Catch history of ringed seals (*Phoca hispida*) in Canada

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ABSTRACT

The ringed seal (*Phoca hispida*) has always been a staple in the diet and household economy of Inuit in Canada. The present paper was prepared at the request of the NAMMCO Scientific Committee to support their assessment of ringed seal stocks in the North Atlantic Basin and adjacent arctic and subarctic waters. Specifically, our objective was to evaluate recent and current levels of use of ringed seals by Canadian Inuit. Annual removals probably were highest (possibly greater than 100,000) in the 1960s and 1970s, a period when sealskin prices were particularly strong. Catches declined substantially in the 1980s following a collapse in sealskin prices, presumably related to the European trade ban on skins from newborn harp and hooded seals (*Phoca groenlandica* and *Cystophora cristata*, respectively). Recent catch levels throughout Canada (1980s and early 1990s) are believed to be in the order of 50,000 to 65,000 ringed seals, with a total average annual kill (including hunting loss) in the high tens of thousands. No reliable system is in place to monitor catches of ringed seals, so any estimate must be derived from a heterogeneous array of sources.

INTRODUCTION

Ringed seals (*Phoca hispida*) have long been and continue to be important in the cultures and household economies of northern people. In spite of such importance, assessment of ringed seal populations has been hampered by the difficulty of estimating population sizes and catch levels. There is a long history of formal record-keeping in Greenland, but catch data in Canada can only be assembled from a mixture of government and private sources. Canadian records have been kept sporadically and for different purposes (Usher and Wenzel 1987). Because the hunting of ringed seals is a casual, almost daily activity for many hunters, the very idea of keeping detailed catch records is daunting. As Brody (1976:162) observed about a land-use mapping project involving interviews with Inuit hunters: "In general, hunters did not consider they were seal hunting when they were travelling, even though they might kill seals along the way." Ringed seals essentially have the status of small game in the Canadian Arctic. Ubiquitous at campsites and stopping places on summer journeys by boat, they are taken frequently for camp meat (Fig. 1). Hunters in the eastern Canadian Arctic and hunters from northern and western Greenland almost certainly take from a common stock (Kapel *et al.* this volume).

At their annual meeting in February 1996, the NAMMCO Scientific Committee reviewed the status of ringed seals in the North Atlantic and adjacent arctic regions and made recommendations concerning future research (NAMMCO 1997). In addition to papers on abundance, the committee received reports on catch data from

Fig. 1
Hunters and their dogs on the land-fast ice, with a ringed seal in the foreground. (Photo: S. Leatherwood, NW Greenland, 3 June 1988)

Greenland (Teilmann and Kapel this volume) and western Russia (Belikov and Boltunov this volume). Brief reviews of catch statistics in Canada were included in working papers by Kingsley and Reeves. It became apparent during the 1996 meeting that a more detailed Canadian summary was needed. The present paper responds, in part, to the recommendation for "monitoring of catches as well as studies of loss rates in different types of hunts, the extent of under-reporting, and changes in hunting effort and trade in seal products" (NAMMCO 1997). We emphasise, however, that our present focus is mainly historical. The need continues into the future for improved systems of monitoring removals and factors affecting removals.

SOURCES OF CATCH DATA AND REVIEW OF PREVIOUS SYNTHETIC SUMMARIES

Published catch estimates before the mid-1980s were based primarily on skin sales or police reports, of varying quality and precision (e.g. Mansfield 1967, Smith 1975, Usher 1975, Smith and Taylor 1977, Malouf 1986). Skin sales are obviously sensitive to market factors, so considerable uncertainty exists about what the trade statistics signify for a given time or place. Three examples illustrate the problem:

(1) T.G. Smith purchased and examined 5,400 ringed seal specimens from hunters at Holman (Fig. 8 see later) between March and October 1971, a year in which the Northwest Territories (NWT) game branch reported 1,096, and records provided to Smith by the Hudson's Bay Company (HBC) indicated 3,614, skins traded at this same settlement (Smith and Taylor 1977).

(2) Between the years 1965 and 1972, Grise Fiord (Fig. 5 see later) hunters sold only 13-61% (average 37%) of the sealskins that they secured (Riewe 1977), so in most years the trade data substantially under-represented the actual catch.

(3) Treude (1977) had difficulty reconciling what he learned from interviews - that 2,480 seals were taken at Pond Inlet (Fig. 5 see later) in the 1972-73 fur-accounting year (1 July to 30 June) - with the fact that only 703 sealskins were traded officially that year despite the fact that high prices were being paid for sealskins. He speculated that many hunters had been "involved in a government assistance program, which made it possible to ship skins to auctions in the South, circumventing the middlemen" and resulting in under-reporting in the official fur trade statistics. This speculation is consis-

tent with the conclusion by Smith and Taylor (1977:2-3) that: "In recent years with more Inuit selling furs to individuals and outlets other than the Hudson Bay Company, unrecorded sales of pelts ... introduce a greater error in harvest records."

These types of uncertainty must be borne in mind whenever removal data are derived from trade records.

According to Mansfield (1967), the maximal number of ringed seal skins traded annually in Canada up to 1962 was about 20,000. He considered this to represent approximately half the secured catch. With the rise in world prices of sealskins that year (see below), the number of skins traded increased to about 70,000, which Mansfield (1967) believed represented most of the annual kill. The sealskin trade remained at this high level until 1966, when prices declined and about 50,000 skins were traded annually (Mansfield 1970).

Smith and Taylor (1977) compiled the HBC trade data (1940-72) and information contained in game reports of the Royal Canadian Mounted Police (RCMP) from 1962 to 1972, giving for each data set, by locality, the maximal reported catch in one year, number of years with records and mean annual catch. Their study included all settlements in the NWT and northern Quebec (coasts of James Bay, Hudson Bay, Hudson Strait and Ungava Bay; Figs 2 and 6) but did not include the Labrador coast. They considered the main value of these data to be as "indications of the relative numbers of seals taken from one community to the other," rather than as indications of total removal rates. In his separate compilation for Hudson and James bays, Smith (1975) considered the maximal reported catches to be reasonably indicative of the "potential harvest" for each community.

Davis *et al.* (1980) took the data used by Smith and Taylor (1977) a step further. They reasoned that if one were to sum the maximal one-year

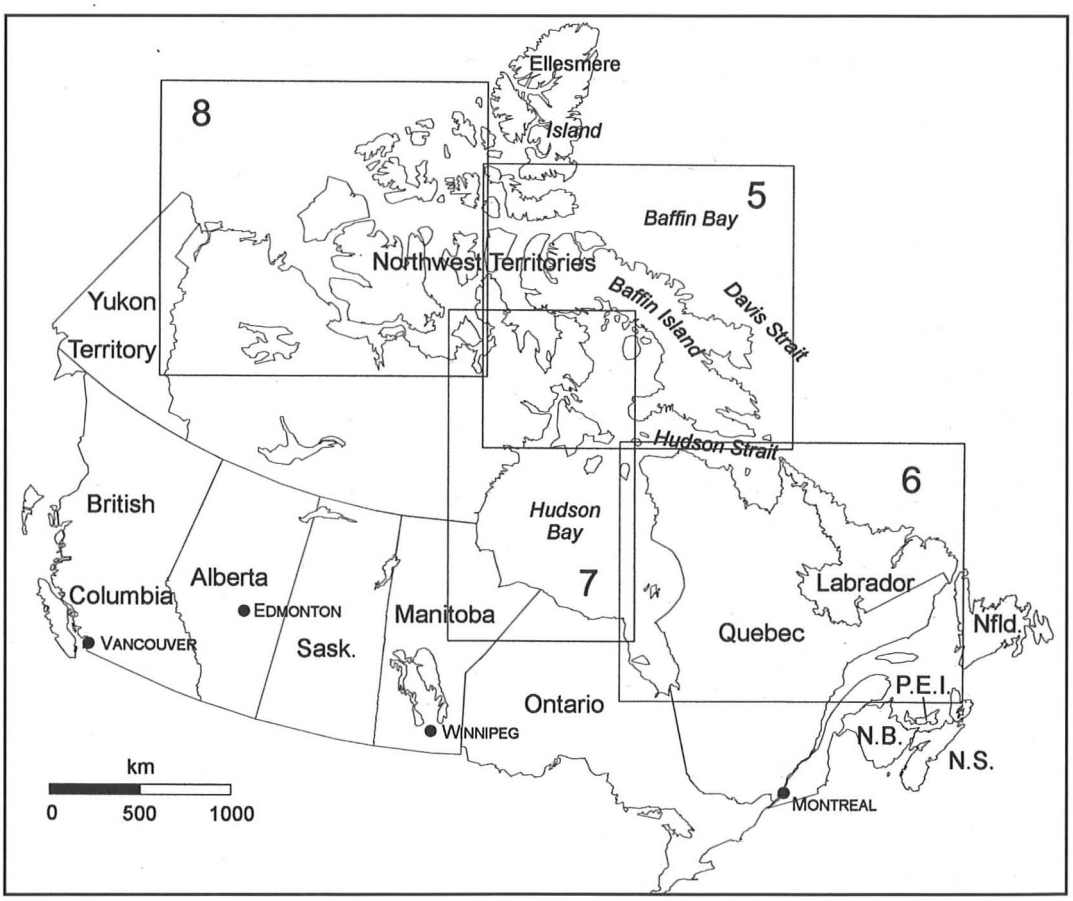

Fig. 2
Map of Canada. Panel numbers refer to Figs 5-8 of this paper.

reported catch (based on sealskins traded) for each community in the NWT between 1940 and 1972, the total would be about 100,000 (actually about 85,000 based on Table 11 in Davis *et al.*(1980)). Presumably, these authors meant to imply that 100,000 would represent a rough upper bound to the annual catch. It is not clear whether Davis *et al.* intended for their 100,000 figure to include an upward adjustment for bias in the skin returns caused by retention of skins for domestic use, incomplete reporting from some settlements, use of sealskins in handicrafts and failure to trade damaged skins (Davis *et al.* 1980).

Myers (1982) reported that the average annual catch of ringed seals in the entire Canadian Arctic ranged between 25,000 and 75,000, but she provided no explanation of the basis for these values. During the late 1970s and early 1980s, the estimated annual landed catch of ringed seals throughout Canada was about 51,000, assuming a total catch of 61,000 seals and that 83.7% were ringed seals (Stewart *et al.* 1986). These values were based on hunter-recall studies, commercial skin sales and reports by government fishery officers (Stewart *et al.* 1986). The average annual catch in 1981-83 for the eastern Canadian Arctic, including 14 Baffin region communities, Grise Fiord, Sanikiluaq, Igloolik and Hall Beach, plus their outpost camps, was estimated at between about 31,500 and 36,500 ringed seals, of which more than half were taken at Pond Inlet, Clyde River, Broughton Island and Pangnirtung (Donaldson 1988).

Yaremchuk and Wong (1989) estimated that about 37,000 ringed seals were taken in the NWT in 1984/85, citing Department of Fisheries and Oceans (DFO) unpublished data but giving no details. Kingsley (1990) considered 100,000 an underestimate of the annual catch in Canada, citing Smith and Taylor (1977) and Smith (1987). He concluded, however, that "the total harvest of seals is difficult to estimate accurately, as there are no reliable statistics."

