

# ASPECTS OF THE POLAR BEAR HARVEST IN THE NORTHWEST TERRITORIES, CANADA

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*Abstract:* We analyzed the age, sex, and chronology of the polar bear (*Ursus maritimus*) harvest in the Northwest Territories (NWT) from 1979-80 to 1989-90. The mean annual harvest during that period was 517 with a current quota of 617. Sex and age information was obtained on approximately 90% of the total kill. The harvest was selective for males (63%). The mean age, sex ratio, and age composition varied according to area, type, and month of harvest. Inuit hunters accounted for 88.8% of the harvest, 5.7% was taken by non-native sport hunters, 5.2% of the harvest was killed in conflicts with humans, and 0.3% was killed through illegal or unknown factors. Sport hunting increased by a factor of 2 to 3 times over the sample period and the number of hunts comprised 10.6% of the allowable quota. Forty-seven percent of the harvest occurred in the spring. Accurate reporting of the sex composition of the harvest is required to determine sustainable harvest quotas. Management of polar bears in the NWT is based on inventory studies, harvest sex ratio, and population modelling.

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The polar bear is a species unique to the Arctic yet known throughout the world. The Government of the Northwest Territories (GNWT) has a special obligation in the management of this unique resource, as a large proportion of the world's polar bears are within its jurisdiction, or shared with it (Stirling 1988).

The polar bear is economically important and ranks highest of all furbearers in the NWT in average pelt price (NWT Department of Renewable Resources Fur Harvest Statistics). The polar bear fur harvest currently brings between 500,000 to 600,000 dollars per year into the Arctic communities. Outfitting and guiding non-Inuit polar bear hunters average another 660,000 dollars (unpubl. data). In some communities the meat is also consumed. A conservative annual replacement cost for this meat would be about 150,000 dollars. Guiding tourists for viewing polar bears and other wildlife is a growing industry in the NWT. A conservative estimate of the tourism value of polar bears to the NWT is 200,000 dollars per year. The total monetary value of polar bears is close to 1.7 million dollars annually.

Wildlife legislation in Canada did not address polar bear harvesting until 1935 when a hunting season from 1 October through 31 May was imposed. In 1949, hunting was restricted to native people (Urquhart and Schweinsburg 1984). Quotas for polar bears were introduced in 1967 and were based on the fur records from several preceding years. Currently polar bears are listed by the Committee for International Trade of Endangered Species (CITES) in Appendix II and are classed as "Vulnerable" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The International Agreement on the Conservation of Polar Bears was signed by all 5 arctic nations (Stirling 1988).

Polar bear management in NWT is based on

inventory studies, harvest sex ratio, and population modelling (Taylor et al. 1987). Accurate recording of the harvest is essential to the species' management. In particular, the sex composition of the harvest is a vital component in calculating the sustainable harvest. This paper summarizes the polar bear harvest over the last 30 years and focuses on specific aspects of the harvest from 1979-80 to 1989-90 in NWT.

We would like to thank the polar bear hunters of the NWT for taking the extra effort to provide the samples and data we requested. Thanks to the many DRR staff who have laboriously filled out data sheets and packed up boxes of polar bear jaws. Special thanks to A. Sutherland whose meticulous record keeping, attention to detail, and tenaciousness in tracking down missing information has provided an exceptionally well organized data base. The people at the CWS polar bear project in Edmonton have provided much support, assistance, and cooperation over the years. Finally, thanks to S. Schliebe and 2 anonymous reviewers for comments on an earlier manuscript.

## METHODS

### Harvest Monitoring

In the early 1900s accurate information on the total kill of polar bears did not exist. Records from the Hudson Bay Company provided minimum estimates of the fur harvested and sold. The Royal Canadian Mounted Police detachments across the arctic collected some information on numbers of bears killed. Harington (1961) summarized the polar bear harvest in Canada from 1950 to 1960. The Canadian Wildlife Service (CWS) also collected harvest data in the 1960s

and 1970s in conjunction with research studies (Smith and Jonkel 1975, Smith and Stirling 1976, Smith 1977).

