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**ECOLOGY, STATUS, AND HARVEST
OF BLACK BEARS
(*Ursus americanus*)
IN THE YUKON**

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Bernard L. Smith

Yukon
Renewable Resources

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1.0 INTRODUCTION

This report is intended provide a basis for the management of the black bear (Ursus americanus) in the Yukon Territory, Canada. Black bears are one of the least well understood large mammals in northern interior ecosystems. Information on the biology and population status of Yukon black bears has never been assembled, which has hampered effective management. In this report, information from a variety of sources has been drawn together so that inferences can be made regarding the capacity of Yukon black bears to sustain a variety of human pressures.

Black bear management is becoming an increasingly important concern to the Yukon. Black bears are emerging as an important recreational resource, but garbage conditioned black bears pose a substantial source of problems for residents and tourists. To date, black bears have been managed by default with the assumption they can sustain current harvest pressure. Available evidence suggests black bears are under-utilized as a game species in most areas of the Yukon, however, in some areas they are receiving considerable pressure from human caused mortality.

Compulsory reporting of black bear kills since 1979 and two ecological studies have provided an information base from which we can consider management of Yukon black bears that is consistent with the Yukon Conservation Strategy and the goals and objectives of the Yukon Fish and Wildlife Branch.

This report is divided into nine sections. First we review available information on the biology of northern interior black bears. Our review is

largely based on short term investigations of black bear ecology in the Pelly River Valley near Ross River and in the Dezadeash Range near Haines Junction, analysis of age and sex specific trends in the black bear sport harvest and studies of black bears in adjacent jurisdictions. The main concern about our knowledge of Yukon black bear biology is the lack of information with which to make realistic estimates of abundance and therefore, sustainable yield.

Second, we consider the black bear sport harvest; general trends and regional distribution. Our review of the sport harvest is based on information submitted by hunters between 1979 and 1986 through a compulsory reporting program (Yukon Biological Submission). Management concerns about the sport harvest focus on the localized heavy harvest around some settlement areas.

Third, we summarize our knowledge of problem black bears in the Yukon, including general patterns and regional distribution. Information for this section comes from records of problem bear complaints submitted to Yukon conservation officers between 1979 and 1986. Problem black bear management concerns focus on the need for improvements in solid waste management and public attitudes.

Fourth, we examine the harvest of black bears by licenced trappers. Information for this analysis comes from a fur export data collection system initiated in 1976. Black bear harvest by trappers is not well understood, therefore there is need for a more comprehensive data collection system.

Fifth, we look at the native subsistence harvest. Native subsistence hunters are not required to report their kill, but a voluntary program was

initiated in 1987 to begin collecting data on native harvest (Quock 1987). Greater native involvement in the development of black bear management programs is required.

Sixth we consider patterns in, and management of, black bear predation on important moose populations in the southern Yukon. Predation by black bears and grizzly bears is an important concern for ungulate management.

Seventh, we summarize and evaluate the combined effect of all human caused mortality on black bears in different areas of the Yukon. There is concern that unreported mortality combined with known mortality is adversely affecting black bear populations in some areas.

Eighth, we examine the utility of managing black bears for non-consumptive use. Wildlife viewing plays an important role in attracting tourists to the Yukon and opportunities to observe and learn about wildlife will be important in maintaining a secure future for Yukon wildlife.

In the ninth section, we provide management recommendations to meet the management concerns identified in the proceeding sections of the report. Strategies to implement these management recommendations will be addressed in a separate management plan.

2.0 BIOLOGY

2.1 Distribution and Abundance

Black bear distribution is assumed to follow the forests associated with rivers, with occasional seasonal movements into adjacent, less productive forests or subalpine settings seasonally rich in foods. The largest concentrations of black bears are in the forested valleys of the central and southern Yukon. Rarely are black bears observed in the alpine or tundra. Youngman (1975) reported unconfirmed records for Shingle Point on the north coast ($68^{\circ} 56'N$, $138^{\circ} 16'W$) and Trout Lake in the British Mountains ($68^{\circ} 49'N$, $138^{\circ} 44'W$). Jonkel (1970) reported increased use of tundra habitats by black bears in the Northwest Territories and attributed it to reduced competition by grizzly bears.

We have made general predictions about the relative abundance of black bears based on the proportion of the Yukon that is comprised of low elevation mixed forests associated with large rivers and their tributaries. The Yukon ecoregions described by Oswald and Senyk (1977) were the ecological areas used in the preliminary estimates of relative black bear abundance outlined in Figure 1. The abundance classes in Figure 1 reflect our perception of an ecoregions capability to support black bears. We were unable to make any statement about the range of densities within each abundance class. However, we doubt that black bear densities in the Yukon ever approach the $2.0-8.0 \text{ km}^2/\text{bear}$ found in more productive habitats on the coast or further south (Table 1). With increasing latitude there is expected to be a decrease in black bear abundance. North of 65° latitude black bear densities are expected to be very low.

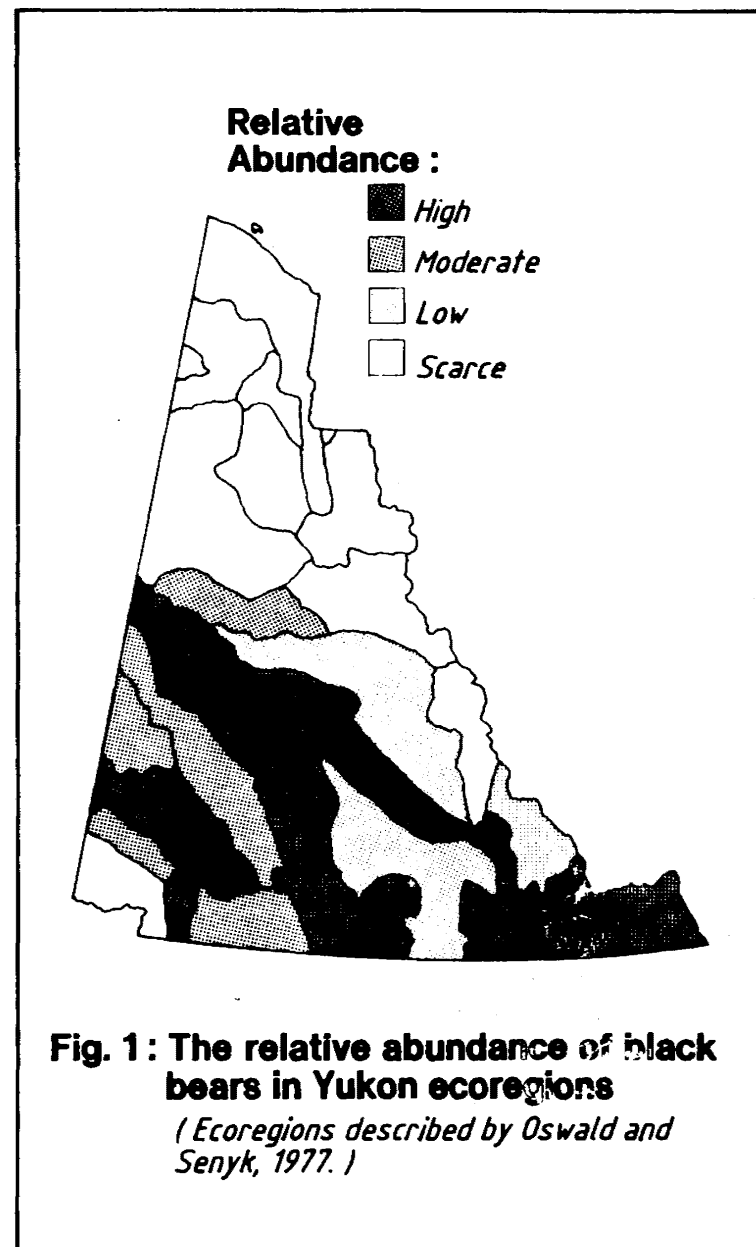


TABLE 1. Estimated black bear densities from several northern North American studies.

Location	Density (km ² /bear)	Remarks	Reference
Swan Hills, Alberta	56.80	-a hunted population sympatric with a grizzly bear population	*Nagy and Russell(1978)
Fort McMurray, Alberta	4.00-5.56	-based on a comparison of densities within specific vegetation types near Cold Lake and relative pro- portions of equivalent habitat in the Fort McMurray study area	*Young (1978)
Fort McMurray, Alberta	2-4	-determined by comparing home range sizes of 4 cubless females with other studies	Fuller and Keith (1980)
Northwestern Montana	2.07-4.40	-the change in density was believed to reflect increased hunting pressure	Jonkel and Cowan (1971)
Cold Lake, Alberta	2.59	-4 year mean of an unhunted popu- lation	Kemp (1972)
Manitoba Parks	8.63	-parks had the highest densities in the province	Shoesmith (1977)
Prince William Sound, Alaska	0.32 1.85-6.67	-lightly hunted -heavily hunted	*McIlroy (1970)
Prince William Sound, Alaska	2.00	-coastal population, hunted -excludes glaciated habitat	Modafferi (1982)
Kenai Peninsula, Alaska	3.9-7.5	-unhunted population	Schwartz <u>et al.</u> (1983)

* from Penner et al. (1980)

In our perceptual model of black bear abundance we expected higher black bear densities and greater use of subalpine habitats where grizzly bears are scarce. It is assumed that grizzly bears competitively limit black bears from some areas (Jonkel 1987). Grizzly bears prey on black bears (Jonkel and Cowan 1971), therefore, the relative abundance of these predators may influence black bear numbers. Competition between black bear and grizzly bears is not well understood in the Yukon although there is circumstantial evidence it occurs. Black bears are commonly seen along the southern portion of the Aishihik Road. However, along the northern portion of the road, during a six week snaring program in 1983, no evidence of black bear presence was found, but four grizzly bears were captured (Lortie et al. 1983). In a study adjacent to the town of Ross River, 20 black bears were captured in a nine week snaring program in 1984. On south facing slopes west of Ross River black bear sightings were frequent (MacHuchon 1984). Conversely, on the east side of Ross River in apparently similar habitat grizzly bears are regularly seen, but few black bears are observed (Whitham pers. comm.). A study in Faro provided further evidence that grizzly bears were excluding black bears from the town garbage dump (Smith and Lindsey 1988).

2.1.1 Management Implications

Concentrations of black bears in river valleys of the Yukon, concurrent with the majority of human settlement, has several management implications. Black bears in river valleys are accessible from both road and river which makes them vulnerable to hunting, but also increases their potential for non-consumptive interests. Black bears will exploit garbage associated with human development, therefore the manner in which garbage is managed can have a large impact on black bear populations.

TABLE 2. Black bears home range data from several northern North American studies.

Location	Area(km ²)	Remarks	Reference
Swan Hills, Alberta	males: 151 (n=9) ^a females: 123 (n=4)	-males: range 13-443 km ² -females: range 71-246 km ²	*Nagy and Russell (1978)
Cold Lake, Alberta	postremoval-males: 119 (n=28) ^b females: 19.6 (n=17) recovery-males: 175 (n=28) females: 32.4 (n=28)	-home range is 40% smaller than occupied area for males but the same size for females -males of different ages overlapped extensively -female ranges decreased slightly with increased density and females appeared territorial	*Ruff (1978)
Cold Lake, Alberta	males: 65-102 ^b females: 19-39	-range in mean size of occupied areas between a food abundant and a food scarce year	Pelchat and Ruff (1986)
Fort McMurray, Alberta	adult females without cubs: 7.5 (n=4) ^a	-range 7.1-12.8 km ²	Fuller and Keith (1980)
Northwestern Montana	adult females: 5.18 ^b adult males: 30.96	- true home ranges were masked by elevational extremes within individual ranges - home range assumed to be circular and calculated from maximum movements	Jonkel and Cowan (1971)

TABLE 2. Continued

Location	Area(km ²)	Remarks	Reference
Duck Mountains, Manitoba	subadult males: 506.4 ^b subadult females: 35.2 adult females: 29.1		Klenner (1982)
Prince William Sound, Alaska	male: 700-100 ^b female: 10-30		Modafferi (1982)
Susitna Valley, Alaska	females: 19-98 ^b males: 94-146	-ranges represent mean home range size differences between downstream and upstream study sites	Miller (1983)
Kenai Peninsula, Alaska	females with cubs: 17.6 ^a females with yearlings: 26.2 female, no offspring: 19.7 juvenile female(3yrs): 17.0 adult male(3yrs): 141.1 juvenile male(3yrs): 15.9	-'home range' refers to areas used from den emergence to late July and mid-Sept. to den entrance; distinct from 'summer feeding areas'	Schwartz <u>et al.</u> (1983)

a home range (the central portion of the range)

b occupied or activity area (contains all locations within the range)

* from Penner et al. (1980)

TABLE 3. The mean weights of adult black bears from several northern North American studies (in kg).

Location	Adult Females	Adult Males	Reference
Swan Hills, Alberta	74.0 (n=16)		Nagy and Russell (1978)
Interior/Coast, Washington	58.0 (n=17)		Poelker and Hartwell (1973)
Northwestern Montana	68.0 (n=8)		Jonkel and Cowan (1971)
Kenai Peninsula, Alaska	52.0 (May) 59.1 (June, July) 74.8 (Fall)(n=7)	104.2(May)(n=6) 90.0 (June, July)	Schwartz <u>et al.</u> (1983)
Upper Susitna River, Alaska	61.5 (May)(n=5) 61.8 (August)(n=7)	88.4 (May)(n=4)	Miller and McAllister (1982)
Prince William Sound, Alaska	70.5 (August)	54.5 - 90.9	Modafferi (1978)
South Central Alaska	69.0 - 79.7 (Summer)	73.2 (Summer) 76.0 - 112.3 (Fall)	Rausch (1961)

Poor information on black bear densities in the Yukon makes determination of sustainable yields difficult.