The above summaries leave no doubt that the annual secured catch of ringed seals in Canada is at least several tens of thousands. They also suggest that 100,000 represents an approximate upper bound. Much uncertainty applies to any regional or nation-wide estimate, however, due to heterogeneity in reporting procedures and other factors. Actual removals are difficult to estimate even at the village scale because of the great uncertainty surrounding hunting loss rates (see "Catching methods and hunting loss" below).

RINGED SEAL EXPLOITATION PRE-1920S

The ringed seal has always been a key resource in the household economies of Eskimo people in Arctic Canada (Maxwell 1985). Small seals, principally ringed seals, were the most frequently identified species in 12 of 13 faunal analyses from Thule culture archaeological sites (Savelle and McCartney 1988; also see Savelle's (1994) more focused review of faunal analyses from Thule sites in the central and eastern Canadian Arctic). Referring to the ringed seal, Soper (1944:238) claimed that "the existence of this species alone renders life possible and supportable to a large number of Eskimos who dwell in comparative plenty on these bleak and storm-swept shores at the present day, as it has for their forebears for centuries past." The oil was used for cooking, heating and illumination. Skins were used for clothing (including footwear), tents, mats, lines, receptacles of various kinds, dog whips and harnesses, sled lashings and kayak covers (Tremblay 1921, Soper 1928, Wenzel 1991).

Whalers, traders and explorers also hunted ringed seals. In written reports, including logbooks, journals and diaries, references to seals are often unspecified to species. Ross and MacIver (1982), for example, were unable to distinguish for 2,169 seal kills mentioned by Davis Strait whalers, whether these were ringed seals or harp seals (*Phoca groenlandica*), but a large proportion were probably the former. Additional seals were killed by Inuit to help provision overwintering whaling crews and semi-permanent trading stations (e.g. Ross 1975). For the most part, however, the visitors preferred other types of game for their own consumption, so their demand for seal meat was mainly to feed sled dogs. Sealskins were only a "marginal item of exchange" until late in the 19th century after the stocks of bowhead

whales (*Balaena mysticetus*) had been substantially reduced (Wenzel 1991; also see Lubbock 1937). Some 3,700 skins per year were shipped out of Cumberland Sound between 1883 and 1903 (Goldring 1986). At the time, the European demand was mainly for the sculps (blubber) attached to the skins, which provided oil to offset the declining availability of whale oil.

An important aspect of the European and American arrival in the north was the introduction of firearms (Müller-Wille 1978). Rifles were widespread in the Canadian Arctic by the beginning of the 20th century, and shooting had largely replaced harpooning as the method of choice for midwinter floe-edge and summer open-water seal hunting by the 1920s (Ross 1975, Kemp 1984). Use of rifles certainly increased the killing power of Inuit hunters and made them permanently reliant upon imported parts and ammunition. Firearms, however, probably had a greater effect on the hunting of species other than the ringed seal, like the caribou (*Rangifer tarandus*) and walrus (*Odobenus rosmarus*). Traditional methods of hunting ringed seals, including waiting for seals at breathing holes (*mauluktuk*) and stalking them on the spring ice (*uuttuq*), persisted alongside, and in fact simply incorporated, new technology (Wenzel 1991).

THE WHITE FOX FUR TRADE ERA, 1920S TO MID-1940S

With the decline and cessation of commercial whaling for bowheads in the eastern Canadian Arctic during the early 1900s, the fox fur trade became the main interface for economic and cultural exchange between Inuit and outsiders (Usher 1976a). Although traders frequently complained about Inuit spending too much time sealing and not enough trapping, the two activities were more often complementary rather than competitive (Wenzel 1991). During this era, the typical pattern was for sealskin trade figures to be lower in good fox years, "not because fewer seals were killed but because of 'the disinclination of the natives to clean and bring in the skins while they can obtain their requirements much more easily with fox skins'" (Goldring 1986; also see Wenzel 1991: his Table 6.1). In good fox years, however, predation by foxes on young ringed seals would have had some effect on availability of seals, whereas in poor fox years the availability of ringed seal pups and juveniles would have been that much greater (McLaren 1958:65).

There is no evidence that sealing effort varied in any major way during this era. On the contrary, the central importance of seals in the subsistence of Inuit (for human and dog food, heating and lighting oil, and clothing) ensured a certain constancy in demand, while decisions about whether or not to trade the skins responded to trapping returns and price fluctuations (Wenzel 1991). This was an era of large dog teams needed to work traplines, and seal meat was regularly used as dog food (Fig. 3). Seal meat and blubber were also used as bait by people who trapped along the coast (Usher 1976a).

Slumping fur prices and a generalised economic depression in the late 1940s brought the fox fur trade era to an end.

POST-WAR DEMOGRAPHIC AND TECHNOLOGICAL CHANGES, LATE 1940S TO EARLY 1960S

Government-sponsored resettlement of Inuit from dispersed semi-sedentary villages into large permanent town sites had important economic and ecological ramifications (Wenzel 1991). The process continued over a period of 15-20 years, generally from the late 1940s to late 1960s. For example, migration from camps into the settlement of Pond Inlet began in the early 1950s, stimulated in part by government social programs such as family allowances, old-age pensions and welfare (Bissett 1968, Treude 1977). After about 1960, the practice of sending adults with tuberculosis to sanatoria in southern Canada meant that families who lost breadwinners saw no alternative but to move into a settlement. A day school opened in Pond Inlet in 1961 and a nursing station in 1966. That same year a program began for building rental housing. Although as late as 1963, 70% of the Inuit in the Pond Inlet area were living in camps, by 1972 the camp population in this area had declined to zero (Treude 1977). At Clyde, the population distribution changed from an average of 26 people per "camp" in the 1940s-early 1960s

to almost 245 in the main settlement in 1971 (Stevenson 1972, Wenzel 1981, 1994).

For our present purposes, one of the most significant changes in northern life has been the people's increased reliance on and adaptation of imported technology for making a living. Motor-equipped whaleboats and freight canoes had already begun to replace the skin-covered kayak in many parts of the Canadian Arctic before the war, but by the late 1950s this substitution was essentially complete (Bissett 1968, Kemp 1971, Müller-Wille 1978). Also by the 1950s, the pressure stove had replaced the seal oil lamp as the primary heat source for the Inuit, and as a result the blubber of killed seals was underutilized (McLaren 1958, Kemp 1971).

New techniques for preparing hair-seal skins were developed in about 1962, and at the same time sealskins became more widely used to make clothing in Europe (Foote 1967). These developments had a dramatic effect on skin prices. For example, in eastern Baffin Island skins of young ringed seals increased in value from C$4.00 per skin in 1955 to C$17.50 per skin in 1963, those of mature seals from C$1.50 to C$12.25 over the same period (Foote 1967). The increase in sealskin prices meant that, for the first and only time in history (at least prior to 1971), the predominantly trapping community of Sachs Harbour on Banks Island (Fig.8 see later) made more money in 1964-65 on sealskins than on fox skins (Usher 1966:67, 1971:56).

The timing of the price increase was propitious as it allowed many hunters to save enough money to purchase snow machines, which were just entering the market (Kemp 1971). By the mid- to late 1960s, the snowmobile had replaced the dog sled as the main form of winter overland and over-ice transportation throughout the Canadian north. For example, Pangnirtung had more than 75 working dog teams in the early 1960s but none left in 1968 (Smith 1973a). Repulse Bay was one of the last settlements to acquire snowmobiles, with the first one arriving in the winter of 1967-68 (Müller-Wille 1978). By 1973, only three or four Repulse Bay hunters had enough dogs to assemble a functioning team, and of these, only one actually

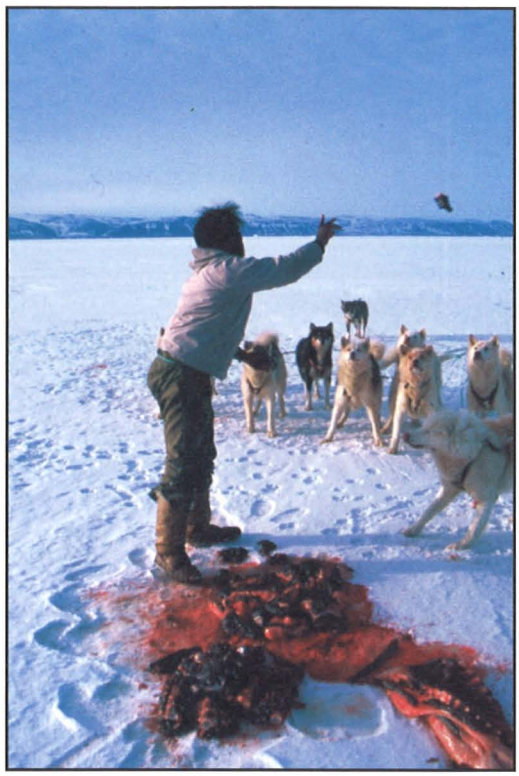

Fig. 3
A hunter tosses a chunk of seal meat to his dog team. (Photo: S. Leatherwood, NW Greenland, 1 June 1988)

hunted with dogs that year (Müller-Wille 1978). Pond Inlet had only three complete dog teams remaining in 1973 (Treude 1977).

People living in settlements and depending on dog-team travel hunted seals intensively in nearby areas. Once equipped with snowmobiles, however, they could spend more time in active hunting at greater distances from the settlements, with no appreciable increase in their time and energy investment. At Clyde, for example, after relocation to the town site, hunters spent more than twice as much time travelling by dog sled to and from the nearest good sealing area than they had done when hunting from their traditional villages. Equipped with snowmobiles, their travel time to the most-used winter sealing area was reduced by as much as 40% (Wenzel 1997). Moreover, hunters achieved a wider pattern of dispersal, not least because snowmobiles allowed smaller cooperative units to function effectively. Formerly, groups of 4-6 men were needed to cover the breathing holes that might be used by a single seal in a specific area. Now, a two-person team was adequate. One man positioned himself at an active hole while the second drove the snowmobile in a cir-

cle some 150m distant from the hole, in essence using the machine's noise to prevent a seal from using distant holes.

ECONOMIC CHANGES, 1970S

Dependence on imported vehicles, parts and fuel created a permanent dependence on money income. The situation at Clyde, where sealskin sales provided much of the cash needed to maintain snowmobile use, is instructive. In 1971-72 the capital and fuel costs over three years (the approximate operational life span of a snowmobile) were about C$2,585 (calculated on a base purchase price of C$1,400 and C$395 per annum for 665 L of fuel; Wenzel 1991). During the early 1970s, 43 Clyde Inuit secured about 2,300 ringed seals, or an average of 55 per hunter, for a potential average return of C$605 per hunter per year (HBC 1971-72 sealskin price: C$11.10; Wenzel 1991). Thus, the snowmobile transition for a Clyde Inuk meant a cash investment of C$2,585 vs. a monetary return of approximately C$1,815 over three years, leaving an apparent net deficit of C$770. This shortfall was generally offset by the use of the snowmobile to hunt polar bears, with bear skins at the time valued at C$526 and with each hunter averaging two bear kills every three years (Wenzel, unpublished data). The combined use of the snowmobile in seal and bear hunting therefore yielded a return of C$2,867, for a net gain of C$282.