### Data Collection

In the 1976–77 hunting season, the GNWT, Department of Renewable Resources (DRR) initiated a collection and monitoring program for the polar bear harvest within its jurisdiction. By the 1979–80 season, the program was producing consistent results. The present harvest analysis is based on 11 years of data collected through this program from 1979–80 to 1989–90.

The harvest program was organized to account for quota and nonquota polar bear kills. All bears taken were required to have a tag attached to the hide. Information was collected by Renewable Resource Officers in each community on tags used, date of kill, location, age, sex, and family status. Ages were determined from premolars extracted from the lower jaws (Stirling et al. 1977). Much of the information requested was not required by law, so initial participation was encouraged by a public relations program and by offering small rewards for data returns; \$10.00 for each lower jaw and \$25.00 for eartags from tagging studies. Compliance with the program became routine and returns with complete information averaged 90% (range 86% to 93%) during the sampling period.

### Data Analysis

We divided the harvest into 4 major types for age and sex comparisons: regular, special, sport, and problem. The regular harvest is taken solely by Inuit and was not specifically targeted at any particular age or sex class. In contrast, the special quota was introduced primarily to select for large adult males. Sport hunting was also expected to favor trophy size males (Amstrup et al. 1986). In comparison, bears killed in conflict with humans (problem bears) tend to be younger animals (Stenhouse et al. 1988). Bears that were killed for reasons not fitting into any of the preceding categories consisted of animals killed illegally or for unknown reasons; these were lumped into a category referred to as miscellaneous.

Twelve populations, within or shared with the NWT, have been identified for management purposes (Fig. 1) (Polar Bear Technical Committee minutes 1988). Analysis of variance was used to examine the affect population, harvest type, and month had on the mean age of harvested bears. Where differences were indicated, means were examined using Duncan's Multiple Range test. To identify differences in sex composition related to harvest type, population, and

month of kill, we compared 95% confidence intervals (Fleiss 1981). In the regular harvest category, trends in mean age, maximum age, percent female, and percent subadults were examined for each population over the sample period using linear regression. Statistical tests were by convention considered significant if  $P \leq 0.05$ .

The GNWT DRR license year runs from 1 July to 30 June. For example, bears killed in the 1982–83 season were killed between 1 July 1982 and 30 June 1983. The polar bear hunting season runs from 1 October to 31 May within that license year. The harvest in this paper was summarized by hunting season such that the 86 season refers to the 1985–86 hunting season.

## RESULTS

### Annual Harvest

*Harvest Numbers.*—From a harvest of 320 bears in 1954, the kill increased to almost 700 in 1967–68 (Fig. 2). The harvest dropped dramatically with the introduction of quotas but slowly rose to another peak in 1982–83. Over the period of 1 July 1980 to 30 June 1990, 6,279 polar bears (mean annual harvest of 571) were reported killed in the Northwest Territories. Of that harvest, 88.8% was attributable to indigenous Inuit hunters (10.3% special quota and 89.7% regular quota), 5.7% to non-native sport hunters, 5.2% to bears killed in defense of life or property (problem bears), and 0.3% to illegal and unknown factors. The mean annual harvest varied considerably among populations (Table 1).

*Sport Hunts.*—Sport hunting for polar bears began in 1969–70 with 3 hunts and gradually increased to an average of 66 over the last 5 seasons (85–86 to 89–90) (Fig. 3). The maximum number of sport hunts in any one year was 83 and occurred in the 1987–88 season. Over the sampling period the success rate varied from 30% in 1979–80 to 91% in 1985–86 with an average over the last 5 seasons of 74%. During this same time period the proportion of quota tags used for the sport hunt averaged 10.6% annually. There is substantial economic return to the community from these hunts both to the Hunters' and Trappers' Association/Committee and the local economy. The cost of a polar bear sport hunt in 1989–90 was approximately \$15,000 Canadian. About two-thirds of that remained in the community.