2.2 Home Range

Information on the home range of individual male and female black bears was collected in the Pelly River Valley, July to September 1984 and June 1986 (Appendix 1). The Pelly River Valley is considered representative of major river valleys in the southern Yukon (MacHutchon 1984). Female bears had a mean home range of 28.1 km^2 (range = $6.8-75.4 \text{ km}^2$) and males had a mean home range of 103.5 km^2 (range = $54.7-164.6 \text{ km}^2$). These values may underestimate the real home ranges due to a paucity of early spring and fall relocations. The measured home ranges of black bears from the Pelly River Valley were similar in size to the occupied areas of black bears from other northern areas (Table 2).

2.3 Morphology

2.3.1 Weight

Complete morphological data from 10 female and 11 male black bears was collected from the Pelly River Valley in 1984 (Appendix 2). All bears were measured between May 23 and July 31. The mean weight of females was $50.8 \text{ kg} \pm 3.52$ ($n=10$; range= $34-72 \text{ kg}$) and the mean weight of males was $43.3 \text{ kg} \pm 4.60$ ($n=11$; range= $25-72 \text{ kg}$). The mean weight of adult females (7+ years of age and older) was $53.5 \text{ kg} \pm 3.76$ ($n=8$; range= $40-72 \text{ kg}$) and the mean weight of adult males was $59.0 \text{ kg} \pm 5.00$ ($n=2$; range= $54-64 \text{ kg}$). Adult male and adult female black bears from the Pelly River Valley were generally lighter and displayed less sexual dimorphism than adult black bears from other

northern areas (Table 3). The small body weights of black bears in the Pelly River Valley may be a reflection of a short growing season and generally dry, unproductive habitat.

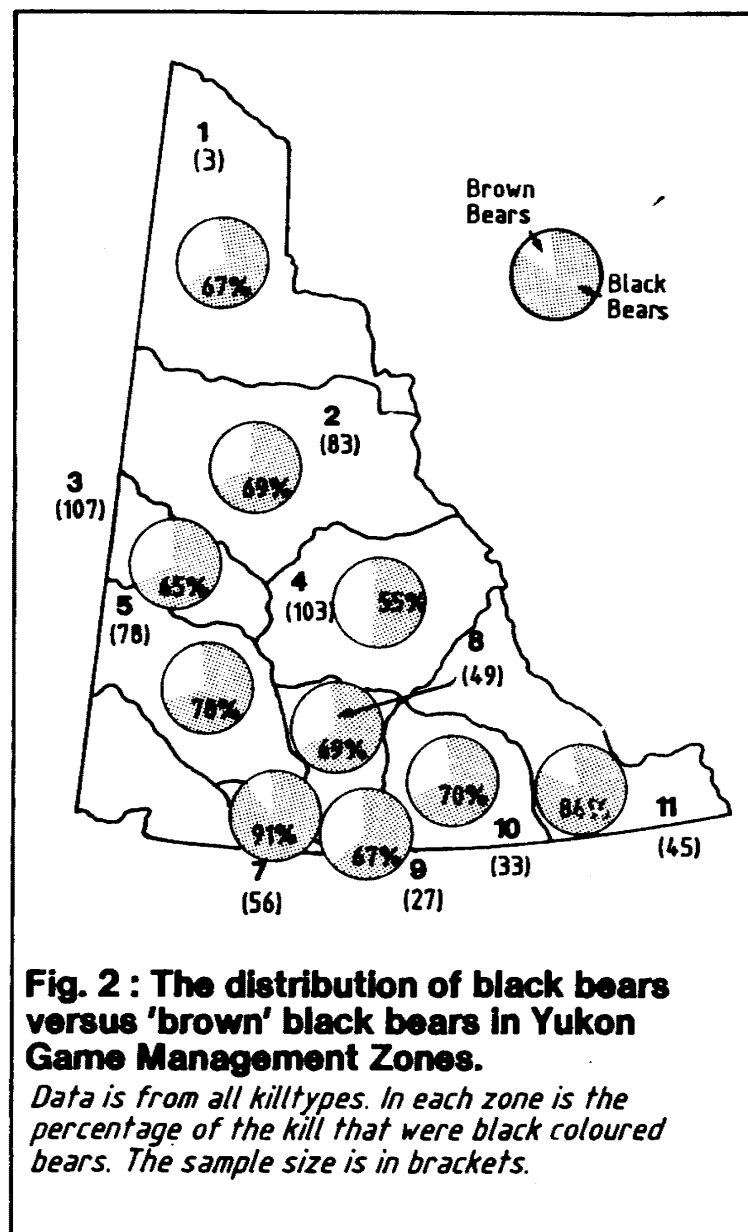
2.3.2 Colour

Black bears in the Yukon have variable pelt colouration. The predominate colour is black, however a considerable number of brown coloured black bears occur. Figure 2 outlines the percentage of black versus brown black bears taken by sport hunters in each of 11 Yukon game management zones. If hunters selectively take bears with pelt colours other than black, the percentages in Figure 2 do not reflect true proportions in the population. 'Glacier' black bears (blue coloured) and 'Kermodes' black bears (white coloured) have been described for the Yukon (Youngman 1975), however, none were reported in the Yukon kill, 1979 - 1986.

Some people in the Yukon believe brown coloured black bears are a cross between black bears and grizzly bears. There is no evidence in the scientific literature to support this belief (Jonkel 1987). Verlaine-Wright *et al.* (1988) examined skulls from northern grizzly and black bear populations and found no evidence of hybridization.

2.3.3 Management Implications

The small size of Yukon black bears, relative to southern populations, limits their desirability to non-resident trophy hunters. Brown black bears may be a more desirable 'trophy' than black coloured bears and can be promoted as such. Selection of male bears can be a prudent management tactic, but sexual dimorphism of Yukon



black bears is not pronounced, therefore sex selectivity in the harvest is difficult.

2.4 Feeding Ecology and Habitat Use

2.4.1 Diet

Quantitative data on Yukon black bear food habits comes from an examination of scats collected in the Pelly River Valley in the spring and summer of 1984 (MacHutchon 1985, 1989). In addition to available quantitative data, predictions about Yukon black bear diet are based on studies conducted in interior Alaska and from observations contributed by Yukoners.

In the Pelly River Valley, herbaceous material and berries accounted for 95% of the volume of collected scats (n=59)¹. Overwintered berries and grasses were important in the spring, horsetail was the most important emerging herb, and shrub fruit were added as they became available. Animal matter was used opportunistically during the summer. These seasonal trends are similar to that reported for other northern black bear populations (Table 4).

¹Appendix 3 is a list of the common and scientific names of plant species mentioned in this report.

TABLE 4. Summary of black bear food habits from several northern North American studies

<u>Food Habits</u>			Remarks	Reference; Location (Habitat)
Spring	Summer	Autumn		
herbs (horsetail, grass, sedge, other)	fruit (honeysuckle, current, cranberry blueberry), herbs (sweet clover, monocots), insects, (ants, beetles)	fruit (honeysuckle, current, cranberry, blueberry), herbs (sweet clover)	-fruit consumed when available -sympatric population of grizzly bears utilize the same food items	*Nagy and Russell (1978); Swan Hills, Alberta (boreal forest)
herbs, (vetchling, horsetail, grass, dandelion), aspen willow, insects	herbs (vetchling), fruit (sarsaparilla)	herbs (vetchling), fruit (blueberry, bearberry), beaked hazel nuts	-1975: high use and high production of blueberries -1976, 1977: little to no use and a nearly complete crop failure of blueberries	*Ruff (1978); Cold Lake, Alberta (boreal forest - aspen parkland)
herbs (grass, sedge, horsetail)	herbs (angelica, horsetail, cow parsnip, grass, sedge, vetch), fruit (huckleberry, buffaloberry), ants		-black & grizzly bear scats were not separated	*Lloyd and Fleck (1977); Southeast B.C. (spruce/fir forest)
herbs (grass, sedge, horsetail), fruit (cranberry, crowberry, blueberry), insects, rodents adult and calf moose	herbs (grass, sedge, horsetail), fruit (cranberry, crowberry, blueberry), insects, rodents, salmon, moose calf	herbs (grass, sedge, horsetail), fruit	-no attempt was made to distinguish between black and grizzly bear scats	Chatelain (1950); Kenai Peninsula, Alaska

TABLE 4. Continued

<u>Food Habits</u>			Remarks	Reference; Location (Habitat)
Spring	Summer	Autumn		
herbs (horsetail, grass, other), fruit (cranberry)		fruit (blue- berry, cran- berry), herbs (horsetail, lupine)	-use of good blue- berry crops on old burns	Hatler (1967); Interior central Alaska (boreal forest)
herbs (grass, horse- tail, sedges, skunk cabbage, ferns, berry), salmon	herbs (fauria, grass, ferns, horsetail, sedges), fruit (salmonberries, blueberry, rasp- berry), kelp, salmon	herbs (fauria), fruit (blue- berries), salmon		McIlroy (1970) and Modafferi (1982); Prince William Sound, Alaska (spruce/hemlock forest)
herbs (horsetail, grass, sedge), fruit (crowberry), insects salmon	herbs (horsetail, grass, sedge	fruit (blue- berries, devils club, crowberry),		Miller (1983); Susitna Valley, Alaska

* from Penner et al. (1980)

Documented and potential food items of Yukon black bears are reviewed below:

- a) Overwintered berries - Overwintered berries are likely used in the spring because they are a good source of carbohydrates and because of delays in the emergence of alternative herbaceous vegetation. In some areas of the Yukon overwintered berries may be an essential food resource, particularly if spring is late. Bearberries were the most common overwintered berry in scats collected in the Pelly River Valley, but crowberries and blueberries were also present (MacHutchon 1985, 1989). Herrero (1985) suggested bearberries are only moderately important to bears in the fall because they are mealy with only a trace of sweetness, however, they are one of the few berries that stay on plants over the winter, during which time the sugar content may increase two to three times. Other overwintered berries reported for the diet of northern black bears are lowbush cranberry and crowberry (Chatelain 1950, Hatler 1967, Miller 1983, Smith 1984, Herrero 1985).
- b) Graminoids - Grasses frequently occurred in spring and summer scats from the Pelly River Valley. Graminoids are commonly reported for the spring diet of black bears (McIlroy 1970, Jonkel and Cowan 1971, Ruff 1978, Modafferi 1982, Herrero 1985).
- c) Horsetail - Horsetail occurred in the first scats collected in the Pelly River Valley in May and was a major constituent of scats until mid-July. Horsetail is commonly reported for the spring diet of black bears (Hatler 1967, McIlroy 1970, Nagy and Russell 1978, Miller 1983).

- d) Roots - There is no direct evidence that Yukon black bears feed on roots or bulbs, although they have been observed digging (Koser pers. comm.). In Alberta, Raine and Kansas (1988) found evidence black bears dig for roots in the spring and fall.
- e) Insects - Insects, particularly ants, were common in scats from the Pelly River Valley, but they made up only 2% of the total scat volume. Insects are frequently reported in the black bear diet (Table 4).
- f) Fish - Yukon black bears have been observed capturing northern pike in the shallows of lakes during the summer (Coleman pers. comm.) and have been observed capturing lampreys on the Porcupine River (Hayes pers. comm.). Salmon are exploited where and when they are available. Black bears may be excluded from some salmon spawning areas because of competition with grizzly bears.
- g) Ungulates - In some areas, black bears are effective predators on young ungulates (Herrero 1985, Kolenosky and Strathearn 1987). In the north, black bear predation on moose calves has been documented (Franzmann et al. 1980, Peterson 1982, Schwartz et al. 1983, Larsen et al. 1985). In the southwest Yukon black bears took 2% of radio collared moose calves in 1983 and 8% in 1985 (Larsen et al. 1985). Because caribou and sheep young are born in upland areas, there is likely no predation by black bears. Ungulate carcasses will be eaten by black bears when they can be obtained (Herrero 1985).
- h) Soapberry - Soapberry fruits, leaves and seeds were the primary component of scats collected

in the Pelly River Valley from mid-July to the end of July.

- i) Crowberries - Crowberries were found in scats from the Pelly River Valley in late-June and late-July to early August. Crowberries were reported in the spring diet of black bears from the Susitna River Valley, Alaska, however, they were a more important fall food (Miller 1983).
- j) Lowbush cranberry - Lowbush cranberry was most frequent in black bear scats from the Pelly River Valley during late spring, however, it was also present in late-July. This fruit may be more important in the diet during the spring than in the fall. Hatler (1967) reported lowbush cranberry in both the spring and fall diet of black bears from central Alaska.
- k) Blueberry - Blueberries were only found in scats collected from the Pelly River Valley during the spring, but they may have become prevalent in August after collection ceased or when bears moved to subalpine areas north and south of the study area (MacHutchon 1985). Blueberries are often identified as a critical black bear food in late summer and early fall (Hatler 1967, McIlroy 1970, Jonkel and Cowan 1971, Rogers 1976, Ruff 1978, Modafferi 1982, Miller 1983).
- l) Rose hips - Black bears in Alaska have been observed eating rose hips in the fall (Hechtal pers. comm.). In southeast Yukon, black bears feeding along the banks of the Beaver River, in the fall, were eating rose hips (Moise pers. comm.).

-) Aspen buds - In the Dezadeash Range near Haines Junction a female black bear was observed pulling over small aspens so her three cubs could eat the emerging green leaves (Smith and Sumanik 1988).
- n) Cottonwood, willow, and aspen catkins - Cottonwood and willow catkins may be important in riparian habitats. Aspen catkins are an early spring black bear food in other regions (Kolenosky and Strathearn 1987).
- o) Human related foods - Garbage, livestock, pet foods, composting fruit, some vegetables and human foods can become important food items for black bears when they are available.