When evaluated on a daily basis, the costs of snowmobile use compare favourably with those incurred to maintain a dog team. In the late 1960s, the average size of a dog team used for sealing at Clyde was 12-15 animals, requiring approximately one 45kg seal every two days. In 1971-72, the cash cost of five gallons of gasoline, generally enough for two days of breathing-hole hunting, was about C$10. Thus, the cash received for one sealskin was sufficient to purchase fuel for two days of sealing. The difference is that with a dog team, the hunter fed the seal carcass to the dogs and sold the skin for cash to buy consumer goods of his choice, while the snowmobile hunter was obliged to use the money obtained from selling the skin to buy gasoline and spare parts, the seal carcass having little or no monetary value.

The high prices of the early to mid-1960s did not last, and by 1968 the NWT price was down to C$3.80 (Table 1). In summer 1967 there was no market in Alaska, while in Canada the HBC set an *ex gratia* price for social reasons (Foote 1967). At the end of the 1960s, prices rose again, reaching C$13 for prime skins at Chesterfield Inlet (Wenzel 1978) and C$42 at Broughton Island (Jacobs 1975). Average prices kept increasing until 1976-77, when they again declined abruptly (Table 1). In November 1977 ringed seal skins in northern Quebec sold for C$1.25, those in the Keewatin for less than C$1.00 (Wenzel 1978). By March 1978, however, the NWT-wide price had already rebounded to C$31 (Jelliss 1978).

FURTHER FLUCTUATIONS DUE TO ECONOMIC AND REGULATORY CHANGES

The European Economic Community's (EEC's) ban on the importation of newborn harp seal and hooded seal (*Cystophora cristata*) skins, beginning in 1982, caused a sharp decline in the prices paid to Inuit for ringed seal skins (Table 1, Fig. 4). This decline in price presumably accounts for the corresponding drop in the volume of sales. At Clyde, the average price per skin actually declined consistently from 1979-80 through 1984-85 (from C$23.09 to C$6.99); hunter participation in the sale of ringed seal skins dropped by about a third after 1981-82; and the volume of skins sold decreased by more than 50% after 1982-83 (Wenzel 1991: his Table 6.12). The 31,586 sealskins reportedly sold in Baffin Island in 1980-81 returned, on average, C$21.54; in 1983-84, only 5,766 skins were sold at an average price of C$9.00; in 1984-85, 3,747 at C$7.00 (Wenzel 1989). Overall in Canada, the number of sealskins traded after 1982 declined by more than 50% (Stewart *et al.* 1986). In the Baffin region alone, the number of ringed seal skins sold declined by 91% in five years, from 25,000 in 1980-81 to 2,300 in 1985-86 (Donaldson 1988).

The price of sealskins recovered substantially in 1987-88, to approximately the real value of the mid-1960s (Fig. 4). Nevertheless, the volume of sales has remained far below those of the 1960s to early 1980s (Table 1). Recorded

Table 1. Sealskin trade statistics for Northwest Territories. Average value for 1955-60 is from Wenzel (1991); all other data are from Murray Angus, Inuit Tapirisat of Canada, Ottawa (*in litt.* to Wenzel, 6 September 1995). Note the following: (a) The skin totals include seals of all species. In 1978-79, the breakdown was 25,935 ringed, 2,110 harp and 1,321 "other" seals - i.e. 88% were ringed seals (*fide* Fur Export Tax Returns provided by the NWT government, Fort Smith Game Office). The proportions of ringed seals in the total skins traded from 1986-87 to 1993-94 were 88%, 92%, 94%, 91%, 99%, 94%, 95% and 98% (*fide* data from M. Angus, as above). (b) Average values are of prices paid to hunters, as computed from Traders Fur Record Books. (c) Number of skins and average values differ in some years from those given in Wenzel (1986: his Table 2). As indicated in Wenzel's footnote, his data after 1980 do not cover the entire NWT.

Year	No. of skins	Average value (C$)	CPI-adjusted ave. (1981 C$)
1955-60	-	1.00	-
1961-62	10470	4.65	-
1962-63	27884	8.49	-
1963-64	45962	14.78	-
1964-65	68332	11.08	-
1965-66	51197	5.97	-
1966-67	46355	6.82	18.68
1967-68	19460	3.80	10.00
1968-69	27479	7.68	19.35
1969-70	31186	8.64	21.07
1970-71	37282	9.22	21.85
1971-72	30819	9.81	22.19
1972-73	26363	15.10	31.72
1973-74	36391	17.36	32.88
1974-75	40468	17.10	29.23
1975-76	34270	23.65	37.60
1976-77	48407	16.99	25.02
1977-78	26726	11.86	16.05
1978-79	29352	14.16	17.55
1979-80	30861	19.05	21.43
1980-81	42120	22.56	22.56
1981-82	24556	19.42	17.53
1982-83	14837	14.87	12.69
1983-84	7689	9.96	8.14
1984-85	5419	10.05	7.90
1985-86	3602	7.98	6.03
1986-87	2580	9.74	9.33
1987-88	976	18.22	16.78
1988-89	1696	19.76	17.33
1989-90	1817	17.94	15.01
1990-91	1517	21.27	-
1991-92	884	16.75	-
1992-93	1128	17.38	-
1993-94	1182	19.15	-

sales of ringed seal skins in 1987-94 ranged from 285 to 1,596 per year in the Baffin region and from 68 to 1,064 in the Kitikmeot region (which includes seven settlements in the central Canadian Arctic, specified later in the text, and all shown on Figs. 7 or 8; Table 2).

Sales in the Keewatin region (which includes seven settlements on the west side of Hudson Bay, specified later in the text, and all shown on Fig. 7) totaled only about 100 per year in 1987-88 and were negligible thereafter.

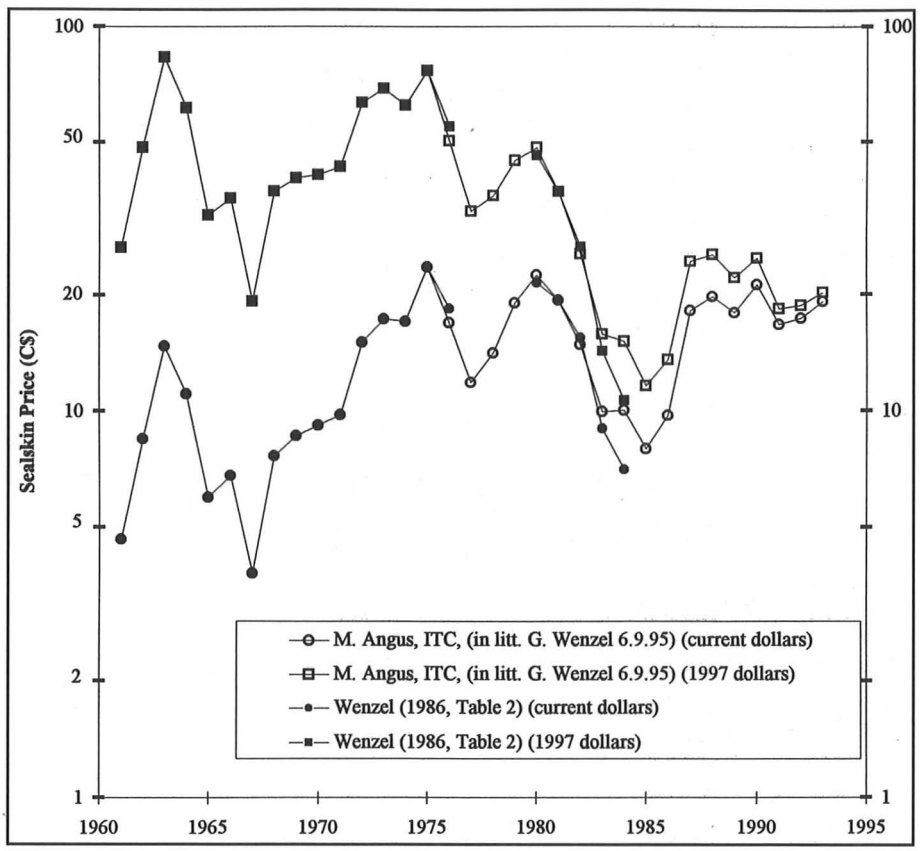

Fig. 4
Trends in average sealskin prices in Canada (data from Table 1).

SEALSKIN PRICING AND MARKETING

There has always been considerable within-year variability in prices paid by trading companies. Also, prices have differed from settlement to settlement and region to region. Official values, given as annual averages, mask this variability but can generally be considered useful for analyzing trends. In addition to the variability evident from the values mentioned in the previous section, a major difference in prices paid for ringed seal skins can be seen between the Baffin region and the Kitikmeot region (Central Arctic; see below) during the late 1980s and early 1990s (Table 2). In 1987 and 1988, the Kitikmeot average price was nearly three times that of Baffin. Although the gap narrowed later, it remained in the vicinity of one and a half to two times through 1994.

Skins from the three life stages of the ringed seal traditionally commanded different prices (McLaren 1958): Whitecoats (unmolted pups) were "sought almost entirely for their trade value." Silver jars (molted first-year pups) had "some value" as fur, whereas common jars (seals older than one year) were generally used locally (especially for making footgear) or sold for leather. At Pond Inlet, where 55-65% of the seal catch in the 1950s consisted of silver jars, their value was 18-105% higher per skin than that of common jars in the mid-1960s (Bissett 1968). Whitecoats are hard to catch without a trained dog to detect the birth lairs, and even then many escape. The low return on effort means that little whitecoat hunting is done today (Riewe and Amsden 1979).

During the late 1970s, three main marketing chains were available to seal hunters in the Northwest Territories (Jelliss 1978): (1) A game officer would pay a portion of the estimated value in advance, then make an appropriate adjustment according to what the skins realized at auction. (2) The locally owned cooperative would pay the full estimated value to the hunter, then auction the skins in southern centres such as Vancouver, Edmonton and Winnipeg. Any profit or loss resulting from the transaction was

Table 2. Regional fur returns from the Northwest Territories, 1987-94. Source: Inuit Tapirisat of Canada, Ottawa (M. Angus, in litt., 6 September 1995). See text for definitions of regions. H = harp seal, R = ringed seal, N = other species not specified. Average prices received by hunters are in Canadian dollars, calculated by dividing total value of the category by total of skins sold in that category.

Year	Inuvik	C$/skin	Kitikmeot	C$/skin	Keewatin	C$/skin	Baffin	C$/skin
1987	-	-	16H	10.81	2H	7.50	195H	12.08
			582R	17.47	96R	13.79	1596R	6.00
			5N	26.00			71N	16.82
1988	4R	30.00	8H	11.25	105R	14.00	27H	14.00
			500R	24.98			285R	9.37
			2N	5.50			43N	13.37
1989	1R	9.00	977R	23.39	35R	23.71	63H	17.36
	1N	15.00					585R	12.53
							34N	40.71
1990	2R	10.00	740R	21.54	1H	20.00	152H	14.99
			4N	20.25	21R	8.76	883R	14.88
							14N	66.43
1991	-	-	1064R	24.71	-	-	15H	19.00
			6N	22.50			432R	12.88
1992	-	-	245R	25.40	-	-	18H	14.50
							590R	13.69
							243N	7.84
1993	-	-	92R	22.72	-	-	43H	24.93
							980R	16.28
							13N	37.77
1994	11R	15.82	68R	29.71	23R	18.30	13H	25.85
							1058R	17.88
							9N	85.00

absorbed by the cooperative and ultimately reflected in its dividend payments to members. (3) The local Hudson Bay Company store would buy skins from hunters, at prices based on the tariff schedule currently in effect in combination with the clerk's appraisal of skin quality. Company skins were shipped to the Montreal storage center, then auctioned in either Montreal or London. Most of the ultimate demand for sealskins was, and remains, in Europe, particularly Germany.