*Problem Bears.*—Over the reporting period 332 polar bears were killed in conflicts with people; 78 of these (24%) were included in community quotas. The annual

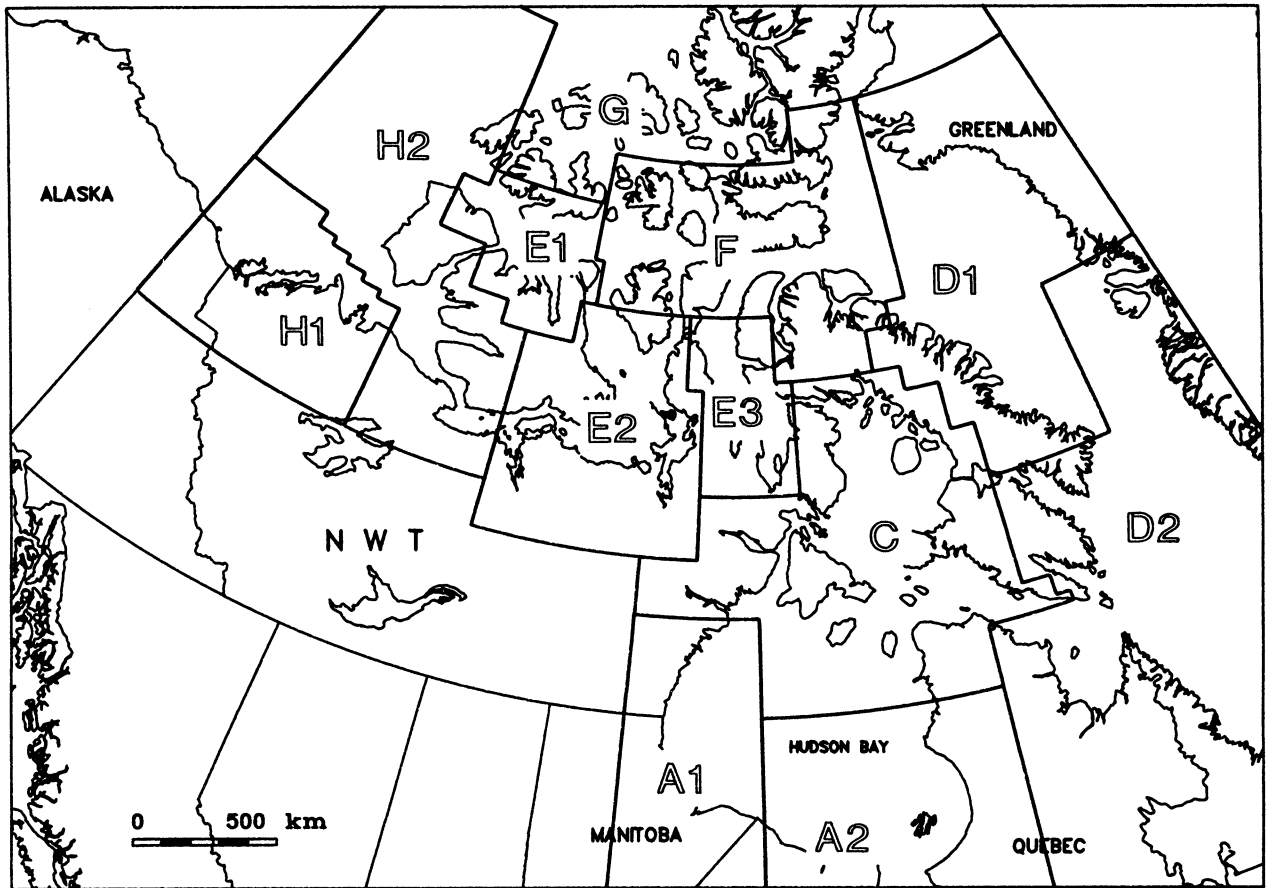


Fig. 1. Polar bear populations within or shared with Canada.

number of problem bears ranged between 22 and 42, with a seasonal mean of 30.2. Fewer problem bears were killed per season during the last half of the monitoring period. During the last decade the number of these bears included in community quotas steadily increased from a low of 2% in 1979–80 to over 51% in 1987–88.