2.4.2 Habitat Use - Active Season

The active season is the period between den emergence in late-April or early-May, and den entrance in early October. Seasonal use of habitats by Yukon black bears was determined from analysis of early June to September black bear relocation data from the Pelly River Valley and Dezadeash Range, correlations of habitat use with the phenological development of preferred food plants, and observations by experienced individuals (Appendix 4a-e). There is no quantitative data on habitat availability in the Pelly River Valley or Dezadeash Range, so direct determination of habitat selection or preference was not possible. Habitat use here is based on a qualitative evaluation of existing data². Six

²Appendix 4a is a detailed look at habitat use data for the Pelly River Valley.

broad habitat types were identified for the Pelly River Valley³:

1. White spruce forest type
2. Black spruce forest type
3. Aspen forest type
4. Willow/alder shrubland type
5. Subalpine type
6. Sagewort/bearberry/grassland type

In the Pelly River Valley, white spruce forest habitat was used the most, but apparently not in the same proportion as its availability. Smaller discontinuous habitats such as aspen forest, subalpine and sagewort/bearberry/grassland appeared to be relatively more important. Black spruce forest and willow/alder shrubland received minimal use.

Relocation data from the Dezadeash Range was placed into one of the six habitat types identified for the Pelly River Valley⁴.

In the Dezadeash Range, 40% of May and early June relocations were in the sagewort/bearberry/grassland habitat type (n=45). In the Pelly River Valley 35% of June relocations were in the sagewort/bearberry/grassland habitat type (n=37). Open southfacing hillsides common to the sagewort/bearberry/grassland habitat are free of

³ Appendix 4b is a detailed description of the six habitat types identified for the Pelly River Valley.

⁴ Appendix 4d is a detailed look at habitat use data from the Dezadeash Range.

snow earliest and have grasses and overwintered bearberries available to bears. In the early 1970's, prior to frequent non-sport losses of problem bears, numerous black bears were observed on open south facing hillsides adjacent to Frenchman Lake, during the spring (Lindsey and Smith 1984). Pilots and outfitters have regularly commented on the prevalence of black bears on open hillsides in the spring and early summer.

From June to mid-July black bears in the Pelly River Valley were most commonly found in white spruce forest and aspen forest habitats. Horsetails are common in white spruce forest and are likely an attraction of this habitat for bears. An observed increase in the use of aspen forest during the summer likely reflects an increase in the importance of soapberries to the black bear diet. Soapberry plants are common along the margins of aspen forests. Subalpine habitat and black spruce forest habitat are used by black bears more in the later part of the summer than early in the summer. It is expected that the increase in use of black spruce forest and subalpine habitat is a result of an increase in the use of berries, particularly blueberries, which are common in these areas (Hatler 1967). Crowberries become important to black bears in late summer and are also common in subalpine habitat. It is possible the increasing use of subalpine habitat in the late summer also reflects a trend in movement toward higher elevations where denning will occur.

Black bears make use of the habitats which best meet their food requirements at different times of the year (Hatler 1967, Jonkel and Cowan 1971). We've attempted to document trends in movement and habitat use exhibited by black bears using a broad categorization of habitats and a small sample of

relocation points. There are considerable limitations to the usefulness of this technique. This analysis does not take into account microhabitats and/or smaller divisions of the broader habitats that may be important. In the Pelly River Valley, a small area of white spruce forest, with the right conditions, was very productive for soapberries and therefore received considerable use (Appendix 4a). This is not true for all white spruce stands and in fact, there is considerable variability within stands. In many cases, bears may enter a specific habitat type simply to make use of an associated microsite and may not use the habitat "type" per se. It is expected riparian areas are productive for black bear foods, particularly early in the spring when green vegetation emerges, but no allowance was made in the habitat classification to consider stand location. Early seral forests, prior to extensive white spruce colonization, are occasionally found on river beds in the Pelly River Valley. These areas may be important to bears, however, relocation data is insufficiently precise to demonstrate use of these areas at any specific time of the year. Out of necessity, streamside stands were clumped in the white spruce type or aspen forest type. A large proportion of male black bears located in the white spruce forest type in June may partially reflect use of early seral stands. Sources of garbage may also be important microsites that influence seasonal bear movement.

Until better data is available we have made several predictions about the critical habitats of Yukon black bears. Tundra, alpine habitats, wet black spruce forests and willow/alder shrubland are relatively unimportant to black bears. Access to open south facing slopes, mixed open/aspen forest hillsides, and moist openings in forests

TABLE 5. Summary of black bear denning habits from several northern North American studies.

Location	Denning Chronology	Denning Habitat	Remarks	Reference
Fort McMurray, Alberta	entrance: last 2 weeks of October	either aspen or jackpine stands	-telemetry data on 4 cubless females only	Fuller and Keith (1980)
Cold Lake, Alberta	entrance: 1975, a 4 week period beginning October 7; 1976, a 5 week period beginning October 1 emergence: March 28 - April 14 adult females first appear, then sub-adults, finally adult males	selected den sites on the periphery of summer range (n=50); proportions of cover types used differed from those available: selection for mature stands of spruce/aspen and avoided muskeg 34 of 38 first dens were dug under the root-mass or trunk of a fallen or leaning tree, into hillsides or into level ground	-denning chronology may have been affected by food availability	Tietje and Ruff (1980)
Northwestern Montana	entrance: late October-early November emergence: mid-April-mid-May	base of hollow tree, under fallen logs, in rock caves under a cabin and underground dens were used	-early snowmelt is related to early emergence -1/3 of bears lined dens, 1/3 were females	Jonkel and Cowan (1971)

TABLE 5. Continued

Location	Denning Chronology	Denning Habitat	Remarks	Reference
Susitna Valley, Alaska	entrance: mid point of extremes 1980, Sept 19-Oct 6; 1981, Sept 15- 23; 1982, Oct 2-11 emergence: 1981 May 5-12; 1982, May 9-13	steep forested terrain -high rate of near river valleys; mean den reuse elevation of 626 metres; about half and half use of natural cavities vs. excavated cavities, hab- itat predominately alder or larger trees		Miller (1983)
Kenai Peninsula, Alaska	entrance: Oct 11 - Nov 8 emergence: Apr 19 - May 9	exclusively underground excavated dens, 41% dug under root masses of live trees, 47% into hill- sides, 8% flat ground, 4% under boulders,; 31% mature upland forest, 67% regrowth forest; selection for regrowth forest		Schwartz <u>et al</u> (1983)

are important. Some human disturbed habitat can be beneficial to black bears⁵, however, disturbance also increases access and therefore vulnerability of black bears to harvest.

2.4.3 Habitat Use - Denning Season

Little information is available on the habitat distribution of black bear dens in the Yukon. Nine black bear dens were located in the Pelly River Valley, however, only one was visited (Appendix 4a).

The mean elevation of dens was 985 metres (range=792-1326m). Denning is expected to commence in late September or early October. The denning habits of black bears in other northern areas is outlined in Table 5.

2.4.4 Management Implications

The documented seasonal habitat use of Yukon black bears has some management implications.

Black bears that concentrate on open hillsides in the spring are particularly vulnerable to harvest, but also provide viewing opportunities for non-consumptive users. Promotion of either activity should stress this.

⁵Early seral vegetation, in areas that naturally regenerate, can provide important foods for black bears. Non-natural plants used in reclamation (Jonkel and Cowan 1971) or dandelions along road corridors (Raine and Kansas 1988) can encourage bear concentrations.

Female bears that do not gain sufficient weight prior to denning will fail to produce cubs, therefore a food shortage can disrupt the productivity of the population (Rogers 1976, Ruff 1978, Bunnell and Tait 1981, Kolensky and Strathearn 1987). Black bears in the Yukon face considerable environmental adversity, therefore a suitable distribution and abundance of key food items is important. Managers should be cognizant of natural failures in the availability of important food species because food shortages will reduce the sustainable harvest yield of the population.

Different habitats are seasonally important to black bears, therefore maintenance of habitat diversity is critical in habitat management.

2.5 Population Biology

No detailed examination of black bear population biology has been conducted in the Yukon. The information presented here is based on evidence from the short term study of black bears in the Pelly River Valley, the black bear sport harvest record and extrapolation from other northern black bear population studies.

2.5.1 Mating Season

Evidence from the Pelly River Valley and Dezadeash Range suggests Yukon black bears mate between early-June and the end of July (Appendix 5). This is later than previously reported for the mating season of black bears. On the Kenai Peninsula, Alaska, black bears primarily breed in June although male/female associations were recorded as late as July 14 (Schwartz et al. 1983). Modafferi (1982) found black bears at Prince William Sound, Alaska bred from mid May through June. Black

bears in Montana are reported to breed in May and June (Jonkel and Cowan 1971). The late mating season in the Yukon is likely a consequence of a later spring than coastal areas or southern locations.

2.5.2 Productivity

Habitat quality is the primary constraint on population productivity in black bears (Bunnell and Tait 1981, Kolenosky and Strathearn 1987). In Montana, black bears achieved sexual maturity at 4.5 years of age but were not able to successfully produce litters until six to seven years of age as a result of poor habitat quality (Jonkel and Cowan 1971). Captive bears in Minnesota, exposed to a rich diet, developed more rapidly than wild bears and wild bears had reduced reproductive success in years of food scarcity (Rogers 1976). Because the Yukon has a short growing season, extreme climate, and reduced habitat productivity, we expect slower growth rates, delayed sexual maturity, smaller litter sizes, and longer intervals between litters for Yukon black bears than southern and coastal black bear populations.

Age at First Litter Production

One female black bear from the Pelly River Valley produced a litter at 6 years of age. In the sport harvest record, an abrupt decrease in the female black bear harvest occurred at age 7 (Appendix 5). We suggest this is the age at which most females first had young and were legally protected from harvest. This age of first litter production is older than reported for other northern black bear populations (Table 6). Until better data becomes available, we recommend that 7 years be assumed to be the average age of first litter production for

TABLE 6. The age of first litter production and litter size for female black bears from several northern North American studies.

Location	Age of first litter production (age in years)	Litter Size (cubs/female)	Reference
Swan Hills, Alberta	youngest female in estrous 3.5 yrs; adult 24; youngest female breeding 5.5	2.2 (n=5)	Nagy and Russell (1978)
Cold Lake, Alberta	adult 24		Ruff (1978)
Northwestern Montana	youngest female in estrous 4.5; adult 24; first litter 6.5	1.7 (n=38, study) 1.6 (n=204, state)	Jonkel and Cowan (1971)
South Central Alaska		1.96 (n=23)	Erikson (1965)
Central Alaska		1.73 (n=30)	Hatler (1967)
Coastal Alaska		1.85 (n=14)	McIlroy (1970)
Upper Susitna River, Alaska	females breeding 4-5	1.9-2.0 (n=15)	Miller and McAllister (1982)
Kenai Peninsula, Alaska	adult at 3.5, first litter at 4	1.9 (n=15, collared) 2.2 (n=23, uncollared)	Schwartz <u>et al.</u> (1983)

central and southern Yukon black bears. Black bears near the arctic circle may have an even later age of first litter production.

Litter Size

Yukon black bears are expected to have a mean litter size between one and two cubs/female. Four litters with two young each were observed in the Pelly River Valley between 1984 and 1986. Occasionally, three offspring litters have been observed in the southern Yukon (Sumanik pers. comm.) No litter with four or more offspring has been reported.

One to two cub litters are normal for northern black bear populations (Table 6). Until better data becomes available the litter size for central and southern Yukon black bears should be assumed to be 1.9 cubs/female; the mean of interior Alaskan studies.

Interval between litters

The age of family breakup has important implications for the interval between litters and ultimately the rate at which cubs are recruited to the population. In the Yukon, some black bear young are left on their own at 1+ years of age but the majority stay with the mother until the spring of their third year (2+ years of age) (Appendix 5).

There is evidence most female black bears in the Yukon do not breed successfully in the year of family breakup or miss one year following breakup before reproducing (see Appendix 5). The majority of females in black bear populations of coastal Alaska missed at least one year between

reproductive cycles (Schwartz et al. 1983). In Minnesota, Rogers (1976) found that only 33% (14/43) of adult females were accompanied by cubs following years of scarce food, whereas 44% (17/39) were with cubs following years of moderately abundant food and 79% (23/29) were with cubs following years of exceptionally abundant food. Bunnell and Tait (1981) and Kolenosky and Strathearn (1987) suggest females that do not attain sufficient weight over the summer to support cubs the following year, fail to implant embryos in the fall, effectively aborting the young. Females in the Yukon likely employ this strategy because of the constraints on gaining sufficient weight over a short season, particularly when they have recently abandoned a litter or there is a food shortage.

The interval between litters likely varies between regions of the Yukon as a result of differences in habitat suitability and yearly fluctuations in habitat productivity. However, we predict female black bears in the Yukon will generally accompany young for two years and fail to produce a litter in the year following family breakup, therefore the interval between litters will be four years. Most black bear populations in the western U.S. have a mean breeding interval of slightly more than three years (Bunnell and Tait 1981).

Cub production rate

Production of cubs is usually expressed as a natality rate (cubs produced per adult female per year) and is equal to the mean litter size divided by the mean interval between litters (Bunnell and Tait 1981). We had little confidence in the mean litter size estimates and interval between litter estimates for Yukon black bears, so an alternative measure of cub production was determined (Appendix

5). The proportion of marked adult females, with cubs, in the Pelly River Valley during late-June or early-July was determined. A production rate of .308 cubs of the year (COYS) (early July)/adult female/year was derived from the observation of 4 COYS/13 adult female years. An early July census period takes into account spring mortality of cubs. In the literature, the lowest estimated natality rate for black bears is .55 cubs/female/year (Bunnell and Tait 1981). Even assuming a 30% cub loss prior to July, Bunnell and Tait (1981) lowest rate of production is higher than that estimated for adult female black bears in the Pelly River Valley.

Maximum age of reproduction

In ursids, reproductive longevity is generally the same as physical longevity. We speculate that 20 years of age is the maximum age most Yukon black bears reach; only 2 black bears over 20 years of age were present in the 537 known-aged bears killed between 1979 and 1986.

2.5.3 Management Implications

The reproductive rate of a population is a major determinant of its ability to sustain harvest, therefore knowledge of the scope of this variable is essential for effective population management. Available evidence suggests Yukon black bears have a low reproductive rate, therefore low sustainable yield. Females that do not produce cubs until 7 years of age, have an interval between litters of four years, and cease reproducing at 20 years of age, may only produce three to four litters in a lifetime.

