) for the period 1970-90 showed catches had fallen to nil in 1989 and 1990. Fishing usually takes place on Winisk, Stockman, Kanuchuan, Chipai and Wapikopa lakes (Fig. 1). Licenses and quotas are assigned by species by the OMNR. These are distributed to the fishermen by the Band Council but, in recent years, quotas have

TABLE 3. Annual Webequie community harvest by kind of fish, October 1987 - September 1988¹

Fish	Number harvested	Mean weight (g)	Total weight (g)	Percentage by	
				number	weight
Lake whitefish	22 470	1140	25 530	27	24
Walleye	17 420	870	15 150	21	14
Northern pike	14 810	1900	28 160	18	26
Sucker sps.	23 900	1370	32 770	28	30
Burbot	2 180	1600	3 480	3	3
Cisco	2 930	930	2 710	3	3
Brook trout	60	1050	60	—	—
Lake sturgeon	40	8740	350	—	—
Totals	83 810		108 210		

¹Numbers are rounded to the nearest ten, total weights to nearest 10 kg.

been large enough not to restrict fishing initiative. Catches must be flown to Pickle Lake, where they are processed and sold through the Freshwater Fish Marketing Corporation in Winnipeg.

A tourist fishing and hunting operation called Winisk River Wilderness Camps is operated by a number of individuals in the Webequie community. Camps are located on the Winisk and its tributaries and offer trophy brook trout as well as wall-eye and northern pike fishing. In the fall, the camps are used for hunting geese and moose.

The camps were very successful in the 1970s but since then have not done so well. The Indians attribute this to a decline in the brook trout fishery. When operating at their peak, the camps employed as many as 15 individuals, mainly as guides. Many former guides stated that until the last 2-3 years they were able to make a good income during the season. In 1988, the Winisk River Wilderness Camps joined the newly formed Native Tourist Organization in Ontario. Through this organization, the community is hoping to expand its advertising and attract more tourists. This should alleviate one factor that may have contributed to the camps' poor performance.

CONCLUSIONS

Our results have provided what we believe to be a conservative estimate of the annual harvest of fish by the inhabitants of Webequie. Like other traditional communities, Webequie is quite dependent on its subsistence fishery. This was expected, since fishing has always been a basic subsistence practice for most native groups in northern Canada and often prevented starvation when other wild resources were not available (Power, 1979; Berkes, 1990). Alton Mackey and Orr (1987) found that fish provided 30% of the country food of the Inuit of Makkovik, Labrador. The bush diet of the Cree of Pinehouse, Saskatchewan, was 41.2% fish (Tobias, 1987). Other studies in Canada have found fish to account for from 25 to 53% of the diet (Rogers, 1963; Balikci, 1980; JBNQNHRC, 1982). A

TABLE 4. Reported landings (kg round weight) by species for Webequie commercial fisheries, 1970-1987

Year	Lake whitefish	Walleye	Northern pike	Lake sturgeon
1970	32 395	29 755	—	41
1971	6 773	15 984	—	253
1972	4 286	14 152	1930	238
1973	—	—	0	—
1974	4 701	5 677	987	—
1975	4 484	8 457	—	—
1976	2 279	4 634	—	—
1977	—	1 515	—	—
1978	7 410	16 598	2606	14
1979	3 381	11 350	1340	—
1980	1 212	3 879	1212	—
1981	452	443	192	—
1982	2 046	2 166	542	—
1983	80	2 031	42	203
1984	2 597	12 998	486	659
1985	—	357	189	—
1986	492	3 490	622	—
1987	279	4 203	640	801
1988	—	1 941	120	—
1989	—	—	—	—
1990	—	—	—	—

variety of animals are eaten by the people of Webequie; geese, ducks, moose, hare, partridge and fish are common foods.

Our results were not designed to estimate the proportion of fish in the diet. The per capita annual weight of 77 kg is relatively high, considering the Canadian average of 117 kg per capita for fish, meat and poultry combined (Usher, 1987). It is much higher than the U.S. per capita consumption of all fishery products, which was estimated at 7.9 kg in 1989 (O'Bannon, 1990). It is similar to those native Alaskan communities with the highest per capita catches where fishing tends to be concentrated on the summer and fall migrations of anadromous species (Craig, 1989), although there are no high-yielding anadromous stocks available to the Ojibwa of Webequie.

Berkes (1983) has converted the harvest values for a number of studies into kg round weight per person to facilitate comparisons. Round weights have the advantage for comparisons of not being subject to various conversion factors used to estimate edible weights. Webequie's value of 124 kg fish per capita (as well as 78 kg per capita used for other purposes) falls in the upper range of estimates for other northern Canadian groups (Berkes, 1990). However, it should be emphasized that this estimate is for one annual cycle and catches may vary considerably from year to year. Our interview results indicated that, although the harvest cycle is similar each year, the weather and the availability of other game can affect the harvest, as can employment opportunities (Berkes, 1990).

A few fishermen were responsible for supplying the community with fish. Twelve individuals in the high fishing activity group accounted for almost half the community total, while those in the high and medium groups (24 fishermen) harvested 75% of the year's catch. Much of this catch was distributed throughout the community to kin and others unable to fish. This was also found by Berkes (1979) and Boivin (1987) and appears to be characteristic of native subsistence fisheries.