In the early to mid-1990s, a local initiative based in Pangnirtung sought to develop a market for sealskin products in Japan (Gregoire 1993). The intention was to buy the skins of harp and ringed seals (at C$35 and C$20, respectively) killed for meat in Pangnirtung, Broughton Island and Clyde River, then ship them to the Ainu in northern Japan who were reportedly "very interested in seal skin crafts."

REGIONAL SUMMARIES

We have arbitrarily divided the Canadian Arctic and Subarctic into seven regions: the eastern high Arctic, southeastern Baffin Island, Hudson Strait and Ungava Bay, Hudson Bay and Foxe Basin, Labrador, the central Canadian Arctic, and the western Canadian Arctic. These divisions are not intended to reflect anything about seal movements or stock differences; nor do the regions represent political or cultural units of

any kind. Rather, settlements have been grouped this way simply for ease of presentation.

Eastern high Arctic

We define the eastern high Arctic to include the settlements of Grise Fiord, Resolute, Arctic Bay, Pond Inlet and Clyde River (see Fig. 5). Miller's (1955) estimate of 11,250 seals/year at Pond Inlet in the early 1950s is worthless, as it is extrapolated from the take of a single "exceptional hunter." Only about 2,500 were estimated to have been taken in the Pond Inlet area in 1956-57, of which 1,038 were traded at Pond Inlet and 857 at Arctic Bay (Pond Inlet RCMP Report, July 1957). Assuming that these values were reliable, it could be inferred that the skins of about 75% of the seals secured were traded. At Clyde River, HBC records indicate sales of about 200-400 sealskins per year during the late 1940s, and this increased to about 300-500 during the 1950s (Wenzel 1991: his Table 6.3).

For the Lancaster Sound region (the three settlements of Resolute, Pond Inlet and Arctic Bay), Welch *et al.* (1992) estimated the annual "pre-snowmobile take" at 7,500, the 1980-84 catch at about 6,400 per year and the more recent catch at 6,000 ringed seals per year. Myers (1982: her Table 3) gave the average annual catch during 1974-79 for the four settlements of Grise Fiord, Resolute, Pond Inlet and Arctic Bay, combined, as only 3,018 but provided no details.

Pond Inlet and Clyde River consistently had the highest catches in the eastern high Arctic, judging by trade data through the mid-1970s (Table 3; and see Stewart *et al.* 1986: their Table 4). Estimates of the secured catch at these two settlements in 1979, based on monthly game calendars kept by hunters, supplemented by recall surveys, were 2,487 and 4,733, respectively (Finley and Miller 1980). These values are cer-

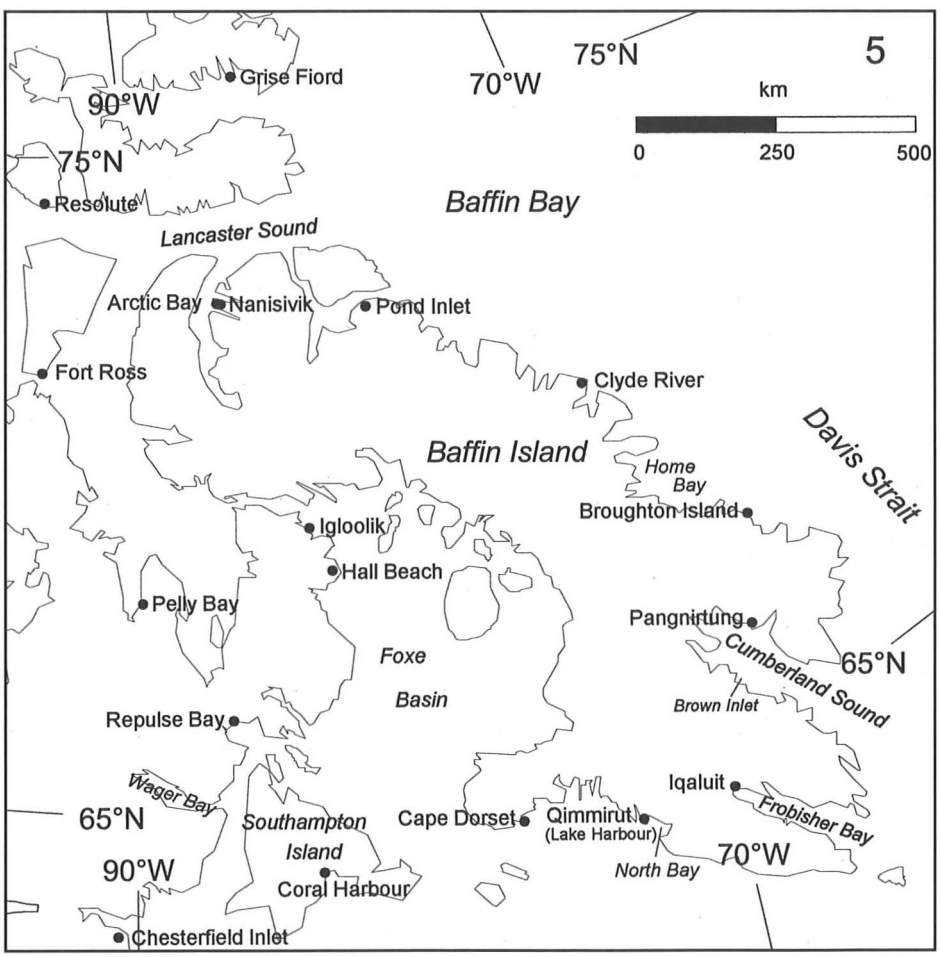

Fig. 5
Map of eastern High Arctic, as defined in this paper.

Table 3. Sealskin trade data for the Northwest Territories and Yukon, 1924-74, from Usher (1975). N = number of years with data; Mean = average number of sealskins sold per year; STD = standard deviation of the mean; Minimum = lowest annual value in series, with year in parentheses; Maximum = highest annual value in series; Period = first to last year with data for that district. Usher's data came principally from (a) fur export tax returns (1971-74) and (b) traders fur record books (1961-68). Both of these sources underestimate actual catches because they refer only to skins traded or exported (see text). Additional sources used by Usher are (c) area economic survey reports sponsored by the Department of Indian Affairs and Northern Development during the 1960s, and (d) year-end summaries of furs traded at Hudson's Bay Company posts. The former (c) provide reliable data for a few years but not a continuous record. They were used for the period 1968-71 or to account for discrepancies between the first two sources (a and b). Source "d" was used only for Pangnirtung and Broughton Island.

District	N	Mean[a]	STD	Minimum	Maximum	Period
Mackenzie Delta	9	273	406	7(72-73)	1291 (64-65)	1962-74
Tuktoyaktuk	8	72	64	3 (67-68)	183 (65-66)	1961-74
Paulatuk	8	337	429	1 (72-73)	1225 (64-65)	1961-74
Banks Island	18	798	623	95 (72-73)	2599 (64-65)	1955-73[b]
Holman	8	2324	1312	362 (61-62)	3963 (65-66)	1961-74
Read Island	2	189	156	79 (62-63)	299 (61-62)	1961-63
Coppermine	8	2159	1051	1068 (67-68)	3885 (63-64)	1962-74
Bathurst Inlet	6	211	128	44 (67-68)	400 (61-62)	1961-68
Cambridge Bay	9	285	224	28 (72-73)	684 (65-66)	1962-74
King William Island (Gjoa Haven)	10	319	178	13 (61-62)	575 (67-68)	1961-74
Spence Bay	19	792	1008	28 (55-56)	3280 (64-65)	1949-74
Igloolik	11	2088	1416	326 (61-62)	4000 (52-53)	1952-74
Arctic Bay	14	1104	757	113 (67-68)	2816 (65-66)	1956-74
Pond Inlet	13	1868	1135	664 (67-68)	4000 (65-66)	1956-74
Resolute Bay	12	311	240	3 (66-67)	670 (64-65)	1958-74
Grise Fiord	5	299	137	194 (61-62)	473 (65-66)	1961-68
Clyde River	15	1628	1177	169 (60-61)	4000 (55-56)	1955-74
Broughton Island	13	4128	1933	820 (60-61)	7185 (71-72)	1960-74
Pangnirtung	44	4065	3593	43 (25-26)	12530 (64-65)	1924-74
Frobisher Bay (Iqaluit)	6	1554	1415	254 (72-73)	4164 (64-65)	1963-73[c]
Lake Harbour	9	2073	875	849 (72-73)	3395 (64-65)	1961-74
Cape Dorset	10	2737	1759	442 (71-72)	5129 (66-67)	1961-74
Southampton Island (Coral Harbour)	10	1759	971	691 (71-72)	3791 (65-66)	1960-74
Repulse Bay	11	1330	582	262 (61-62)	2500 (60-61)	1960-74
Chesterfield Inlet	10	322	287	14 (67-68)	950 (52-53)	1952-74
Rankin Inlet	10	617	624	62 (67-68)	1875 (63-64)	1961-74
Eskimo Point	13	384	227	20 (53-54)	858 (64-65)	1952-73[c]
Belcher Islands (Sanikiluaq)	9	1148	770	86 (62-63)	2129 (65-66)	1962-74

[a] Mean number of sealskins traded or procured per year during the specified period, calculated for years with available data (it should not be assumed that no seals were taken in years for which no data are available).

[b] In years for which there are no data (i.e. pre-1955), the island was uninhabited so the take presumably was zero.

[c] Unreadable data for 1973-74.

tainly more reliable than fur trade statistics and may be as close to accurate as can be achieved. Miller *et al.* (1982) estimated the annual kill (corrected for hunting loss; see later) for Pond Inlet, Clyde River and Broughton Island (see below under Southeastern Baffin Island), combined, as about 17,300 during the late 1970s and early 1980s. Estimated annual secured catches for 1981-83 were 1,946 for Arctic Bay (plus 424 for nearby Nanisivik), 3,148 for Clyde River, 3,040 for Pond Inlet and 223 for Resolute (Stewart *et al.* 1986: their App. 1). In addition, the outpost camps associated with these settlements took an estimated 550 seals per year (based on the 1982 data in BRIA 1983).

Grise Fiord was established on the south coast of Ellesmere Island in 1953. About 600 ringed seals were traded annually through 1972 (*contra* Table 3), but this represented only somewhat more than a third of the secured catch (Riewe and Amsden 1979; see above). An estimated 686 were taken at Grise Fiord in 1979 (Finley and Miller 1980), and an annual average of 757 from 1981 to 1983 (Stewart *et al.* 1986).