3.0 SPORT HARVEST

3.1 Introduction

In this section, sport harvest by non-native residents and non-residents is considered. The term 'resident hunter' refers to non-native resident hunters only, and excludes native resident hunters and resident trappers, wherever possible. Due to the structure of sport harvest legislation and the data recording system, some trapper harvest and problem bear kills are reported as resident sport harvest.

Sport hunters are the primary consumptive users of Yukon black bears. Between 1956 and 1977 there was an estimated sport harvest of 75 black bears per year and between 1979 and 1986 there was a mean reported sport harvest of 80 black bears per year (Appendix 6). The sport harvest was 62% of all reported black bear mortality in the Yukon, 1979-1986 (Figure 3). For Yukon big game species hunted, black bears rank third behind moose and caribou in the average effort expended by resident hunters (Smith and Hare 1988). Between 1973 and 1986 there was an 89% increase (from 15.5% to 29.3%) in the proportion of resident sport hunters buying black bear tags, despite an 11% decrease in the number of residents purchasing a hunting licence. There was a 95% increase in the proportion of licensed non-residents buying black bear tags, 1979-1986 (Appendix 7). From 1979 to 1986, the Yukon territorial revenue from black bear tag sales and trophy fees was \$56,766, representing a mean yearly income of \$7,096 (Appendix 8).

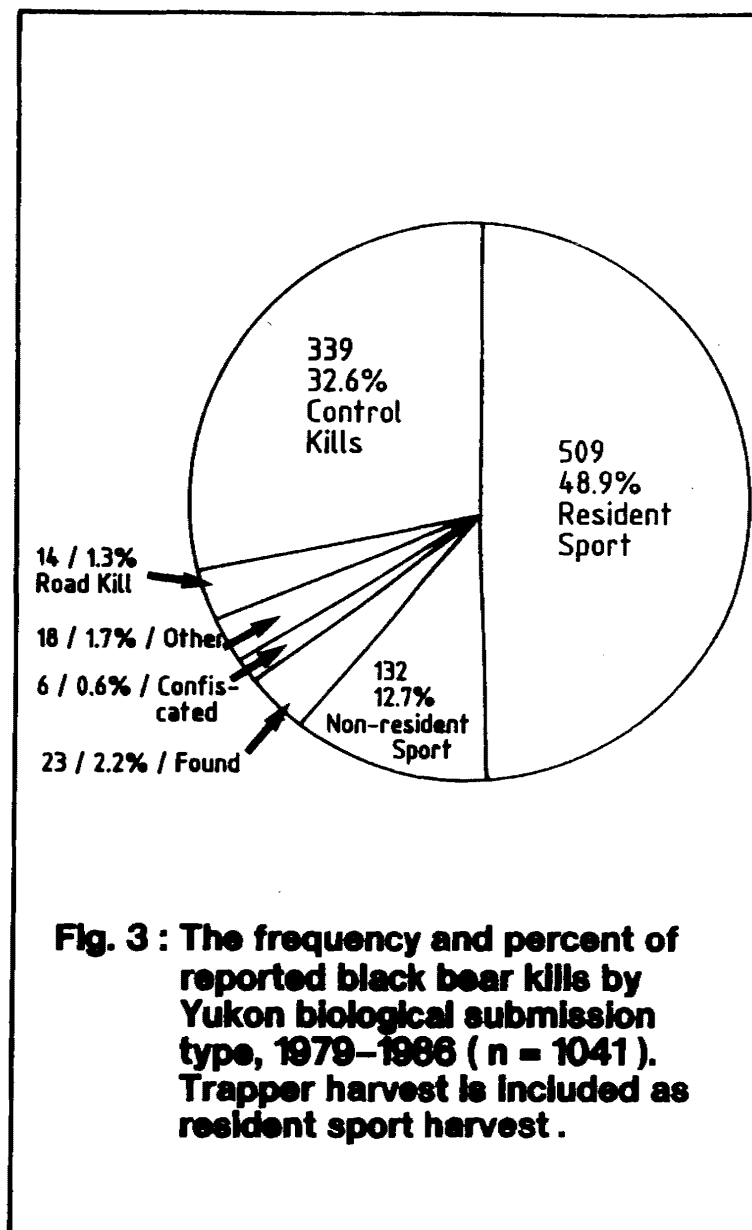


Fig. 3 : The frequency and percent of reported black bear kills by Yukon biological submission type, 1979-1986 (n = 1041). Trapper harvest is included as resident sport harvest .

3.2 History of Regulations

Black bears were not killed in substantial numbers until late in the 19th century when an influx of white settlers put considerable pressure on all big game species. During this period, black bears were killed primarily as nuisance animals or as a secondary meat source. Legislation providing protection for game animals was enacted in 1894, however, bears were not protected until 1928 (Appendix 9).

In 1928, the bag limit for bears was set at six and this remained in effect until 1933 when it was repealed. Between 1933 and 1949 hunting for bears was relatively unrestricted, except non-residents were required to retain a guide. Significant protection for black bears was imposed in 1949 with a single bear bag limit and a season set at 1 May to 30 June. In 1951, the bag limit was raised to two and no major changes occurred until the early 1970's. In 1971 the bag limit was decreased to one, the seasons were set at 15 April to 15 June and 1 August to 31 October, black bear tags were required and female bears accompanied by cubs were protected. Regulations changed little between 1971 and 1979. From 1979 to the present sport harvest regulations for black bears have undergone numerous changes. Generally, bag limits have become more liberal. In 1982 the yearly bag limit for all hunters was increased to two in certain game management subzones, provided one bear was taken during the spring. In 1983 the yearly bag limit of two was applied to all game management zones, but one bear still had to be taken in the spring. In 1984 the yearly bag limit was increased to three provided one bear was taken in certain bear reduction subzones. Bear reduction subzones were established in areas where there was concern about black bear and grizzly

bear predation on moose calves. Increases in moose calf survival through reduction of bear numbers was the primary management objective for the bear reduction subzones. In 1985 the yearly bag limit was reset at two in all open zones, including the bear reduction subzones. This bag limit is in effect today. The only areas where black bears occur that are closed to sport harvest are: Kluane National Park, Kluane Game Sanctuary, MacArthur Game Sanctuary, and portions of the Dempster Highway corridor.

3.3 Temporal Trends in the Sport Harvest

Several temporal trends are apparent in the Yukon sport harvest. The majority of the sport harvest is by residents (79%, 1979-1986). The resident sport harvest increased slightly over seven years of compulsory submission (1980-1986) and the non-resident sport harvest remained relatively stable, despite a doubling of the bag limit in 1983⁶ (Figure 4).

The majority of black bears harvested by residents are taken in the spring (63%, 1979-1986) and the majority of black bears harvested by non-residents are taken in the fall (70.3%, 1979-1986). Roadside hunting and spring river trips account for most of the resident sport harvest, while most non-residents take black bears incidentally during fall hunts of other big game species. Only one outfitter in the Yukon markets black bear only hunts.

⁶Appendix 10 is a breakdown of the resident and non-resident sport harvest by year, 1979-1986.

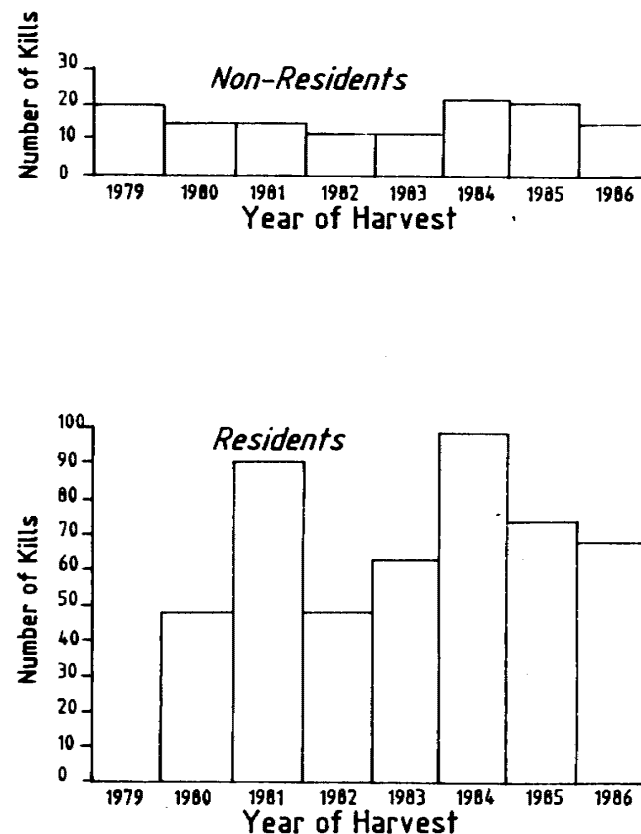


Fig. 4 : The sport harvest of black bears by non-residents and non-native residents, 1979-1986. *Compulsory submissions by residents were not mandatory until 1980, therefore the known resident sport harvest for 1979 is not complete.*

Hunter success varies between residents and non-residents and between seasons. Between 1979 and 1986, 7.4% of resident hunters were successful, hunting for an average of 2.8 days (Table 7). During the same period, 6.2% of non-resident hunters were successful and hunted for an average of 5.7 days. Resident hunters had higher success at lower effort because most residents hunt black bears in the spring. Of all Yukon's big game species, spring black bears are easiest to hunt and fall black bears the hardest (Figure 5).

Seasonal differences in the age and sex composition of the harvest suggest differences in the vulnerability of different to harvest. Between 1979 and 1986 females comprised 45% of the fall harvest, but only 21% of the spring harvest (Table 8). We hypothesize that the greater percent of females in the fall harvest is due to a decrease in the relative vulnerability of adult males from spring to fall and an increase in the relative vulnerability of adult females. There is a higher percentage of adult females in the fall harvest than the spring, presumably because loss of litters to mortality and family breakup make more adult females vulnerable to harvest in the fall (Table 8, Figure 6). Conversely, there is a higher percentage of adult males in the spring harvest than the fall. In the spring, adult males are undergoing breeding movements which increases the probability they will come into contact with hunters. The percentage of male and female offspring 1+ - 2+ years of age and 2+ - 3+ years

⁷ Appendix 11 is a breakdown of the yearly resident and non-resident sport harvest by season, 1979-1986.

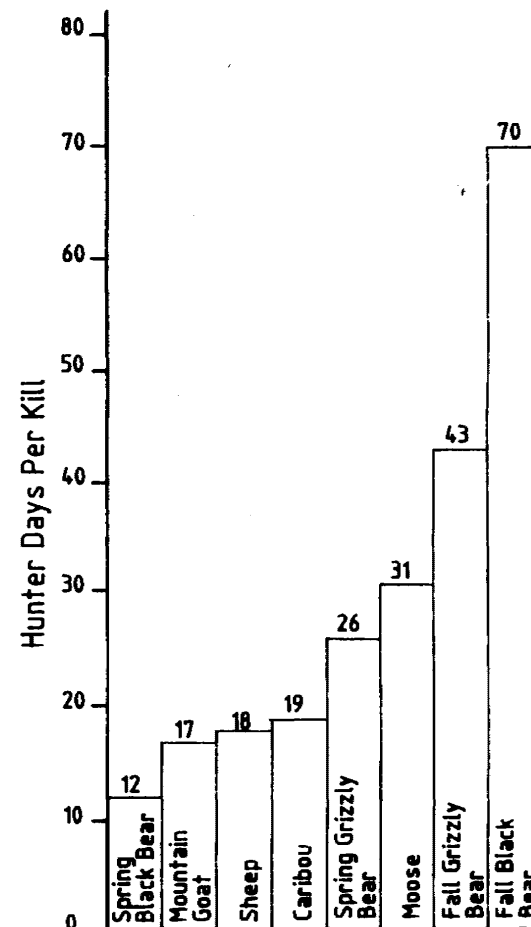


Fig. 5: The mean number of hunter days per kill for Yukon big game species. The means are determined from hunter questionnaire respondents, 1979-1986.

TABLE 7. The percent success of resident (non-native) and non-resident sport hunters acquiring black bear tags and the mean number of days spent hunting by successful hunters, 1980 - 1986*.

Year	Resident Tags	Reported Resident Harvest	Percent Success	Mean Days Hunting/ Bear	Non- Resident Tags	Reported Non- Resident Harvest	Percent Success	Mean Days Hunting/ Bear
1980	855	48	5.6	2.1	250	15	6.0	4.1
1981	899	91	10.1	2.6	222	15	6.8	6.9
1982	934	48	5.1	3.1	206	12	5.8	4.4
1983	946	63	6.7	3.7	227	12	5.3	7.4
1984	1053	99	9.4	2.0	286	22	7.7	6.2
1985	978	74	7.6	3.5	306	21	6.9	4.3
1986	931	68	7.3	2.8	309	15	4.9	6.6
ALL YEARS	6596	491	7.4	2.8	1806	112	6.2	5.7

*The reported harvest and mean number of days hunting are taken from Yukon biological submission records.

TABLE 8. The percent of the Yukon black bear sport harvest in each of six age/sex classes, by season.