The estimated community catch, about 84 000 fish, average weight 1.3 kg, is of considerable magnitude. It is taken from waters that can be expected to yield only about $2.3 \text{ kg}\cdot\text{ha}^{-1}\cdot\text{y}^{-1}$ (Ryder, 1965). This implies the harvest represents the yield from about 500 km^2 . This area of water is accessible within about 25 km radius of the community. It is also exploited, especially on overnight trips in summer, when most fishing occurs more than 15 km from the village. A need to distribute the fishing over such a wide area emphasizes the requirement for cheap fuel to support the current subsistence practices.

Analysis of a James Bay Cree fishery revealed that the present population used less than 10% of available fish production (Berkes, 1979). A change that occurs when previously nomadic hunters move into permanent settlements is that there is a sharp increase in population. A consequence of this is likely to be increased fishing pressure on local stocks. In the mid-1970s, Berkes (1979) noted that overfishing of whitefish occurred in the area surrounding Fort George, Quebec. Given the current doubling rate of approximately 25 years for native populations, it is questionable how long the northern fish stocks can be maintained (Usher, 1987). Outboard powered boats and snowmobiles increase the area available for hunting and fishing, which compensates to some extent for the negative effect of living in permanent settlements (Berkes, 1979). This is only possible if the community can meet the expenditures.

Webequie fishermen complain about the high price of fuel and feel it limits the distance they travel. However, most choose to make frequent short day trips. Berkes (1982) found that the most favourable energy input:output ratio was when fishermen established field camps rather than relying on day trips from the settlement. But this conflicts with family interests, children's schooling and access to medical and other facilities. The health of the subsistence fishery is closely linked to the cost. If fuel and equipment prices rise faster than incomes, the subsistence fishery may not be economically feasible, and this could affect the quality of the native diet.

Many southerners and non-natives have underestimated the economic significance of subsistence fishing to the natives and too quickly assumed that it was declining as a means of livelihood. The high price of store-bought food in the community emphasizes the value of the subsistence economy. Nowak (1977) calculated that local food could account for one-quarter of the total real income of a family. The subsistence harvest is also important for the physical and social well-being of families. A number of intangible and unquantifiable factors, such as taste preferences, traditional food preparation and eating practices, the esteem by which a successful hunter is held in a native community and simple satisfaction of being in control of one's means of livelihood, combine to make any dollar estimate of the value of the native renewable resource harvest totally inadequate from the native's perspective (Resource Management Consultants Ltd., 1980).

By contrast, the future of the commercial fishery does not look very promising. The development of this fishery from its introduction in the 1930s to becoming an economic mainstay of many communities in the 1950-70 period is outlined by Rogers (1972). In 1977-78, the mean commercial harvest for all commercial fisheries operating in the jurisdiction of the Freshwater Fish Marketing Corporation (Manitoba and northwestern Ontario) was only 2500 kg, with a mean value of \$2063 (Thompson, 1981). The Department of Northern and Indian Affairs subsidized commercial fisheries in the northern communities in the past, but not in recent years (Anderson, 1985), resulting in a decline. Subsidies cannot be justified on economic development grounds because the fisheries have no potential to be self-sufficient in the foreseeable future (Thompson, 1981). Since fisheries' subsidies are merely forms of welfare, it may be desirable to increase social benefits while developing local markets in northern communities (Riewe *et al.*, 1983). Whatever happens, the potential conflict between commercial and subsistence fishery harvest must be considered. Any promotion of commercial activity where subsistence fisheries occur must be fully justified and fish stocks protected from over-harvest.

Sport fishing may be an alternative to commercial fishing as a source of income. The Winisk River Wilderness Camps, opened in 1967, have never been seen as an opportunity to provide appropriate employment to Indian people. Many of the natives are looking for jobs that permit them to stay on the reserve. The sport fishery allows them to maintain traditional lifestyles and resist pressures to move to the cities (Anderson, 1985). Since Webequie is located in ideal fishing country, there is potential for development of the sport fishery, but it must be managed carefully. Recent membership in the Native Tourist Organization of Ontario should help reactivate interest in the camps.

In the North, the problem of allocation of fishery resources can be acute. Commercial, sports and subsistence users may all be competing for the same stocks in an area where productivity is basically low. Many natives feel the subsistence fishery will lose to other interests; conversely, non-natives are concerned about the impact of native fishing on northern fish stocks. In the boreal region as a whole, the importance of subsistence and sport fisheries harvest is much greater than that of commercial fisheries (Riewe *et al.*, 1983). For fisheries managers to develop policies that are socially acceptable, practical and equitable to all users, they must have accurate information. Reliable and accurate subsistence data may be the most difficult to obtain, yet they are an integral part of the information required. Fish and wildlife are still, for the most part, abundant in the North and must continue to support the native economy as well as provide for the use and enjoyment of others (Usher, 1987).

ACKNOWLEDGEMENTS

We thank the people of Webequie for their friendly and generous participation in this study and for sharing their knowledge of fish and fishing. Special thanks go to Mathias Suganaqueb, Peter Jacob, Sammy Jacob, Fred Jacob and Johnny Neshinopaise. Tina Spanjers, John Henschel, T. Tobias and Ron Zondervan are thanked for providing advice, assistance and encouragement when needed. We thank the referees for their constructive comments, which helped to improve an earlier version of this manuscript. The study was made possible by a Northern Studies Grant awarded through the Association of Canadian Universities for Northern Studies to Mark P. Hopper and a grant from the Ontario Ministry of Natural Resources, GERALTON.

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