Summing the estimates for 1981-83, the five settlements in this region took an estimated total of 10,088 ringed seals per year.

Southeastern Baffin Island

We include only Pangnirtung, Broughton Island and Iqaluit in this region (Fig. 5). The first two of these settlements have long been recognized for producing the largest annual catches of ringed seals in eastern Canada (Haller *et al.* 1967, Smith 1973b, Smith and Taylor 1977, Stewart *et al.* 1986: their Table 4; and see our Table 3). Takes at Iqaluit (called Frobisher Bay in early accounts), while substantial by comparison with all other settlements, have generally been no more than half those at Pangnirtung and Broughton Island.

The residents of Pangnirtung traditionally carried out an intensive hunt for whitecoats and silver jars. The HBC post at Pangnirtung received an annual average of 2,764 ringed seal skins in trade between 1924 and 1936 (Goldring 1986: his Table 4). From 1927 on, about a third of the skins were from silver jars and almost half from whitecoats. An annual average of 966 whitecoats were traded at Pangnirtung between 1921 and 1936 (range 41 to 2,638); 406 between 1946 and 1957 (range 82 to 1,008)(McLaren 1958). According to Soper (1928) thousands of silver jars were killed annually in Cumberland Sound, their skins either used as undergarments or sold to traders. Special journeys were made to particular areas to hunt them (e.g. an island near Brown Inlet; Haller *et al.* 1967). There appears to have been some increase in the number of skins traded between the 1930s and the 1950s, judging by the annual average of 5,267 for the years 1958-59 to 1962-63 (Haller *et al.* 1967: their Table 16), which however may include some skins from other species. A police officer at Pangnirtung estimated that the skins of about 60% of the ringed seals taken in that area in 1957 were traded (Pangnirtung RCMP Report, July 1957). The fur trade records at Pangnirtung for the period 1962-65, when there was high commercial demand for sealskins, indicate yearly sales of 6,331, 8,803, 11,341 and 12,342 ringed seals, of which about 35% were silver jars and the rest common jars (Haller *et al.* 1967: their Table 14; also see our Table 3). Haller *et al.* (1967) estimated that about 1,000 ringed seal skins per year were used for domestic purposes by the Inuit of Cumberland Sound.

The estimated annual catches of ringed seals in 1981-83 were 4,590 for Broughton Island, 1,887 for Iqaluit and 4,937 for Pangnirtung (Stewart *et al.* 1986). An additional 1,051 seals to account for the takes at outpost camps (from BRIA 1983, assuming all to have been ringed seals) would give a total secured catch of some 12,465 per year in this region.

Hudson Strait and Ungava Bay

Catches at the NWT settlements of Cape Dorset and Lake Harbour (Qimmirut) (Fig. 5, Table 3) and the northern Quebec settlements of Salluit, Kangiqsujuaq, Quaqtaq, Kangirsuk, Aupaluk, Tasiujaq, Kuujjuaq, Kangiqsualujjuaq and Killiniq (Fig. 6, Table 4) are included in this region.

Lake Harbour and Cape Dorset are among the major ringed seal hunting settlements in the eastern Canadian Arctic, judging by trade data (Table 3; Smith and Taylor 1977) and the re-

Table 4. Reported or estimated catches of ringed seals by the Inuit of northern Quebec. Where catches refer to more than one year, the values given are annual means over the specified period.

Settlement	Period	No. of seals	Source
Kuujjuarapik	1941-72	1275/3446 (14)[a]	Smith (1975)
	1973-75	1210	NHRC (1980)
	1976-80	1899	Sinaaq (1992)[b]
	1985	510	Makivik (1986)
	1985	1899	Makivik (1986): GHL[c]
	1990	2002 I	NRS-Urbanisation (1990)[d]
Inukjuak	1941-72	1001/3977 (29)[a]	Smith (1975)
	1973-75	2322	NHRC (1980)
	1976-80	2081	Sinaaq (1992)
	1985	1135	Makivik (1986)
	1985	2081	Makivik (1986): GHL
	1990	2078	INRS-Urbanisation (1990)
Povungnituk	1941-72	419/1395 (23)[a]	Smith (1975)
Akulivik	1973-75	1207	NHRC (1980)
	1976-80	675	Sinaaq (1992)
Salluit	1973-75	1583	NHRC (1980)
	1976-80	1749	Sinaaq (1992)
Kangiqsujuaq	1973-75	4809	NHRC (1980)
	1976-80	2665	Sinaaq (1992)
	1985	864	Makivik (1986)
Quaqtaq	1973-75	895	NHRC (1980)
	1976-80	617	Sinaaq (1992)
Kangirsuk	1973-75	1122	NHRC (1980)
	1976-80	401	Sinaaq (1992)
Aupaluk	1976-80	175	Sinaaq (1992)
Tasiujaq	1973-75	213	NHRC (1980)
	1976-80	219	Sinaaq (1992)
	1985	104	Makivik (1986)
	1985	219	Makivik (1986): GHL
Kuujuaq	1973-75	752	NHRC (1980)
	1976-80	492	Sinaaq (1992)
Kangiqsualujjuaq	1973-75	635	NHRC (1980)
	1976-80	691	Sinaaq (1992)
	1985	124	Makivik (1986)
	1985	691	Makivik (1986): GHL
Killiniq	1973-75	789	NHRC (1980)
	1976-80	591	Sinaaq (1992)
Chisasibi	1973-75	0	NHRC (1980)

Table 4, cont.

	1976-80	14	Sinaaq (1992)
Umiujaq[e]	1990	762	INRS-Urbanisation (1990)
TOTALS:			
	1973-75	15537	NHRC (1980)
	1976-80	12269	Sinaaq (1992)
	1985	2737	Makivik (1986)
	1985	7555	Makivik (1986): GHL
	1990	4842	INRS-Urbanisation (1990)

[a] Average number of sealskins traded/Maximal number traded in one year (Number of years with records).

[b] Data from JBNQNHRC (1988).

[c] Guaranteed Level of Harvesting for the Inuit of Quebec established in 1985.

[d] Total catches of seals are presented in this study; ringed seal component was calculated assuming that 96% of the catch was ringed seals.

[e] This community was created after the study period in Makivik (1986) and Sinaaq (1992).

sults of harvesting studies (Stewart *et al.* 1986, Donaldson 1988). Ringed seals provided about two thirds of the "game calories" for residents of Lake Harbour during the late 1960s (Kemp 1971). In the 12-month period from February 1967 to February 1968, an isolated camp with five nuclear families on the north-central shore of Hudson Strait at North Bay took 400 ringed seals (Kemp 1975). Most or all of the products of this hunting were consumed locally. The 1981-83 annual averages were 2,071 for Cape Dorset and 1,527 for Lake Harbour (Stewart *et*

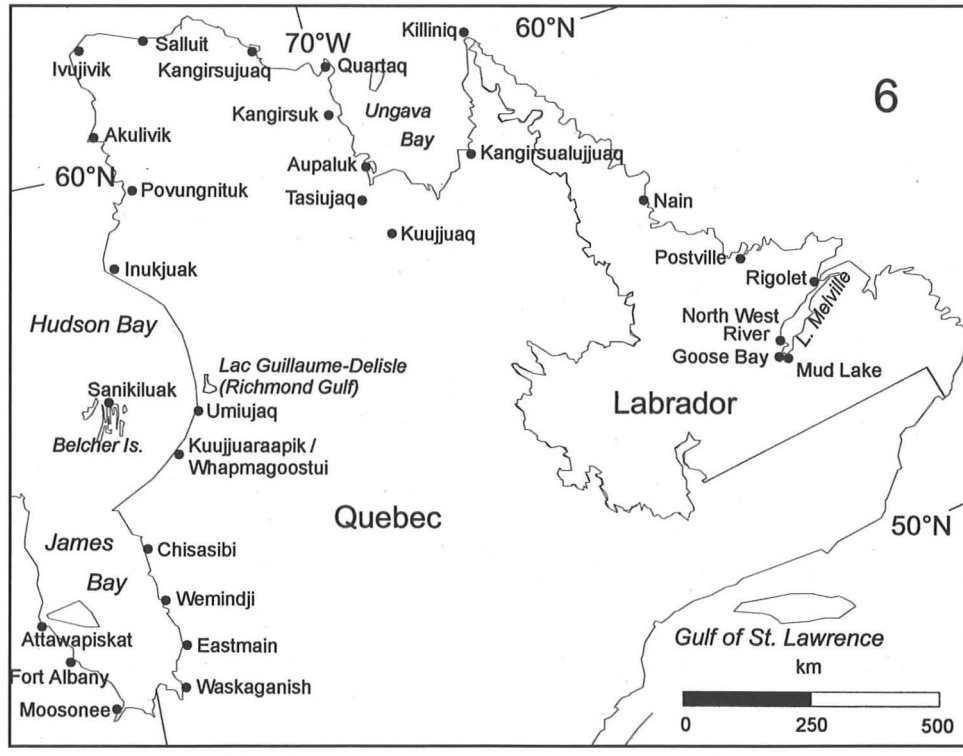

Fig. 6
Map of Labrador and northern Quebec.

al. 1986), plus 276 seals for their outpost camps in 1982 (BRIA 1983).

The settlements on the south shore of Hudson Strait all take substantial numbers of ringed seals although Kangirsujuak (formerly known as Wakeham Bay or Maricourt) and Salluit (formerly Sugluk or Saglouc) seem to take many more than the settlements situated along the shores of Ungava Bay (Table 4; also see Stewart *et al.* 1986: their App. 4). Hunting returns for Ivujivik (formerly Wolstenholme), an active seal hunting community at the west end of Hudson Strait, are not included in the official statistics given in Table 4 or in Stewart et al. (1986). The people there have consistently refused to participate in harvest studies, as have about half of the hunters at Salluit (Boulva 1981). Estimated annual catches at Ivujivik increased from about 1,000 in 1946-61 to 1,500-2,500 in 1962-64 and close to 4,000 seals in 1967 (Roy 1971). More than 80% of the catch consisted of ringed seals.

Rough estimates of annual landed catches of ringed seals in the late 1970s and 1980s along the south coast of Hudson Strait, including Ungava Bay, would be: Ivujivik 3,000, Salluit 2,000, Kangirsujuaq 1,000-2,000, Quartaq 500, Kangirsuk 250-500, Aupaluk 150, Tasiujaq 250, Kuujjuaq 250-500, Kangirsualujjuaq 500-750 and Killiniq 500-750. The total would therefore be about 8,500-10,500. Adding about 4,000 to account for the settlements on southern Baffin Island, the total for this region is in the order of 13,000-15,000.

Hudson Bay and Foxe Basin

This region includes settlements all round the shores of Hudson and James bays and Foxe Basin, starting in the northeast at Akulivik and going clockwise to Igloolik (Figs 5,6 and 7). Smith (1975) summarized the available information on catches in Hudson and James bays based on sealskin trade records, and harvesting studies in the 1970s and 1980s provide estimates of secured catch that are independent of the sealskin trade (Tables 4 and 5; also see Stewart *et al.* 1986). Smith (1975) identified 1963 as the year with the highest number of sealskins traded in Hudson Bay overall. He increased the grand total of 11,828 by 26% to account for seals that were killed but not recovered and for untraded skins (based on the reasoning given in Smith (1973b:49) in the context of Home Bay catches), giving an estimated total kill of 14,900 that year.