Age/Sex*	Spring		Fall	
	#	%	#	%
AM	110	36.2	35	16.4
SM	116	38.1	62	29.1
JM	15	4.9	20	9.4
AF	26	8.6	32	15.0
SF	34	11.2	52	24.5
<u>JF</u>	<u>3</u>	<u>1.0</u>	<u>12</u>	<u>5.6</u>
ALL	304	100.0	213	100.0

*AM= adult males (7 years of age or older)
 SM= subadult male (3-6 years of age)
 JM= juvenile male (0-2 years of age)
 AF= adult female (7 years of age or older)
 SF= subadult female (3-6 years of age)
 JF= juvenile female (0-2 years of age)

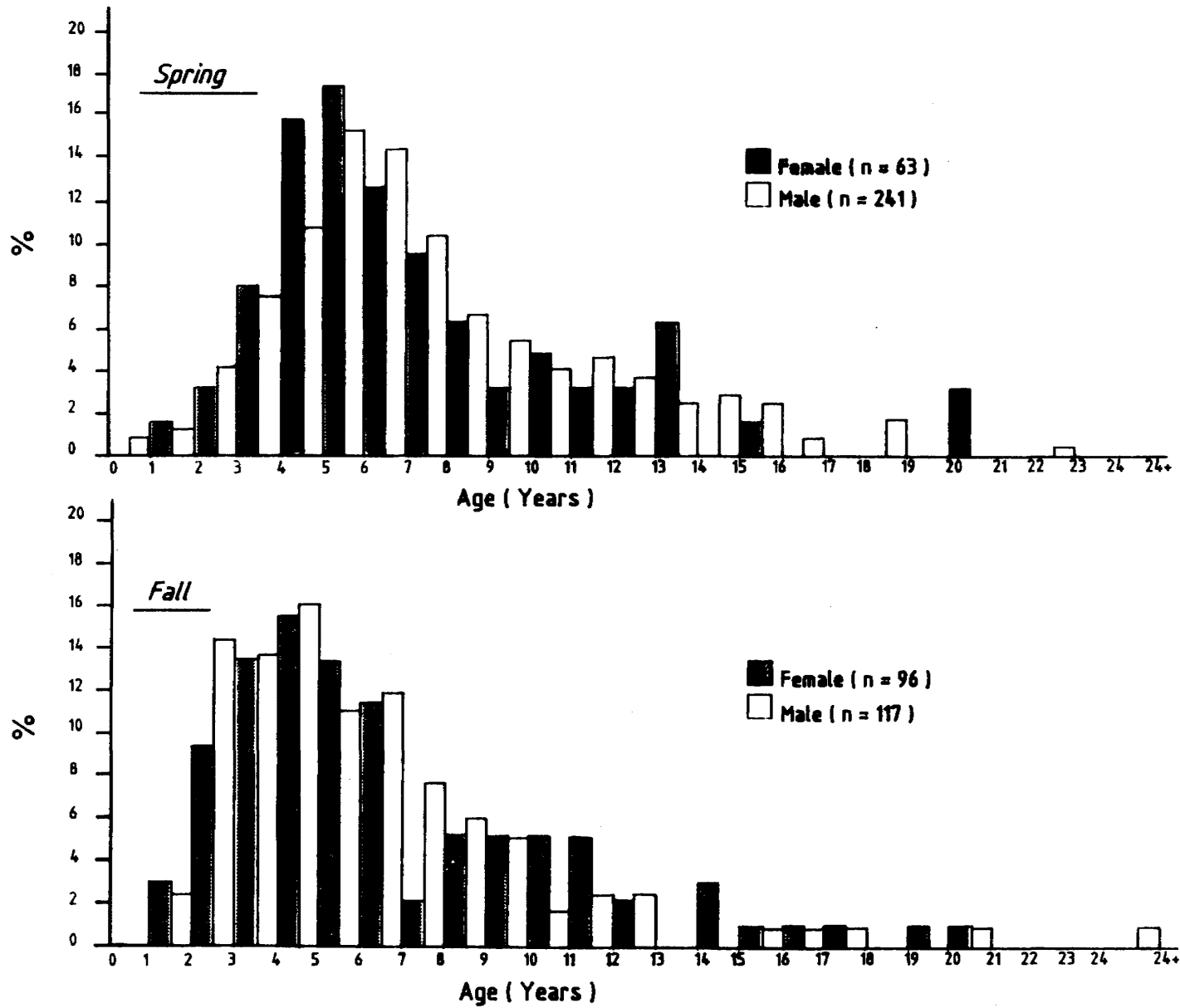


Fig. 6 : Age distribution for sport harvested black bears, by season, 1979–1986.

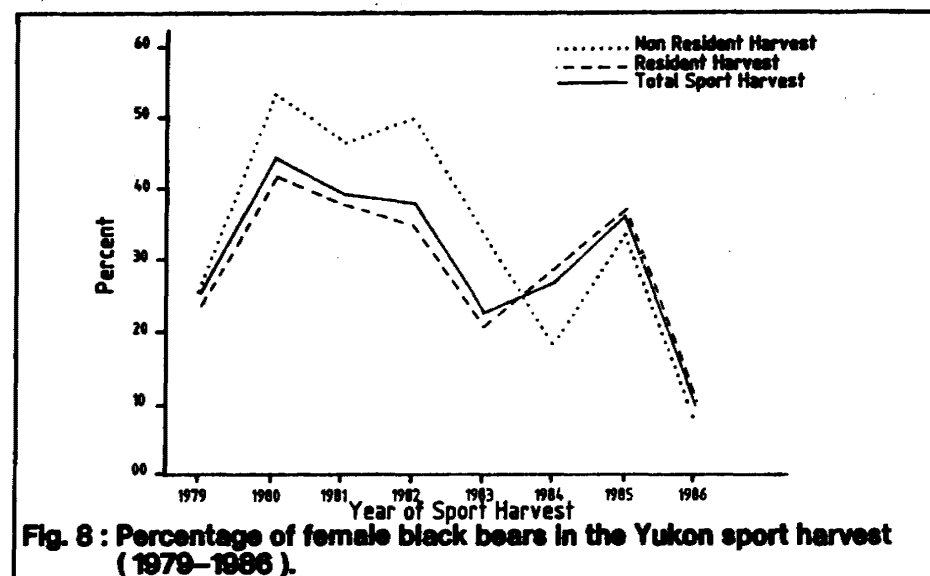
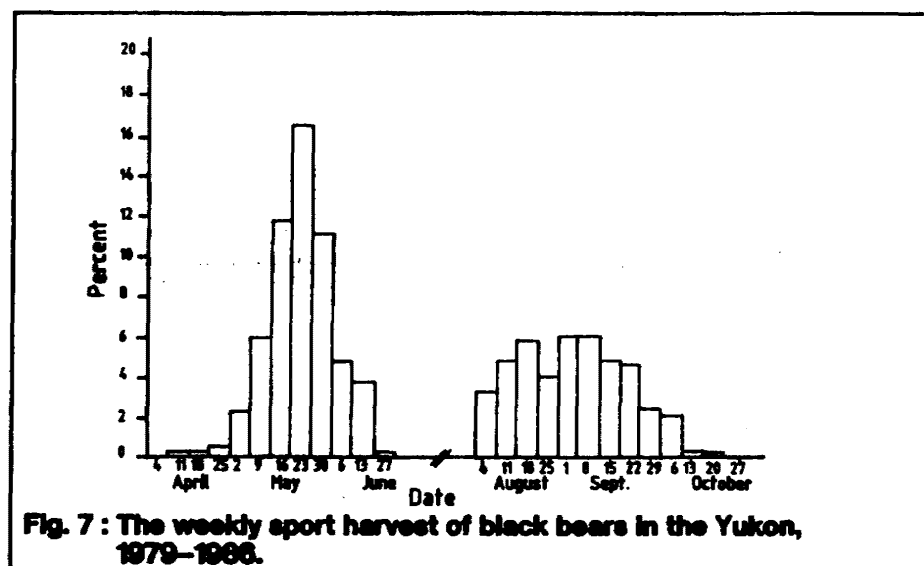
of age is higher in the fall harvest than the spring (Figure 6). When family breakup occurs in the late spring or summer, young animals become vulnerable to harvest in the fall. A higher percentage of young males than young females are killed in the fall, likely because males disperse more than females, bringing them into contact with hunters.

The majority of black bears killed in the spring are taken in the fourth week of May (Figure 7). This corresponds to the period when large rivers are opening up; before deciduous trees green up.

Overall, the percent of females taken in the sport harvest has decreased since 1979 (Figure 8). The mean percent of females in the 1979-1986 sport harvest was 30.2%. This relatively low proportion of females suggests there is no Yukon wide problem of overharvest (Fraser *et al.* 1982, Bunnell and Tait 1985). The mean percent of females in the non-resident harvest is higher than in the resident harvest (33.5% vs 30.2%), but is from a mean yearly harvest of 17 bears, therefore of little concern.

There is a gradual increase in the mean age of sport harvested male bears between 1979 and 1986 (Figure 9)⁸. In heavily hunted populations there is normally a decline in the mean age of male bears because older, bigger males are selected first (Bunnell and Tait 1980, Fraser *et al.* 1982, Kolenosky 1986). The trend in Figure 9 suggests there is no problem with the overall harvest. The mean age of male black bears in the sport harvest,

⁸ Appendix 12 is a summary of the mean ages for sport harvested black bears taken by resident and non-resident hunters.



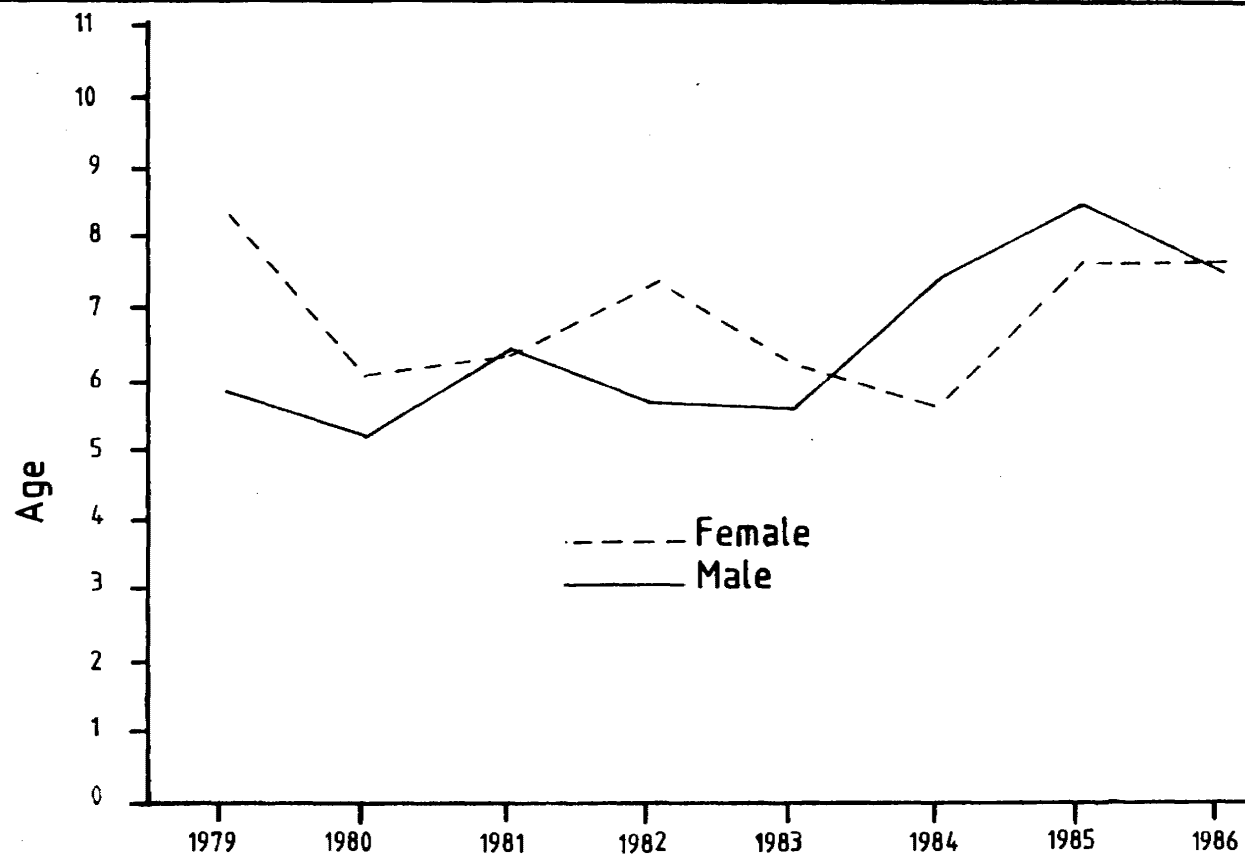


Fig. 9 : Mean age of sport harvested male and female black bears in the Yukon, 1979–1986.

1979-1986, was 6.7 years ($n=372$) and the mean age of females was 6.5 years ($n=165$).

There was a general decline in the days required for resident hunters to take a black bear between 1979 and 1986 (Table 9). Decreasing hunter effort may reflect either, higher black bear numbers, greater skill of resident hunters, more intensive hunting, or more spring hunting. The effect of more liberal regulations on hunter success was difficult to assess; between 1983 and 1986 14% of successful resident black bear hunters took more than one black bear.

The proportion of females in the seasonal harvest shows considerable annual variation (Figure 10). We hypothesize that a peak in the proportion of females in the spring harvest indicates a year when many females failed to produce young, therefore fewer females were protected from harvest. Peaks in the proportion of females in the spring harvest occurred in 1982 and 1985, which we suggest were a result of poor habitat productivity or food shortages in 1981 and 1984, respectively. Three pieces of evidence suggest 1981 and 1984 were poor years for black bear foods. Reported black bear control kills were 58% higher in 1981 and 56% higher in 1984 than an eight year average (1979-1986), suggesting more bears were exploiting garbage and moving through developed areas searching for food (Kolenosky and Strathearn 1987). In both 1981 and 1984, the percent of females in the control kill was higher than other years, suggesting that bears exploiting garbage were not just subadult male bears forced from their natal areas (Erickson *et al.* 1964). Reported sport kills were 33% higher in 1981 and 51% higher in 1984 than an eight year average (1979-1986), suggesting black bears were more vulnerable to harvest because they were moving

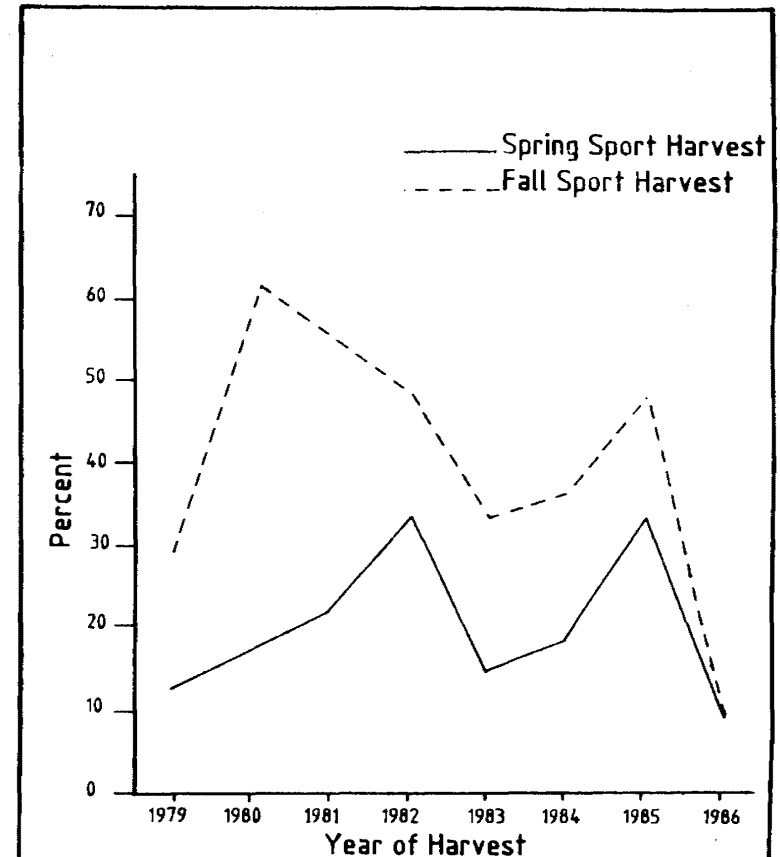


Fig. 10 : The percent of females in the Yukon sport harvest, by season and year, 1979-1986.