**Family Groups.**—Most bears killed in the quota harvest were single animals, but occasionally (5%) bears were taken in family groups (female and cubs). From all populations, an average of 10 family groups were taken annually. Populations C, D1, and F accounted for 60% of these family groups. The other 9 populations harvested a mean of less than 1 family group each per year. Reliable reporting of family groups is not consistent and we consider this to be a minimum estimate.

#### Sex Composition

The sex composition of both native harvest classes favored males (regular harvest: 0.61 male, special

harvest: 0.63 male) and were not significantly different ( $P > 0.05$ ) from each other (Fig. 4). The sex ratio of the problem kill was more skewed toward males but was not significantly different from that of the native harvest. However, the sport harvest, which was composed of 81% males, was significantly different ( $P < 0.05$ ) than all other harvest categories. Each harvest category was significantly different ( $P < 0.05$ ) in sex composition from a sample (51% female,  $n = 6,018$ ) of captured bears 1 year or older from all locations across the Arctic (CWS and DRR, unpubl. data). This capture sample was not different from a 1:1 sex ratio. The proportion of females taken in the harvest was highest in the D1 population and lowest in A1 (Table 1). Sex composition of the harvest from all populations but D1 and G was significantly lower ( $P < 0.05$ ) than 50% females.

#### Age of Harvest

The mean age of all 4 major harvest types was significantly different ( $F = 20.17$ ; 3, 1,462 df;  $P =$

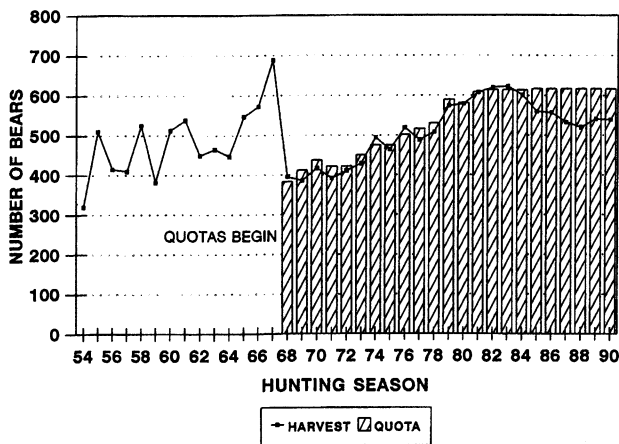


Fig. 2. Numbers of polar bears killed in NWT from 1953-54 to 1989-90. (Modified from Urquhart and Schweinsburg 1984).

0.0001): regular, 6.5 years; special, 7.3 years; problem, 5.3 years; and sport, 9.0 years. The mean age of bears killed in the regular harvest from population E1 (7.6 years) was significantly higher ( $F = 4.19$ ; 11, 4513 df;  $P = 0.0001$ ) than that of bears harvested in population A1 (5.4 years) (Table 1). All other populations showed no significant difference in mean age of the regular quota harvest. To examine the age distribution of the harvest we grouped bears into 3

Table 1. Age and sex composition of the polar bear harvest from 12 populations in NWT. Data not from NWT was averaged for the most recent 5-year period reported from Born (1988), Schliebe (1988), and Calvert (1988).

Polar bear population	Mean annual harvest	Mean age (n)	Percent adult	Percent female
A1	46	5.4 (352)	64.2	28.8
A2	68	5.9 (194)	46.8	31.3
C	142	6.6 (1,257)	50.3	39.4
D1	44	5.9 (432)	53.3	46.3
D2	60	7.1 (263)	40.1	35.0
E1	19	7.6 (84)	37.7	36.6
E2	37	7.2 (341)	42.3	42.8
E3	40	7.2 (282)	48.6	41.5
F	101	7.2 (745)	43.9	32.4
G	43	6.4 (14)	50.0	40.0
H1	64	7.1 (318)	48.1	34.5
H2	38	6.6 (232)	47.7	41.3