Judging by data from the sealskin trade and harvest studies, the settlements of Coral Harbour and Repulse Bay on the west side of Hudson Bay (Tables 3 and 5), Igloolik in northern Foxe Basin (Table 3) and Inukjuak, Kuujjuarapik and Sanikiluak (listed as "Belcher Islands" in Smith 1975) in eastern Hudson Bay (Tables 3 and 4) have consistently taken large numbers of ringed seals (also see Smith and Taylor 1977, Stewart *et al.* 1986). The traditional hunting range of the Inuit in eastern Hudson Bay included most of James Bay and the offshore islands to the north (Schwartz 1976).

Ringed seal catches appear to have declined considerably at some settlements in western Hudson Bay since the 1960s (Table 5). For example, only some 800 ringed seals were taken at Arviat (Eskimo Point) in 1976-77 compared with an estimated peak catch of about 3,000 during the 1960s and early 1970s (McEachern 1978). The catch evidently continued to decline, with much lower estimates in the 1980s (Gamble 1984, 1987a, 1987b; see Table 5). For the Keewatin region as a whole, including the seven communities of Baker Lake, Chesterfield Inlet, Coral Harbour, Arviat, Rankin Inlet, Repulse Bay and Whale Cove, the total catches of ringed seals in those same years were roughly 2,000, 1,100, 2,500 and 2,400 (Gamble 1984, 1987a, 1987b), whereas the annual average number of skins traded in 1941-72 was about 3,750, with a maximum one-year total of almost 9,000 (Table 5; Smith 1975). An interview program at Repulse Bay in 1973 revealed that about 1,300 ringed seals were taken that year (Müller-Wille 1978) - two to three times the mean value for that settlement in the mid-1980s (Table 5).

Ringed seals are rarely taken in southern Hudson Bay, but the James Bay Cree have traditionally taken small numbers (Table 5 - Attawapiskat and Fort Albany; Table 6). About 150 skins were traded per year at the James Bay posts between 1941 and 1972 (420 in the high-

Table 5. Catches of ringed seals at settlements in the Keewatin region of the NWT in western Hudson Bay and on the Ontario coast of southern Hudson Bay. References are: 1, Smith (1975); 2, McConnell (1971); 3, Gamble (1984); 4, Gamble (1987a); 5, Gamble (1987b). Abbreviations of settlement names are: EP, Eskimo Point (Arviat); RI, Rankin Inlet; RB, Repulse Bay; CI, Chesterfield Inlet; CH, Coral Harbour; WC, Whale Cove; BL, Baker Lake; AP, Attawapiskatt; FA, Fort Albany. Although species were not always specified in the source, it can be assumed that more than 95% of the skins traded were from ringed seals.

Yrs	Ref.	EP	RI	RB	CI	CH	WC	BL	AP	FA	Total
1941 -72[a]	1	277/ 873 (20)	407/ 1441 (11)	625/ 1689 (25)	271/ 950 (17)	1091/ 1819 (14)	1072/ 2000 (5)	-	25/ 71 (9)	1/ 3 (4)	3769/8846
1967	2	-	500	-	500	-	1500	-	-	-	2500
1964-68	2	-	-	-	-	-	-	-	-	-	2200-3000
1981-82	3	411	452	124	46[b]	821	124	-	-	-	1978
1982-83	3	244	449	212	137	-	50	1	-	-	1093
1983-84	4	516	414	553	43	828	106	6	-	-	2466
1984-85	5	234	406	850	40	587	232	-	-	-	2349
Mean, 1981-85[c]		351	430	435	66	745	128	4	-	-	2159

[a] Average number of sealskins traded/Maximal number traded in one year (Number of years with records).

[b] Jan., Feb., Aug. & Sept. 1982 (no data for 1981).

[c] Calculated only from the data extracted from Gamble (1984, 1987a, 1987b).

est-catch year) (Smith 1975). The estimated total catch in the early 1970s by the five Cree settlements in Quebec was a little more than 900 per year, and this seems to have declined to about 550 in the mid-1970s (Table 6). The highest catches were at Chisasibi (formerly Fort George) and Kuujjuarapik (Great Whale River).

In northern Foxe Basin ringed seals have been taken in fairly large numbers at Igloolik and somewhat smaller numbers at Hall Beach (Stewart *et al.* 1986, Donaldson 1988). Based on RCMP data, Bradley (1970) reported annual sealskin sales at Igloolik of 670 to 3,914 between 1964-65 and 1968-69. He added 8% for hunting loss (see below) and 20% for domestic consumption to estimate total takes. The total estimated annual catch of ringed seals for Igloolik, Hall Beach and their outpost camps during the early 1980s was about 2,200 (1,386, 740 and 96, respectively; Stewart *et al.* 1986, BRIA 1983).

A crude estimate for the entire region of Hudson Bay and Foxe Basin in the 1980s, based primarily on data in Tables 4-6 and Stewart *et al.* (1986), would be in the order of 12,500-14,000 ringed seals per year (including 5,000-5,500 for eastern Hudson Bay, 500-1,000 for the James Bay Cree, 2,500 for Sanikiluaq, 2,500 for Keewatin and 2,000-2,500 for Foxe Basin).

Table 6. Ringed seal catches by the James Bay Cree of northern Quebec.

Period	Whapma-goostui	Chisasibi	Wemindji	Eastmain	Waska-ganish	Total	Source
1941-72[a]	No data	73/235 (6)	37/96 (4)	0	12/18 (3)		Smith (1975)[b]
1972-75	94	562	225	10	17	908	JBNQNHRC (1978)
1975-76	224	252	67	0	2	45	JBNQNHRC (1978)
GLH[c]	135	404	166	10	8	723	JBNQNHRC (1987)
						657	Weihs *et al.* (1993)

[a] Average number of sealskins traded/Maximal number traded in one year (Number of years with records).
[b] Smith's (1975) Table 3 includes under "James Bay" the catch data for Attawapiskat and Moosonee, both on the Ontario coast of the bay (see our Table 5 and Fig. 6). Also, Smith refers to Chisasibi as Fort George, to Wemindji as Paint Hills and to Waskaganish as Rupert's House.
[c] Guaranteed Harvesting Level for northern Quebec Cree established in 198?.

Labrador

Seal hunting was a traditional activity all along the Labrador coast (Brice-Bennett 1977). In many areas the ringed seal was the most important seal species for household consumption. Ringed seal meat was a popular local food (Mackey 1980-81a, 1980-81b, 1980-81c), and skin sales made a valuable addition to the local economy at least in the 1970s and early 1980s (Brice-Bennett 1977, Boles *et al.* 1983). The largest reported catches of ringed seals in the early 1980s were in Nain, Hopedale and North West River (Stewart *et al.* 1986: their App. 6; Fig. 6). Totals for seven settlements between 1980 and 1984 ranged to as high as 1,925 in 1981, the only year with data for all seven sites. An estimated 650-900 ringed seals were taken per year in Lake Melville (mainly by people from Rigolet and North West River) during the late 1970s and early 1980s (Boles *et al.* 1983; Table 7).

Without indicating the source, Stenson (1994) reported annual catches of 1,036-2,561 seals, other than harp and hooded seals, in the Newfoundland/Labrador region from 1988 to 1992. Most of these were said to have been taken in Labrador rather than Newfoundland, and 90% (= 932 to 2,305) or more of them were assumed to have been ringed seals (Stenson 1994). According to Stewart *et al.* (1986), the catch data from northern Labrador "are a collation of commercial sales and estimates of the domestic harvest made by Federal Fisheries officers."

Central Canadian Arctic (Kitikmeot)

The Kitikmeot region includes seven main settlements: Bay Chimo/Bathurst Inlet, Cambridge Bay, Coppermine, Gjoa Haven, Holman (also formerly Read Island), Spence Bay and Pelly Bay (Figs 7 and 8, Table 3). Judging by sealskin returns through the 1970s, Coppermine and Holman have always been among the leading ringed seal hunting communities in Canada (also see Smith and Taylor 1977). From 1973 to 1982, these two settlements sold an average annual total of 4,150 ringed seal skins (Stewart *et al.* 1986: their App. 8).

In Gjoa Haven, Spence Bay and Pelly Bay, the ringed seal has long dominated the local economy (Villiers 1969) although according to

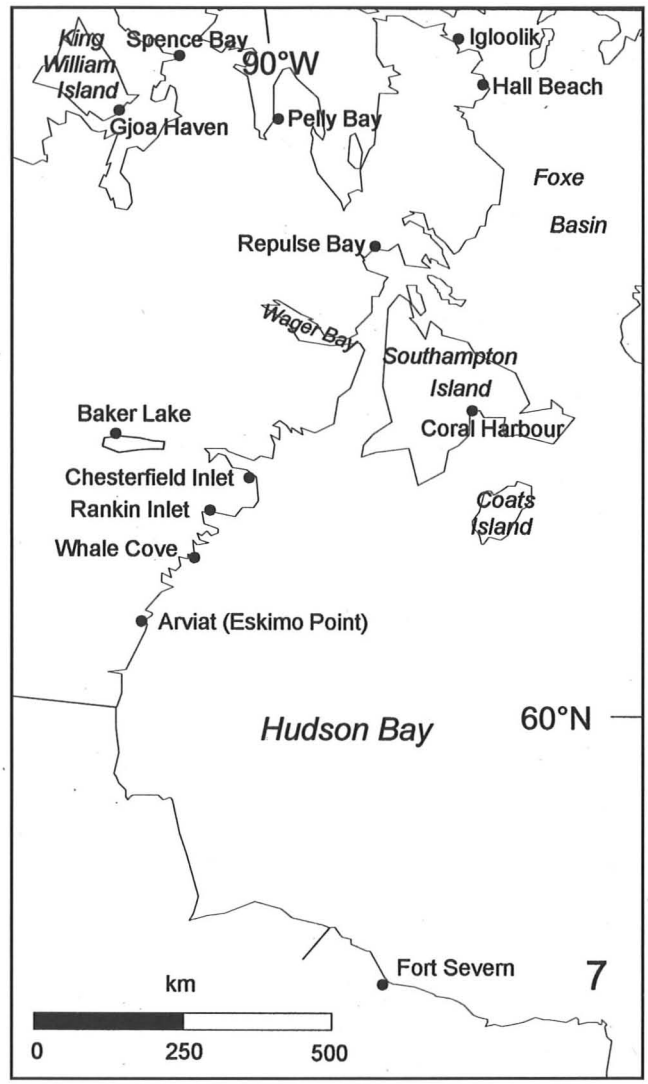

Fig. 7
Map of southern and western Hudson Bay, Foxe Basin and a portion of the central Canadian Arctic (as defined in this paper).