TABLE 9. The mean yearly success of resident (non-native) black bear hunters. Estimates are derived from hunter questionnaire analysis.*

Year	Total Estimated Days Hunting Black Bears	Total Estimated Harvest	Success (Days/Kill)
1979	1248	60	20.8
1980	1721	70	24.6
1981	1569	84	18.7
1982	1941	71	27.3
1983	1782	84	21.2
1984	1864	119	15.7
1985	1646	95	17.3
1986	<u>1162</u>	<u>94</u>	<u>12.4</u>
ALL YEARS	12933	677	19.1

*Yearly hunter effort was determined by dividing the total number of days hunted for all black bear hunters (that hunted) by the total estimated black bear harvest.

more in search of food. Although the number of black bear tags sold to residents was 12% higher in 1984 than a seven year average, 1980-1986, the percent success of resident hunters was 27% higher (Table 7).

3.4 Regional Distribution of the Sport Harvest

Temporal trends in the sport harvest indicate that black bears are lightly hunted through most of the Yukon. To determine if there are any areas of the Yukon where overharvest of black bears is occurring, the sport harvest was examined on a regional basis. In the regional assessment, we used four predictive measures of harvest pressure to identify potential areas of concern.

First, a minimum harvest of one bear/1000 km²/year was used to identify areas for further consideration. Because harvest density may simply reflect bear densities rather than harvest pressure, it is not an adequate measure of harvest pressure by itself.

Secondly, a high proportion of females in the sport harvest was used to indicate relatively heavy harvest. Male bears are more vulnerable to harvest than female bears (Bunnell and Tait 1980). Hunters try and select the largest black bears available, which are usually adult male bears. In addition, female bears with cubs are protected from harvest, therefore a high proportion of females in the harvest indicates a reduction in the availability of male bears (Kolenosky 1986). The mean percent of females in the Yukon sport harvest, 1979-1986, was 30.2%. We assume this indicates a moderate sustainable harvest. A ten year harvest sex ratio of 33% females was considered sustainable for black bear populations

in the Nelchina Basin, Alaska (Townsend 1986). In the central Tanana Valley, Alaska, 41% females in the 1984 and 1985 black bear harvest was considered to indicate heavy harvest pressure (Townsend 1986). For this analysis we suggest a harvest sex ratio greater than 35% females is the limit beyond which a more detailed assessment of the harvest is warranted.

Thirdly, a young mean age of harvested male bears suggests a reduction in the number of adult males in the population. The mean age of harvested male bears in the Yukon was 6.7 years. Harvest ages below this average, accompanied by a relatively high harvest and a high proportion of females (greater than 35%) were the main variables we used to flag potential areas of concern.

The fourth measure of sport harvest pressure was changes in hunter success, measured in days hunted per black bear taken. A general decrease in hunter success, ie. an increase in days hunted per bear taken, over several years, suggests bears may be becoming scarce, therefore harder to hunt. Unfortunately, variables other than density of black bears can alter hunter success statistics, such as increased bear vulnerability due to increased bear movement (this is particularly relevant in years of poor food availability), and changes in the number of hunters and methods of hunting (Kolenosky 1986). Caution is necessary in the interpretation of success statistics.

The majority of black bears taken in the 1979-1986 sport harvest came from the Klondike River, Pelly River, Lake Laberge, Ruby Range and Coast Mountain ecoregions (Figure 11). The Coast Mountain ecoregion has a harvest sex ratio of 50% females, the mean age of male bears killed was 5.2 years (n=20) and the mean age of female bears killed was

5.6 years (n=22). These variables suggest a heavy harvest.

In an attempt to focus on specific problem areas, the black bear sport harvest was mapped by game management subzone (Figure 12)⁹. Subzones where the harvest exceeds one bear/1000 km²/year are concentrated along roads in the southern Yukon, particularly near settlements, and along the Yukon River south of Dawson. Seven subzones with a harvest density greater than one bear/1000 km²/year had greater than 35% females in the sport harvest. The long term effect of heavy harvest will depend on the degree of pressure simultaneously exerted on surrounding areas. As a result, the harvest density, percent of females in the harvest and mean age of male bears taken was determined for the subzones identified above, plus one or more adjacent subzones (Table 10).

The sport harvest in the Beaver Creek area is judged to be sustainable based on the overall harvest density, sex ratio, and mean age of male bears harvested. The percent of females in the Mt. Skukum sport harvest is high, however, the total sport harvest over eight years (1979-1986) was not high and the mean age of harvested male bears is well above the Yukon average. Little harvest occurs in adjacent subzones. The harvest density around Carcross is high and the mean age of sport harvest male bears is below average, however, the percent of females in the harvest is only slightly above the Yukon average and hunter success increased between 1979 and 1986 (Table 11). The total number of bears in the Carcross

⁹ Appendix 13 are distribution maps of the sport harvest by subzone for the resident (non-native) kill and the non-resident kill.

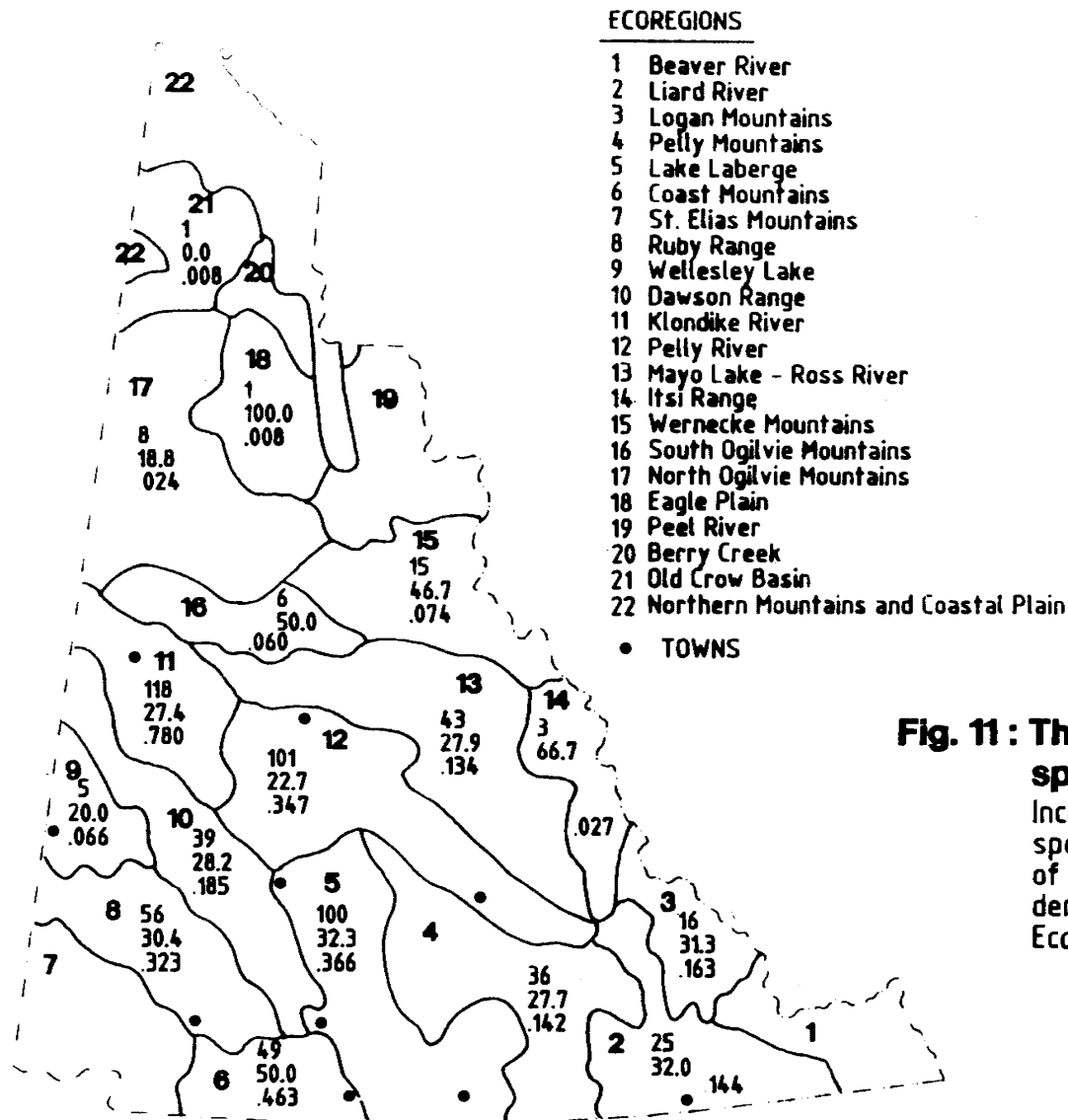


Fig. 11 : The distribution of the Yukon sport harvest by ecoregion.

Included for each ecoregion is the total sport harvest (1979-1986), percent of females in the harvest and harvest density expressed as kills/1000 km²/year. Ecoregion numbers are given in bold type.

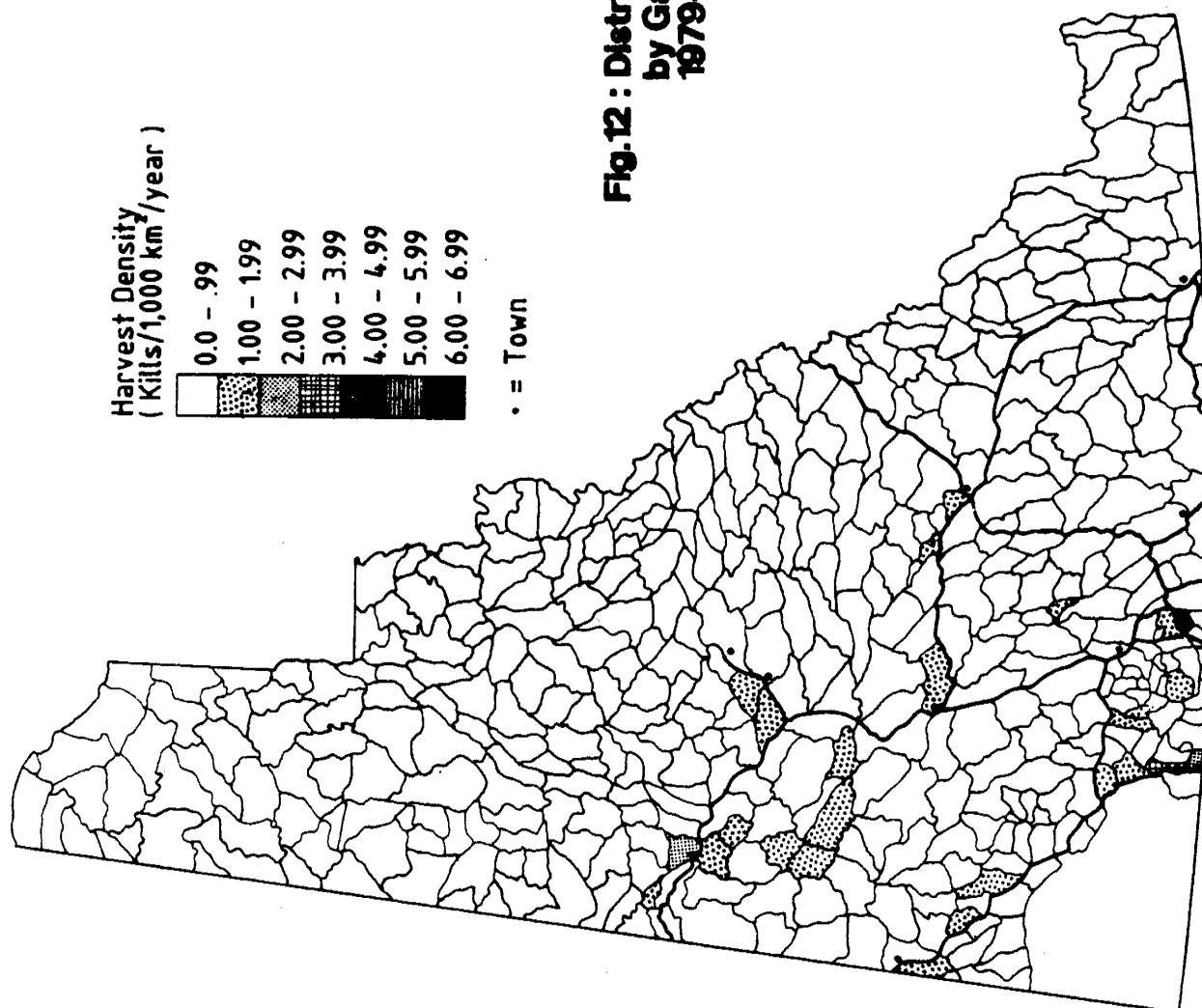


**Fig. 12 : Distribution of the sport harvest
by Game Management Subzone,
1979-1986.**

TABLE 10. The harvest density, percentage of females, and mean age of males in the black bear sport harvest for six areas in the Yukon, 1979 - 1986.