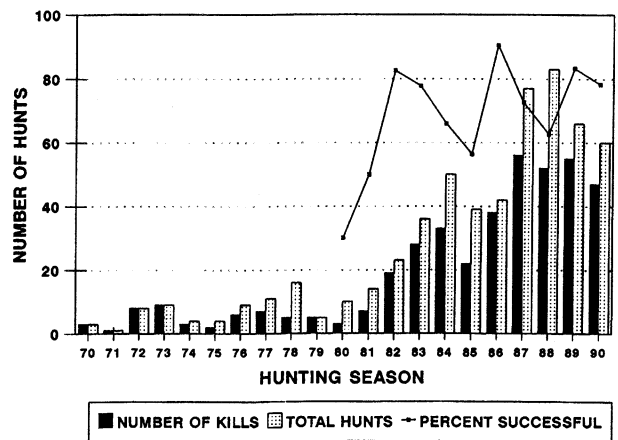


Fig. 3. Sport hunts occurring in NWT from 1969-70 to 1989-90.

age classes: ages 0 to 4, subadults; 5 to 14, adults; and 15 or more, older adults. The age composition over all populations was 49% subadults, 40% adults, and 11% older adults. The proportion of subadults occurring in the harvest from A1 (67%) was significantly higher ( $P < 0.05$ ) than that of any other population. There were no significant differences ( $P > 0.05$ ) in the proportion of subadults killed among any of the other populations.

Similarly, other than A1, there were no significant differences in the proportion of adults in the kill. The harvest of all populations had fewer than 15% older adults.

### Timing of the Harvest

Polar bears from the quota harvest were taken in all months of the hunting season, October through May.

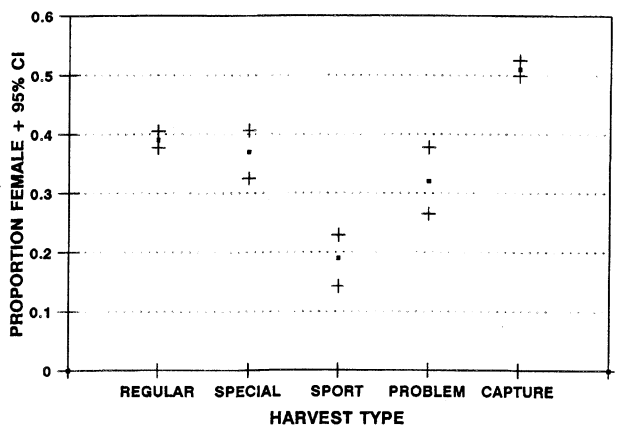


Fig. 4. Proportion of female polar bears killed in NWT from 1979-80 to 1989-90 represented in each of 4 harvest types.

There was no significant difference in proportion of females taken by month. December showed the highest proportion of females (45%) and April the lowest (34%). Across the NWT, 46.7% of the bears killed were taken in spring (March-May), 30.7% in winter (December-February), and 22.6% in fall (October-November) (Fig. 5). The mean age of bears taken in fall (5.9) was significantly lower ( $F = 24.12; 2, 4511$  df;  $P = 0.0001$ ) than those taken in winter (6.5) or spring (7.4). In each population, annual values for mean age, maximum age, percent subadults, and percent female in the harvest were examined for detectable trends over time. No significant trends were observed.

## DISCUSSION

### Annual Harvest

*Harvest Numbers.*—The harvest record from 1954 until the initiation of quotas was based on fur returns and export records. Harington (1961) estimated that during the 1950s 20% of the hides taken were retained for local use. Consequently, the fur records represent a minimum number of bears killed during the early period. As the Arctic became more heavily travelled and southern markets became more aware of polar bear hides, the commercial value of the hide began to outweigh the inclination for domestic use. After quotas began in 1967–68, the harvest was monitored in each community but there was no central depository for the information. Lack of government officials and the

remoteness of most communities hindered collection and communication.