Treude (1975), the decline of caribou in the mid-1930s forced the Netsilik Inuit of this region to intensify their hunting of ringed seals for subsistence. Small numbers of ringed seal skins were traded at Fort Ross before World War II and at Spence Bay after the war: 111 in two years at Fort Ross (1939-40, 1940-41); 1,056 in nine years at Spence Bay (1949-50 to 1957-58) (Villiers 1969: his Table 14). This fairly low rate of sales continued until the early 1960s, when it increased to about 2,300 per year for the three settlements combined (Villiers 1969: his Table 16). Catches in 1971 were estimated as 600 in Gjoa Haven, 1,200 in Spence Bay and 500 in Pelly Bay (Treude 1975). The three settlements, combined, produced an annual average of only about 630 ringed seal skins between 1973 and 1982 (Stewart *et al.* 1986: their App. 8).

In one year, from 1961-62 to 1962-63, the hunters at Holman increased their sale of sealskins "with little effort" from 362 to 1,726 (Abrahamson *et al.* 1964:87). A quarter of the 1,726 were silver jars. Abrahamson *et al.* (1964: 93) estimated that the actual secured catch at Holman in 1962-63 was about 2,500 seals.

A study in the early 1980s provided reliable data on ringed seal catches, based on monthly interviews with approximately 75% of the hunters in the seven Kitikmeot settlements (Jingfors 1984; also see Stewart *et al.* 1986: their App. 3). The total reported catch between October 1982 and November 1983 was 4,106 seals, broken down as follows: Bay Chimo 26, Cambridge 112, Coppermine 549, Gjoa Haven 371, Holman 1,665, Pelly Bay 339 and Spence Bay 1,044. No attempt was made to estimate total catches from these reported values, but they are sufficient to demonstrate that Holman remained a major center for ringed seal hunting. Smith and Wright (1989) cited Smith (1973a) to document their claim that Holman had the highest take per capita of ringed seals in the NWT. The reported catches for Holman were 1,115 in July 1986-June 1987, 370 in July-December 1987, 1,076 in 1988 (Fabijan 1991a), 569 in 1989 (Fabijan 1991b) and 1,372 in 1990 (Fabijan 1991c). These numbers indicate a substantial decline in catch when compared with the trade statistics for Holman in the 1960s and 1970s (Table 3; also see Smith and Taylor 1977).

Trade data for 1973-82 indicate an average annual catch of at least 5,000 ringed seals in the Kitikmeot region (4,869 skins traded; Stewart *et al.* 1986: their App. 8), and catches reported by Jingfors (1984; see Stewart *et al.* 1986: their App. 3), totaling 4,106 and uncorrected for incomplete hunter response, suggest that 5,000 is a reasonable figure for the total secured catch in

Table 7. Data on trade and catch of ringed seals in Labrador, 1972-82. Source: Boles *et al.* (1983).

Year	Rigolet		North West River[a]	
	Skins traded[b]	Seals taken	Skins traded[b]	Seals taken
1972		355		268
1973		407		
1974		409		250
1975		167		188
1976		276		125
1977	111 (incompl.)	243		159
1978	321	138		101
1979	529	287	364	243
1980	438		401	
1981	351		307	
1982	236 (incompl.)	111 (spring only)	171	

[a] Catches for 1972-79 include Goose Bay and Mud Lake.

[b] Data from Hudson's Bay Company.

the 1970s and early 1980s. Skin sales for 1987-94, however, averaged only 500-600 ringed seals (Table 2).

Western Canadian Arctic

For the purposes of this study, the western Canadian Arctic includes only the settlements west of Victoria Island - Sachs Harbour on Banks Island, plus the mainland sites of Tuktoyaktuk, Paulatuk and the Mackenzie Delta settlements of Inuvik and Aklavik (Fig. 8).

The average estimated catch on Banks Island between 1955-56 and 1966-67 was 947, with a one-year high of 2,600 in 1964-65 (of these totals, about 4% were bearded seals (*Erignathus barbatus*); Usher 1971:57). The declining trend noted above for Holman is at least as pronounced for Sachs Harbour (Banks Island), where close to 800 skins were traded per year between 1955 and 1973 (18 yr of reporting; Table 3) and only 74 from 1973 to 1982 (Stewart *et al.* 1986: their App. 8). Recent reported catches were 475 in July 1986-June 1987, 152 in July-December 1987, 151 in 1988 (Fabijan 1991a), 463 in 1989 (Fabijan 1991b) and 84 in 1990 (Fabijan 1991c). It is probably fair to conclude that an annual catch of only about 500 ringed seals has been made in the western Canadian Arctic in recent years.

CURRENT STATUS OF CATCH REPORTING AND RECORD KEEPING

Stewart *et al.* (1986:4-5) stated: "DFO is developing standard reporting methods but in the interim, existing harvest estimates are the best available quantitative index for northern utilisation of seals." Seal catches are not reported in the "Annual Summary of Fish and Marine Mammal Harvest Data for the Northwest Territories", which has been published by the Department of Fisheries and Oceans since 1991 (Anon. 1991 *et seq.*). No official government statistics are published on seal catches in the Canadian Arctic and Subarctic.

In the absence of a formal catch-monitoring system, harvest studies have been done on a piecemeal, regional basis. These generally have depended on a combination of hunter recall surveys, calendar diaries kept by participating hunters, trade data and direct observations (Stewart *et al.* 1986, Usher and Wenzel 1987). Such programs have been initiated in relation to land-claim settlements, including the James Bay and Northern Quebec Agreement of 1975, the Western Arctic (Inuvialuit) Land Claim of 1984 and the Eastern Arctic (Nunavut) Land Claim of 1993.

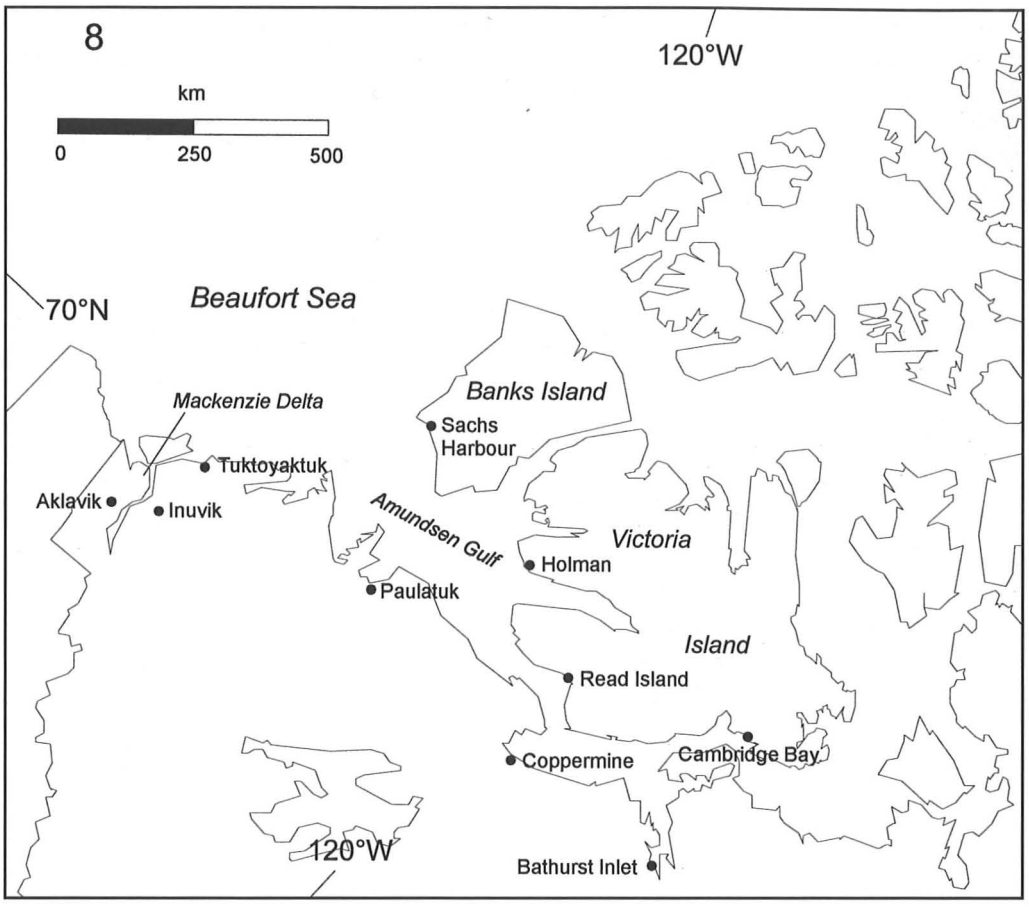

Fig. 8
Map of western Canadian Arctic and a portion of the central Canadian Arctic (as defined in this paper).

The James Bay and Northern Quebec Agreement established "guaranteed harvest levels" (GHLs) for species including the ringed seal. GHLs were to have been based on harvest studies carried out in 1973-80. The GHL for Inuit of northern Quebec is 7,555 ringed seals (Makivik Corporation 1986), that for the Cree of northern Quebec 723 (JBNQNHRC 1987). Before any other use is contemplated, these specified levels of harvest by the Inuit and Cree must be assured. The actual reported harvest levels by the Inuit during 1973-75 and 1976-80 were about twice the GHL (Table 4).

The Western Arctic Land Claim Agreement includes provision for a harvest study. It was started after the agreement was signed and is now a continuing operation (Fabijan 1991a, 1991b, 1991c). However, the Agreement does not specify how the results are to be used, except that the harvest levels might inform compensation claims in the event of environmental damage caused by a developer. The agreement covers only six communities, of which three hunt few seals. Inuvik and Aklavik are within the Mackenzie Delta, and while some residents go out to hunt belugas (*Delphinapterus leucas*), few actively hunt seals. Tuktoyaktuk people have opportunities to work for wages. Also, situated on the fringe of the delta, they are not in good seal habitat, so their seal take is quite small. Only three Inuvialuit communities, Sachs Harbour, Holman and Paulatuk, have hunters who spend large amounts of time hunting seals.

The Nunavut Final Agreement is different. The Nunavut Territory has an area of some 350,000km^2 and encompasses Baffin Island, most of the high arctic archipelago and a large segment of the north-central Canadian mainland. It also includes the NW coast of Hudson Bay, two large islands in northern Hudson Bay (Southampton and Coats) and the Belcher Islands in eastern Hudson Bay. Nunavut has a total human population of approximately

22,000, of which about 17,500 are Inuit, concentrated mainly in 27 communities. The agreement provides for a 5-year harvest study to establish "basic needs levels," with formulae for converting the harvest study results into those levels. The harvest study began in July 1996 and is continuing.

SEALSKIN SUBSIDIES AND HUNTER-SUPPORT PROGRAMS

Programs have been in place since the early 1970s to provide monetary support for hunters and trappers in the NWT (Ames *et al.* 1988). The Incentive Subsidy Program, initiated in 1973-74, is still managed and funded by the territorial government. Hunters and trappers are paid a percentage of the market value of their produce each year, not including sealskins. The Outpost Camp Subsidy Program was introduced in 1976-77 by the territorial government. It provides grants for housing, heating fuel and transport of fuel to outpost camps. Under the Gasoline Subsidy Program, begun in 1981, the territorial government sends the hunter a check each year in the amount of 5% of the total value of his fur production (excluding polar bear hides).