Area	Subzones	Area (km ²)	Total Sport Harvest (1979-86)	Total Density (Kills/1000) km ² /year)	No. Females	% Females	Mean age of Males
Beaver Creek	505,506	1634	11	0.84	3	27.3	8.0
Mt. Skukum	730	572	5	1.09	3	60.0	10.0
Carcross	903,904,905	1071	12	1.40	4	33.3	4.3
Carmacks	526,414	2734	23	1.05	11	47.8	4.8
Dawson	224,302,307	4196	33	0.98	13	39.4	5.7
Klukshu	612,613,707,709	1195	16	1.67	10	62.5	3.8

Table 11. The estimated success (days/bear killed) for resident (non-native) sport hunters, 1979 - 1986. Figures are based on estimates of days hunted and bears killed, extrapolated from hunter questionnaire analysis.

Area	Subzones	1979	1980	1981	1982	1983	1984	1985	1986
Carcross	903,904,905	*	81.0	39.0	*	25.6	12.5	16.0	3.6
Carmacks	526,414	35.0	38.0	8.3	35.5	*	13.4	7.0	1.0
Dawson	224,302,307	41.0	58.0	18.3	44.5	22.8	12.0	56.0	0.9
Klukshu	612,613,707,709	4.3	9.3	5.5	13.0	23.0	*	*	4.4

***no resident harvest**

area may not have declined however, it is possible there has been a reduction in the number of large, mature male bears allowing more subadult bears to establish home areas (Kemp 1972, Young and Ruff 1982). Black bears around Carmacks appear to be receiving considerable harvest pressure. The harvest density is not high, but the two subzones considered are large. The proportion of females in the harvest is high and the mean age of males bears is low. Despite these indications of heavy harvest, hunter success in the Carmacks area has increased since 1982. Black bears in the Dawson area are being relatively, heavily harvested. Harvest density is not high, but a large area was considered in this assessment. The proportion of females in the harvest is above 35% and the mean age of harvested male bears is below the Yukon average. Hunter effort in the Dawson area fluctuated considerably between 1979 and 1986. In the Klukshu area harvest density is high, the proportion of females in the harvest is well above 35% and the mean age of male bears harvested is well below the Yukon average. Hunter success in the Klukshu area steadily decreased to 1983, there was no resident harvest in 1984 and 1985 and success was high again in 1986. Black bears in the Klukshu area appear to be overharvested.

3.5 Management Considerations

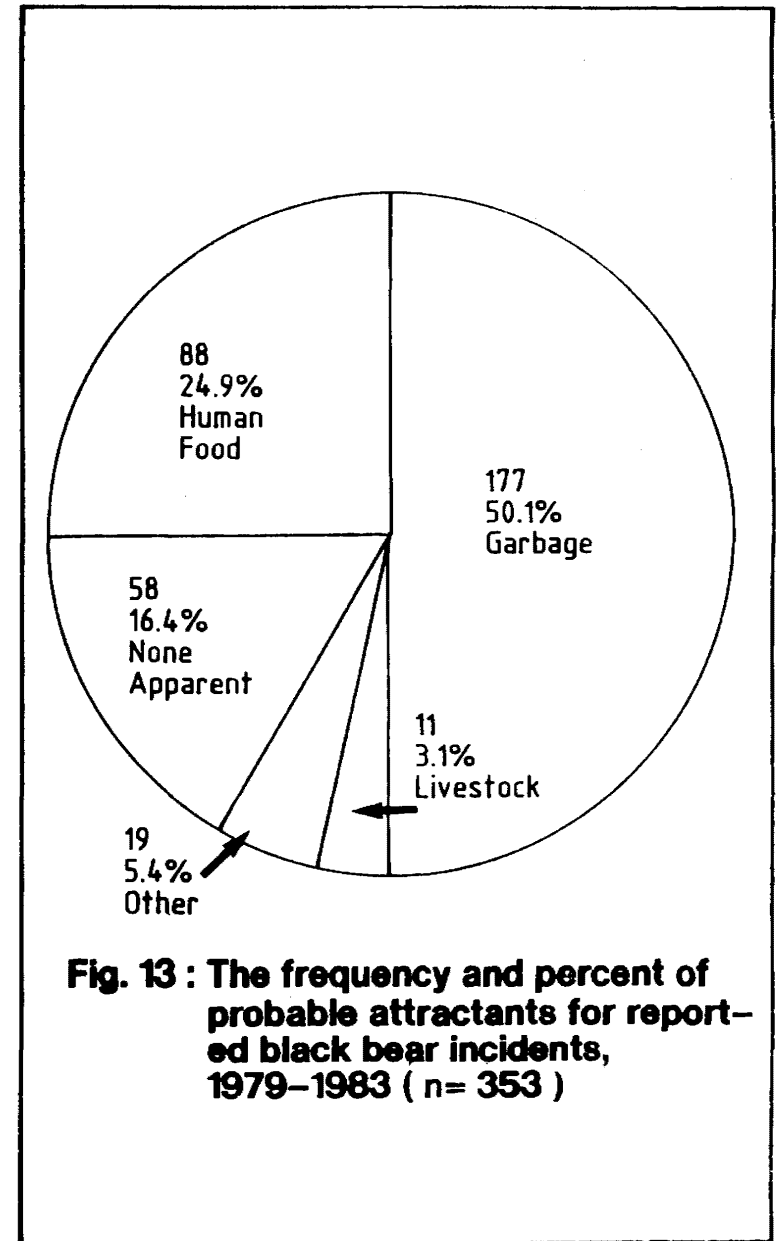
Determining the sustainable harvest rate of a population requires information on the abundance of animals in an area, the rate at which young are recruited to the population, the degree of immigration from outlying areas, and the level of natural mortality. Data on these variables is lacking for Yukon black bears. There is evidence, however, that the reproductive potential of Yukon black bears is lower than populations in the south

or coastal Alaska (Section 2.5.2). Until more detailed information on population dynamics is available, black bear sport harvest management in the Yukon must be based on an assessment of relative harvest pressure, focussing on areas of potential concern.

At present, there is no concern for the level of sport harvest of black bears in most areas of the Yukon, including the Beaver Creek and Mt. Skukum areas examined above. Sport harvest of black bears in the Carcross area is not a major concern, although changes in the sex ratio of the harvest should be monitored. There is probably a significant native harvest and unreported non-native harvest in the Carcross area. Sport harvest data for the Carmacks area suggest black bears in the area need management attention. Black bears in the Dawson area need management attention, particularly given the high unreported kill of black bears known to occur in local mining camps. Black bears in the Klukshu area were probably overharvested in the late 1970's and early 1980's. Habitat in the Klukshu area is considered to be productive for black bears, so numbers may be able to rebound quickly. Future trends in the black bear sport harvest for this area should be monitored.

Local, heavy harvests of black bears are not expected to affect the long term status of Yukon black bears, however, local reductions should not be ignored if recreational hunting opportunities near settled areas are to be maintained.

In addition to sport harvest, mortality from control kills, native harvest and resident trapper harvest must be determined before adequate black bear status assessments are possible. Black bear mortality from these three additional sources will be considered in following sections.



4.0 PROBLEM BEAR MANAGEMENT

4.1 Introduction

Human food and associated garbage are powerful attractants to black bears. In 75% of reported black bear/human conflicts in the Yukon, human food and garbage were the known attractants (Figure 13). Black bears that use garbage frequently become a nuisance and a potential threat to humans and their property. The traditional approach to problem bear management is to destroy or relocate nuisance bears, thereby attacking the effect of the problem rather than the cause. Escalating problems with nuisance bears have prompted managers and conservation officers to begin to adopt more preventative strategies.

Yukon government policy regarding the handling of nuisance bears leaves much of the decision about proper action to the wildlife official(s) involved. In all situations where a bear contacts a human, the bear is destroyed. When property damage occurs or when bears are active near developed areas, discretion is used. Greater leniency is given to adult bears, particularly females with cubs. They are often relocated after due concern for manpower and cost. In any situation, the personnel involved first consider their responsibility for the safety of the public and secondly their responsibility for the preservation of the resource. Decisions regarding the fate of a nuisance bear require the evaluation of many factors and cannot be tied to strict policy guidelines.

Data on problem bear incidents in the Yukon comes from problem bear interview forms completed by conservation officers and from biological

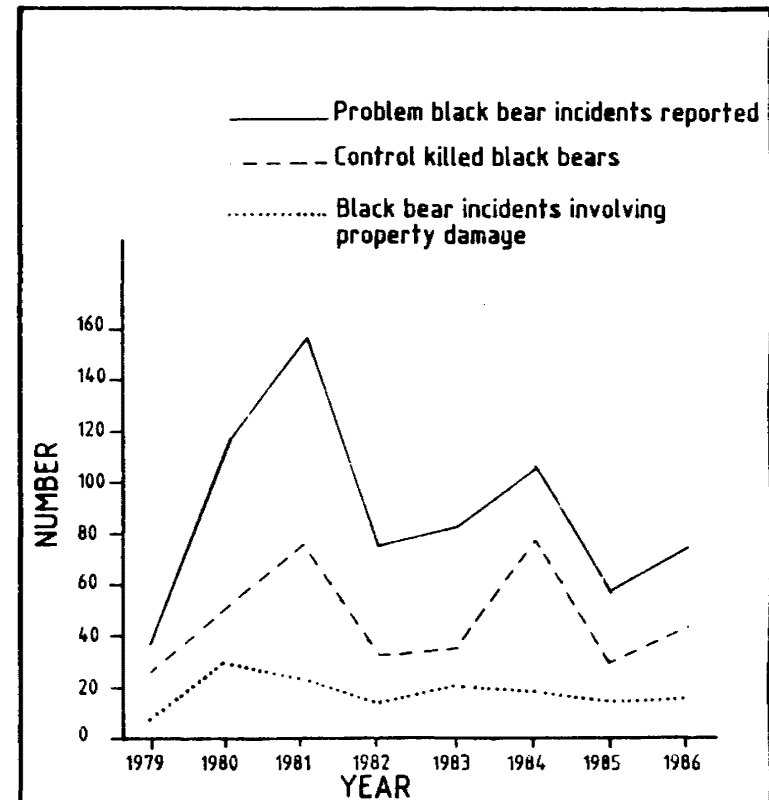


Fig. 14 : Reported problem bear incidents, number of control killed black bears and problem incidents involving property damage in the Yukon, 1979-1986. All information is taken from problem black bear interviews.

submissions following control kills. Residents and tourists are encouraged to report all bear encounters, particularly those near human settlement. Of 699 reported black bear incidents between 1979 and 1986, 30% were non threatening to property or human safety. These incidents included bear sightings from a distance, bears hit by vehicles, bears found dead, and bear signs such as tracks or droppings. Control kills of problem bears accounted for 36% (n=1041) of human caused black bear mortality in the Yukon between 1979 and 1986 (Figure 14)¹⁰. The number of reported control kills underestimates the actual number of problem bears killed because numerous unreported kills which occur in remote camps, particularly placer mining, fish and mining exploration camps. Unreported control kills may equal or exceed the reported control kills. Interviews with mining staff suggest only 2-10% of bear problems are reported by the exploration industry.

4.2 Overview of Problems

Subadult male black bears comprise the bulk of nuisance black bear problems (Kolenosky and Strathearn 1987). Between 1979 and 1986, juvenile males (0-6 years of age) were taken in at least 60% (n=96) of control kills where sex and age were established. (Figure 15). In 1981, conservation

¹⁰ Between 1979 and 1986, 370 control kills were reported on problem bear interview forms, but only 339 were reported as control kills on biological submissions. The difference occurred because some problem bears killed by residents during hunting season were reported sport kills on biological submissions, rather than as control kills.