The recorded annual harvest fluctuated between 300 and 550 from 1954 to 1964 but began a steady rise in 1965. Factors that may have contributed to this increase include the advent of the snowmobile in the mid-1960s, the expansion of the market for hides, a rise in the value of polar bear hides, and possibly the introduction of the NWT fur marketing system that facilitated hunters obtaining top price for their hides. Once quotas were instituted the harvest followed them closely. Occasions where the harvest exceeded the annual quota were normally caused by a greater number of problem bears being killed. As efforts were made to have these bears included on the quota, over-quota harvests occurred less frequently. In 1985 a management agreement resulted in a harvest reduction of 45 bears in the D1 population. That drop in harvest affected the total NWT kill, keeping it well below the annual quota in the following years.

The quota steadily increased after its inception. Political pressure, a desire to move toward a renewable resource economy, and results from polar bear population inventory studies contributed to the increases. In the 1978–79 season, the largest increase occurred when the quota was increased by 12% by the introduction of the special quota. The present quota has been in place since 1982.

*Sport Hunt.*—Sport hunting for polar bears was originally expedited by the GNWT, but was turned over to private enterprise in the late 1970s. Records were kept for successful hunts but tallies of unsuccessful hunts were not always attainable. During the first years of the harvest program, emphasis was placed on obtaining complete information from the actual kill. By the 1979–80 season accurate information on number of unsuccessful sport hunts was being collected.

Polar bear sport hunting began with experimental hunts involving 2 or 3 villages and has now expanded to many communities across the Arctic. These hunts are subject to certain restrictions: they must be guided by Inuit, they must use dog teams for the hunt, the tags used for the hunt must come from the community quota, and tags from unsuccessful sport hunts may not be used again (GNWT DRR Wildlife Regulations). Although the number of hunts rose steadily through the early and mid-1980s, it has declined in the last several years. Sport hunters are known to select for trophy animals, usually large adult males (Amstrup et al. 1986). Our sample indicated 26% of the sport hunts resulted in no bear being taken. From a conservation perspective, sport hunting may be preferable to the

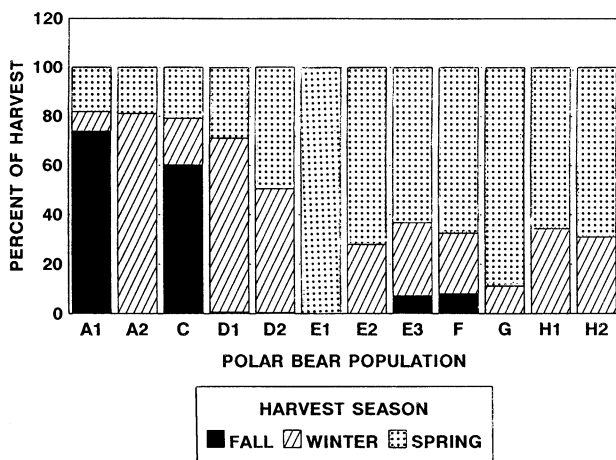


Fig. 5. Percent of polar bears killed in the NWT polar bear harvest from 1979–80 to 1989–90 in each of 3 seasons: fall, October and November; winter, December to February; and spring, March, to May.

domestic harvest.

*Problem Bears.*—Bears killed in conflicts with humans tend to be subadult males (Stenhouse et al. 1988). Similar trends in age and sex composition were also evident in our more recent data. The number of these bears killed per season was similar to that reported by Stenhouse et al. (1988).

*Family Groups.*—The number of family groups killed is not large. Females with cubs having a stretched hide length of less than 1.5 m in length are protected in NWT (GNWT DRR Wildlife Regulations). However, females with cubs of the year occasionally are taken by hunters who, being unaware of the young bears, kill the mother, and are then compelled to kill the cubs. In other situations, cubs of the year are large enough in the early fall or winter to be considered legal. Sometimes females with yearlings are killed but the cubs are not. Although that is a legal practice, the cubs' chances for survival are greatly reduced (Stirling and Latour 1978).