Since the collapse of the market for ringed seal pelts after the EEC ban in 1982, territorial and federal agencies in Canada have taken further measures to encourage seal hunting by Inuit. The DFO began in 1982 offering hunters a premium of about C$6.00 on sealskins sold to the local HBC (Northern Stores) or co-operative shop or at auction (Stewart *et al.* 1986). To qualify, the hunter had to sell at least ten skins, then apply to the program. Payments for all sealskins sold, including the first ten, were made in lump sums at the end of the fur year (1 July to the next 30 June). Because skins were almost worthless commercially at the time (in many cases < C$1.00), and payment was deferred, often for months after the work had been completed (including the substantial effort by women to fix the skins), participation was low.

The NWT government offered an additional subsidy of C$5.00 per skin beginning in 1983-84. In 1985-86 it was specified that only ringed and harp seal skins were eligible for the subsidy. Participation remained low, and in 1986-87 only six hunters (out of a potential pool of about 110) at Clyde River applied for and received sealskin subsidies (Wenzel, unpublished data).

Stabler *et al.* (1990) refer to a program administered by the NWT Department of Renewable Resources which "advances a portion of the appraised value of the [fur] catch prior to sale." In addition, they mention an incentive program for trappers which provides subsidies for sealskin sales. An article in Nunatsiaq News (20 August 1993, p. 17) refers to a sealskin subsidy program administered by the territorial government, under which hunters "can only collect the sum once a year." Data from the NWT Renewable Resources office in Iqaluit in 1995 (J. Stevenson, NWT Renewable Resources, Iqaluit, *in litt.* to Wenzel, 24 March 1995) indicate that the numbers of sealskins against which payments were made under the Fur Incentive & Subsidy Program (later changed to Fur Price Program) were 1,517 in 1990-91, 874 in 1991-92, 1,128 in 1992-93, 1,182 in 1993-94 and 839 in 1994-95.

The NWT's Fur Price Program, begun in 1995-96, was committed to purchasing up to 5,000 sealskins directly from hunters at C$30 apiece, ostensibly for auction (J. Stevenson, *in litt.* to Wenzel, 24 March 1995). Most or all of the skins went to the sealskin tannery at Broughton Island, a subsidiary of Nunasi Corporation. Skins purchased under this program are now being sent to Nipissing, Ontario (Wenzel, unpublished data).

Another support program, called the Nunavut Wildlife Harvester Support Program, was introduced in 1995 under the Nunavut Agreement. Nunavut Tungavik and NWT Renewable Resources each contributed C$15 million. The goal was to fund up to 260 hunters across Nunavut, at up to C$7,000 apiece, with the money to be used for major equipment purchases. Hunters had to apply to their local hunters and trappers organisation, which then ranked and forwarded the applications to the regional office in either Iqaluit, Rankin Inlet or Cambridge Bay. In 1995-96, 1,167 applications were received, and 260 awards were made (22% successful applications) (Anon. 1995-96).

The Inuit of northern Quebec are eligible for the Hunter Support Program under the terms of the James Bay and Northern Quebec Agreement. The government of Quebec purchases "country food" (including seal meat) from hunters, then distributes it to beneficiaries who are unable to hunt themselves. The program also subsidises the purchase of equipment, such as boats, at the community level, to stimulate participation in hunting and increase the production of wild meat and other products (Ames *et al.* 1988).

The James Bay Cree, who take relatively small numbers of ringed seals (< 1,000 per year), are encouraged to continue their hunting and trapping through the Income Security Program established under the James Bay and Northern Quebec Agreement (Weihs *et al.* 1993).

CATCHING METHODS AND HUNTING LOSS

Ringed seal hunting has always followed a seasonal round, depending on ice conditions and seal availability. Many authors have described hunting methods in detail (e.g. Boas 1888, Manning 1944, Bissett 1968, Nelson 1969, Usher 1971, Wenzel 1991). Breathing-hole (*mauluktuk*) hunting is done from late November or early December into May. Setgun hunting was introduced by the RCMP (Mary-Rousselière and Atagutsiaq 1990) and has been used in some areas (e.g. Manning 1944 - Wager Inlet, Balikci 1964:56 - Pelly Bay, Bissett 1968 - northern Baffin Island, Wenzel, unpublished data - Clyde River). Seal hooks were used at one time in at least the Coppermine region (Damas 1972). In spring, basking seals can be stalked, sometimes using a white "shooting screen" (*taluak*) (Fig. 9). At the fast-ice edge, or floe edge, seals shot in the water are retrieved using small skiffs. In open water, hunting is done from motorized boats (usually freighter canoes) running on low power, with a rifle used to shoot seals in the water or on floating ice. In some areas, shooting is also done from shore, with a boat used for retrieval. Nets, deployed in open water or tide cracks, have been widely used in Canada (e.g. Bissett 1968, Treude 1977), but the proportion of the catch made by netting has generally not been large. At Grise Fiord, for example, only about 6% of the annual catch (1965-72) was netted even though netting was found to be about three times more efficient than the most efficient hunt, in terms of man-hours invested per seal retrieved (Riewe and Amsden 1979). Four nets are still being used at Clyde River, mainly

Fig. 9
An Inuk hunter carries his rifle and shooting screen in pursuit of a seal. (Photo: S. Leatherwood, NW Greenland, 5 June 1988)

to obtain seals for dog food (Wenzel, unpublished data).

Hunting loss can be defined as the difference between the number of animals removed from the wild population as a result of hunting and the number actually retrieved by the hunters (Usher 1976b). Catch records are generally given in one of three forms - kill, consumption or production - as defined by Usher and Wenzel (1987). Unfortunately, the distinctions have often not been recognized or accounted for, and thus many data sets are subject to ambiguous interpretation. While hunting loss may be an irrelevant consideration in many social science studies, it is an essential concern in a resource assessment study (McLaren 1958).

The shooting of seals at substantial distances is the cause of most hunting loss. The loss rate varies primarily according to seasonal changes in the specific gravity of seals (i.e. their fat content) and the salinity of surface water. Seals are fattest and the water most saline in winter, which means that the animals are much more prone to float at that season than they are during spring and summer. Seal buoyancy is directly related to the spring basking season, which in turn is related to latitude. Locality is also a factor, in that seals shot in river mouths are more likely to sink because of the relative freshness of the water there.

Few rigorous attempts have been made to estimate loss rates from field observations (see Davis *et al.* 1980: their Table 12, Miller *et al.* 1982: their Table 14). Losses of up to 60% of the seals killed during July have been recorded off southwestern Baffin Island and in southern Ungava Bay (McLaren 1958: his Table XV) and at Lake Harbour (Kemp 1971). Open-water hunting at Holman resulted in loss rates of 50% (Smith and Taylor 1977). Loss rates in Cumberland Sound ranged from about 10% on the fast ice in spring (21 May-11 June) to 28% in open water in summer (12-31 July) (Haller *et al.* 1967: their Table 17). Of Haller *et al.*'s total sample of 694 seals killed, 150 (21.6%) sank. Smith (1973b) used this value (combined with 5% for untraded skins) to correct data on secured catch in several areas. Bradley (1970) used a correction factor of only 8% for catch data in northern Foxe Basin, citing Foote (1968). During hunts in northern Foxe Basin between 29 May and 24 August, Beaubier (1970) observed 54 ringed seals secured, 15 sunk and 8 wounded but lost, for an overall loss rate of 21.7% if the wounded component is ignored, or 28.9% if wounded seals are assumed moribund. During a study at Sachs Harbour in the late 1960s, approximately one seal was killed and lost for every two secured during the spring, but the recovery rate was somewhat better in summer (one for 2.5 to 5) and much better in winter (one for 7 to 10) (Usher 1971). Riewe and Amsden (1979) sampled different phases of the hunt at Grise Fiord between 9 July and 26 September 1972, and their data indicate a 75% retrieval rate (115/154). Wenzel's (1991: his Table 4.6) composite data from Clyde River, collected during various phases of the hunt from the early 1970s to mid-1980s, indicate a maximal loss rate of 36% in summer open-water hunting.

While recognizing the extreme differences in loss rates according to season, locality and hunting technique, an adjustment of at least 10-20% should be applied to ringed seal landings to account for hunting loss (cf. Mansfield 1970:444). When possible, the loss-rate adjustment should be weighted to account for known variability, by season and capture method.

SUMMARY AND CONCLUSIONS

In the absence of unbiased time series, trends in catch rates in Canada are difficult to characterise and interpret. The export value of sealskins has had an undeniable effect on the numbers of sealskins traded by hunters in the Canadian Arctic (Foote 1967, Wenzel 1991). However, it cannot be assumed that changes in skin sales have been mirrored by changes in removal rates or domestic consumption of seal products. For example, Wenzel (1991:70-74) analyzed the relationship between skin sales and catches by Clyde River hunters from the 1960s to mid-1980s. Until 1975, the volume of skin sales was about 25% less than the landed catch. For a brief time in the mid-1970s nearly all the skins obtained were sold, amounting to about 3,400. Following the steep protest-linked decline in skin prices during 1976-78, however,

the catch fell to its level of the early 1970s - about 2,000 seals per year, while trade volume steadily declined. The threshold level of some 2,000 seals was viewed by Wenzel (1991) as reflecting the subsistence need of the community, i.e. the local demand for seal meat and other products. Thus, as long as the hunters could afford to go sealing, they would try to approach this level of take regardless of skin prices.

The foregoing regional summaries provide a basis for judging the approximate scale of ringed seal removals in Canada as recently as the 1980s. Summing the estimates for all areas, the aggregate total is between 50,000 and 65,000 seals secured per year. Taking account of hunting loss, the lower bound would approach 60,000 and the upper bound 80,000. We conclude that the present-day annual kill of ringed seals in Canada is probably in the high tens of thousands. The kill almost certainly exceeded 100,000 in some past years when both the value of skins and the local household demand for seal products were high.

Local depletion of ringed seals may have occurred within the hunting radii of communities where exploitation has been intensive (Mansfield 1970). The Royal Commission on Seals and the Sealing Industry in Canada cautioned that "the catches made in some areas prior to 1983 [may] have exceeded the sustainable yield, and the decline in sales of skins apparent in some areas in the mid-1960s [i.e. during a period of increasing sealskin prices] might be a sign of this" (Malouf 1986:161). If this were the case, the commission reasoned, "resumption of catching at the 1970s level might see the collapse of some of these stocks." While past reductions in numbers of ringed seals in particular areas may well have been due to excessive offtake by hunting, the effects of natural variability in year-to-year production and pup survival cannot be ignored. Extreme annual variation in the density of ringed seals in the eastern Beaufort Sea and Amundsen Gulf, apparently due to differences in weather and ice conditions, has been demonstrated by survey and other data (Smith and Stirling 1975, Stirling *et al.* 1977, 1982, Smith 1987, Harwood and Stirling 1992).

The Royal Commission acknowledged that great uncertainty surrounded the status of ringed seals throughout their range in Canada (Malouf 1986), and this remains true more than a decade later. After analyzing kill rates and population estimates from surveys of fast-ice habitat, Finley *et al.* (1983) concluded that the hunting by Inuit off eastern Baffin Island was sustained, in part, by seals produced in the offshore pack ice of Baffin Bay (also see Miller *et al.* 1982). Studies of ringed seal production in the pack ice may be necessary for a proper assessment of the sustainability of removal rates in western Greenland and eastern Canada.

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