*Miscellaneous Harvest.*—Each year bears are killed for various reasons that do not fit into any of the major harvest categories. Circumstances can range from an undersized bear being harvested and seized in an enforcement action, to a hunter killing a bear for humane reasons. Although that is a very small proportion of the actual harvest (0.3%), those bears are included in determining the sustainable harvest.

### Age and Sex Composition

The sport hunt appears more effective at targeting the male portion of the population than the special quota introduced in 1978–79. Modelling demonstrated that in a long-lived, slow-reproducing species like the polar bear the most critical portion of the population are the adult females (Taylor et al. 1987). The special quota was an attempt to target older, larger males. The tags from that quota were assigned to selected communities, were not to be used until 1 January with the intent of protecting females moving inland to den, were to be used for large males, and were in some cases restricted to specific geographic areas. Although the mean age of the special quota was significantly higher than the regular harvest, the sex ratios were not different. More older bears were killed, but not significantly more males (Fig. 4).

The regular quota harvest was the least selective for males (61% males) of all harvest types, but was still significantly different ( $P < 0.05$ ) from a 1:1 sex ratio (Fig. 4). From a sample covering several years and several areas across the Canadian Arctic, Harington (1961) estimated the sex ratio of the Inuit polar bear

hunt at close to 1:1. He suggested that "Eskimos often have little choice with regard to sex or age composition of their kill once the sled dogs have caught bear scent." It may be that over the last 15–20 years the use of snowmobiles, and more recently, programs emphasizing protection of females have encouraged hunters to be more selective.

Harington (1961) also indicated that individual regions appeared to have varying degrees of preference or availability of certain age and sex classes. That tendency appears to still be valid as we found differences in sex composition among some of the polar bear populations. In some cases, such as the A1 population, polar bear hunting occurs in the fall, a time when subadult males are moving up the coast of Hudson Bay from northern Manitoba (Stirling et al. 1977). In that region females accounted for only 29% of the harvest. In contrast, population D1 revealed the highest proportion of females (45%) among all the populations. Much of the hunting in D1 occurs early in December before the Baffin Bay pack ice is complete. Bears congregate along the coast and in the fiords, particularly females that will be denning. This may contribute to the higher prevalence of females in the harvest. The higher mean age observed in population E1 is probably a reflection of 33% of the harvest over the last decade being from sport hunting.

### Timing of Harvest

Because of ice conditions, available daylight hours, seasonal temperatures, traditional hunting habits, and distribution of bears, each community tends to have their own polar bear hunting pattern (Freeman 1976). However, communities sharing the same population usually harvest most of their bears in the same season. The chronology of the harvest appears not to have changed a great deal since it was described by Harington (1961). We found that the greatest number of bears were harvested during the spring with a second peak in fall. In some populations, such as A1 and C, which both showed a preponderance of kills in the fall, polar bears are not readily available in the spring or winter but tend to congregate in coastal regions before and during freeze up. After a winter of darkness and extreme temperatures, the spring months provide good travel conditions, long daylight hours, and more moderate temperatures. The improved travelling in the spring probably also influences the hunter's selectivity. The increase in age observed in the spring may be a reflection of hunters spending more time looking for larger bears as opposed to taking the first one to appear in the headlight of a snowmobile.

Polar bear quotas were originally established and allocated by community. Thirty-one communities currently receive quotas; additionally, 3 separate geographic areas also receive a quota. The DRR is moving away from a community quota system toward population quotas based on sustainable harvest calculations (Taylor et al. 1987). The patterns of polar bear harvest in NWT are unique to each community and each population. Currently the DRR is attempting to develop Local Management Agreements between the communities that share a given population. These agreements are based in part on the harvest patterns for the communities and populations. Each agreement contains a clause to guarantee the continuation of the harvest reporting program. Miller (1990) reviewed several options for influencing the number and composition of the harvest. However, to attempt to manage local polar bear harvests other than by encouraging the taking of fewer females, more detailed analysis of the hunter-bear system for each hunting area would be required.

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