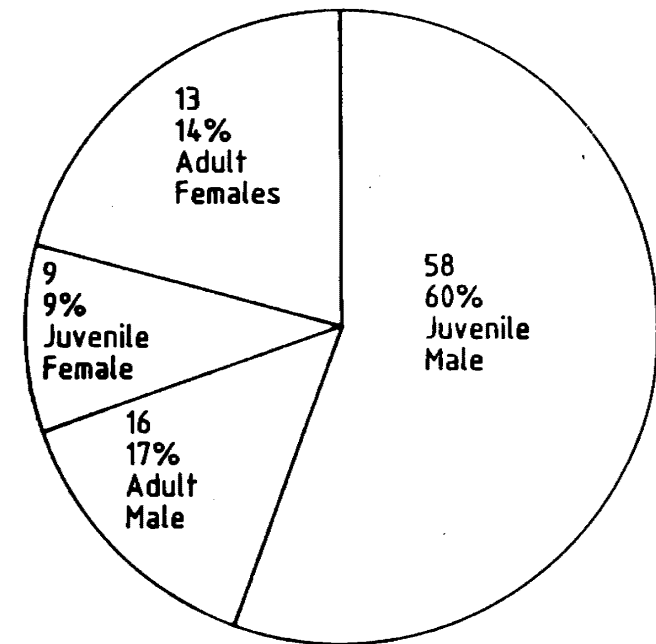
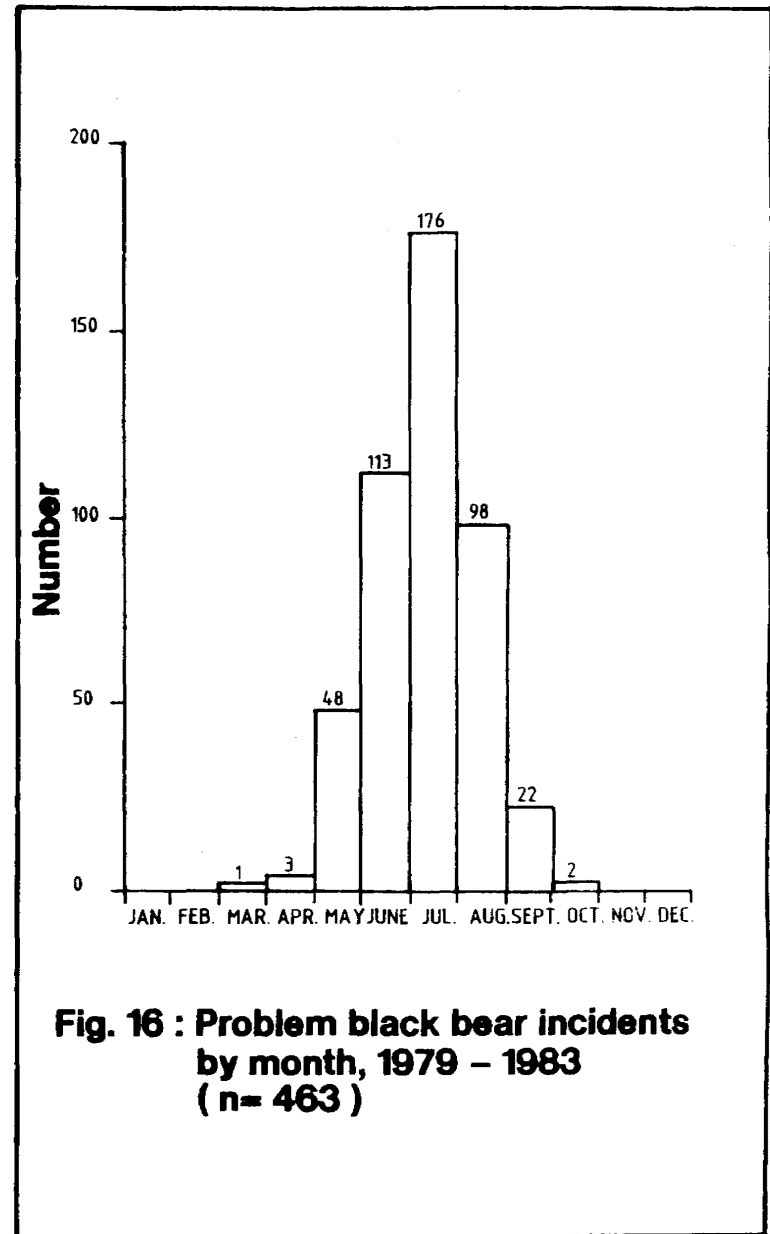


Fig. 15 : The age and sex class of black bear control kills, 1979-1986 (n = 96). Adults are black bears 7+ years and older. Juveniles are bears 0-6+ years old.

officers were instructed not to bring in samples from young males and after 1981 submission patterns varied greatly between conservation officers. Therefore, the data in figure is biased toward sex and age classes other than juvenile male. The mean age of male bears killed in control actions was 5.6 years ($n=74$) and the mean age of females bears was 7.0 years ($n=22$). The age for male bears is likely higher than for the reason mentioned above. Subadult males are forced from natal home ranges after families breakup at which time they wander widely attempting to establish a home range. Their inexperience can lead to food stress and their movements often bring them into contact with human settlement (Herrero 1985).

The majority of problem black bear incidents (74%, $n=463$) occur in the summer months of June, July and August, with a peak in July (Figure 16). We suspect there is a peak in black bear problems in June and July for several reasons. Family breakup occurs during the mating season in June and July so that subadult black bears are beginning to fend for themselves. Green vegetation is probably of less nutritive value during late June (as fiber content increases) than at first emergence and berries have not yet become a staple in the black bear diet. Residents and tourists are most active outside in July and August and as a result there are more encounters with bears and there is more garbage available to bears. (Kolenosky and Strathearn 1987). The reason we believe there is not a peak in black bear problems during August is because black bears are feeding on berries and are less dependent on garbage. In years when the berry crop fails we expect problem black bear incidents would peak in August (Hatler 1967).



Most problem black bear incidents occur in residential areas (25%), at recreational sites (23%) or at industrial sites (21%) (Figure 17). In these areas black bears can cause extensive damage to human property. Black bears were responsible for 146 reported damage occurrences between 1979 and 1986, which accounted for 71% of all bear damage occurrences (Figure 14). In six incidents, black bears were responsible for injury or death to livestock. The low level of bear/livestock problems in the Yukon is likely due to the paucity of small livestock, rather than any unusual livestock husbandry practices. In four cases black bears have injured humans¹¹.

The Yukon public incurs a significant financial burden as a result of problem bears, including:

- 1) government manpower, handling and travel costs to respond to problem bears;
- 2) property damage inflicted by bears;
- 3) education costs to inform the public about safety around bears and to change their attitudes about waste disposal; and
- 4) management costs, including data analysis and reporting, drug administration and handling courses.

¹¹ Black bear caused human injuries include a woman killed by a black bear in the Dezadeash area (1975), a canoeist bit in the shoulder while sleeping (1979), a young girl bitten on the hand while sleeping beside some drying meat (1981), and a motorcyclist scratched in the leg when he startled a panhandling black bear (1988).

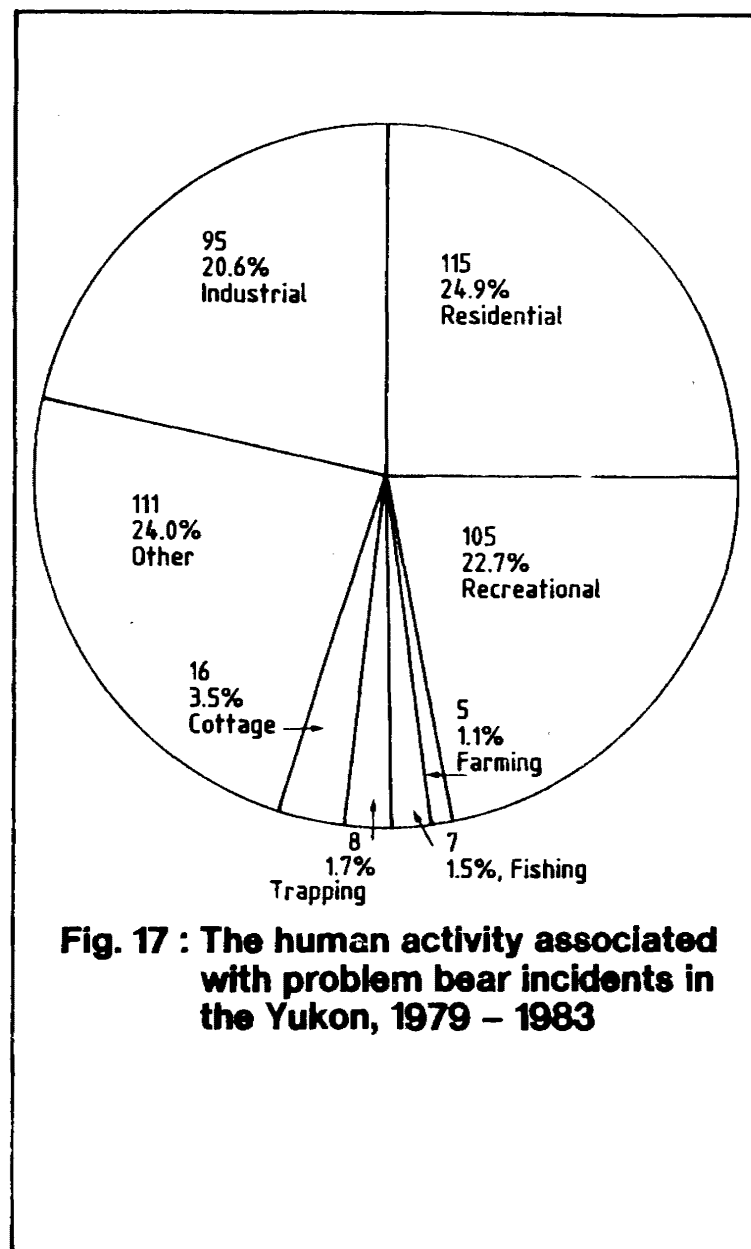


Fig. 17 : The human activity associated with problem bear incidents in the Yukon, 1979 - 1983

The specific costs of black bear problems have not been determined, however, the total costs associated with grizzly and black bear problems have (Waterreus pers. comm.). An individual problem grizzly bear costs the public more than an individual problem black bear, however, black bears are responsible for nearly 75% of known species complaints. Between 1979 and 1988, the estimated yearly cost for responding to problem grizzly and black bears was \$22,638. The estimated yearly cost in property damage was \$7,488, the estimated yearly cost of education was \$7,488 and the estimated yearly costs of management was \$5,775 (Appendix 14).

4.3 Regional Distribution of Control Kills

The highest densities of control kills occur in the Klondike River, Lake Laberge and Coast Mountain ecoregions (Figure 18). These same ecoregions also had the highest sport harvest densities (Figure 11).

To illustrate areas of the Yukon with chronic black bear problems, control kills have been plotted by game management subzone (Figure 19). As expected, most subzones with high control kill densities are near human settlements with associated open-pit garbage dumps. The number of reported control kills in one or more subzones adjacent to settlements was determined (Table 12). Settlement areas with the highest reported control kills were Dawson, Mayo, Whitehorse, and Teslin.

4.4 Management Considerations

Control kills are mainly subadult male bears, therefore they are not expected to adversely

impact Yukon black bear populations, except where they occur in conjunction with a heavy sport kill or unreported kill (see Section 8.0). A high density of control kills does point out areas where more effective attention to sources of bear/human conflict is required, however.

Despite heavy control kills mean settled areas, nuisance bears continue to be a problem because of poor garbage management. Preventative strategies are less costly in the long term than reactive problem bear management. Proper garbage management not only reduces the governments cost of control, but it increases human safety, reduces property damage by spoiled bears, and helps maintain black bear populations in a wild state. Unreported control kills by the mining industry and by rural native and non-native residents need to be better understood.

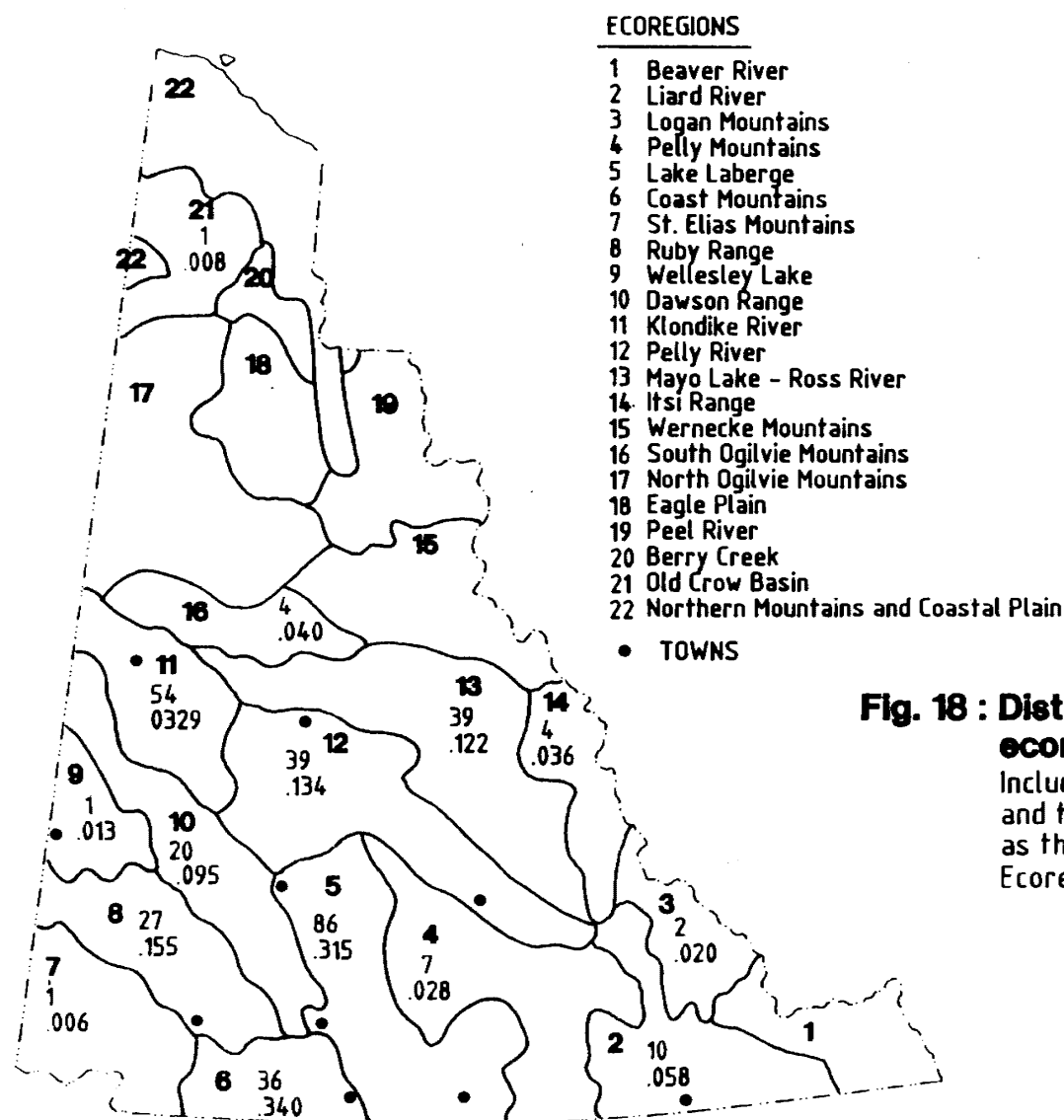


Fig. 18 : Distribution of control kills by ecoregion, 1979-1986.

Included in each ecoregion is the total kill and the density of bears killed, expressed as the number/1,000km²/year.

Ecoregion numbers are given in bold type.

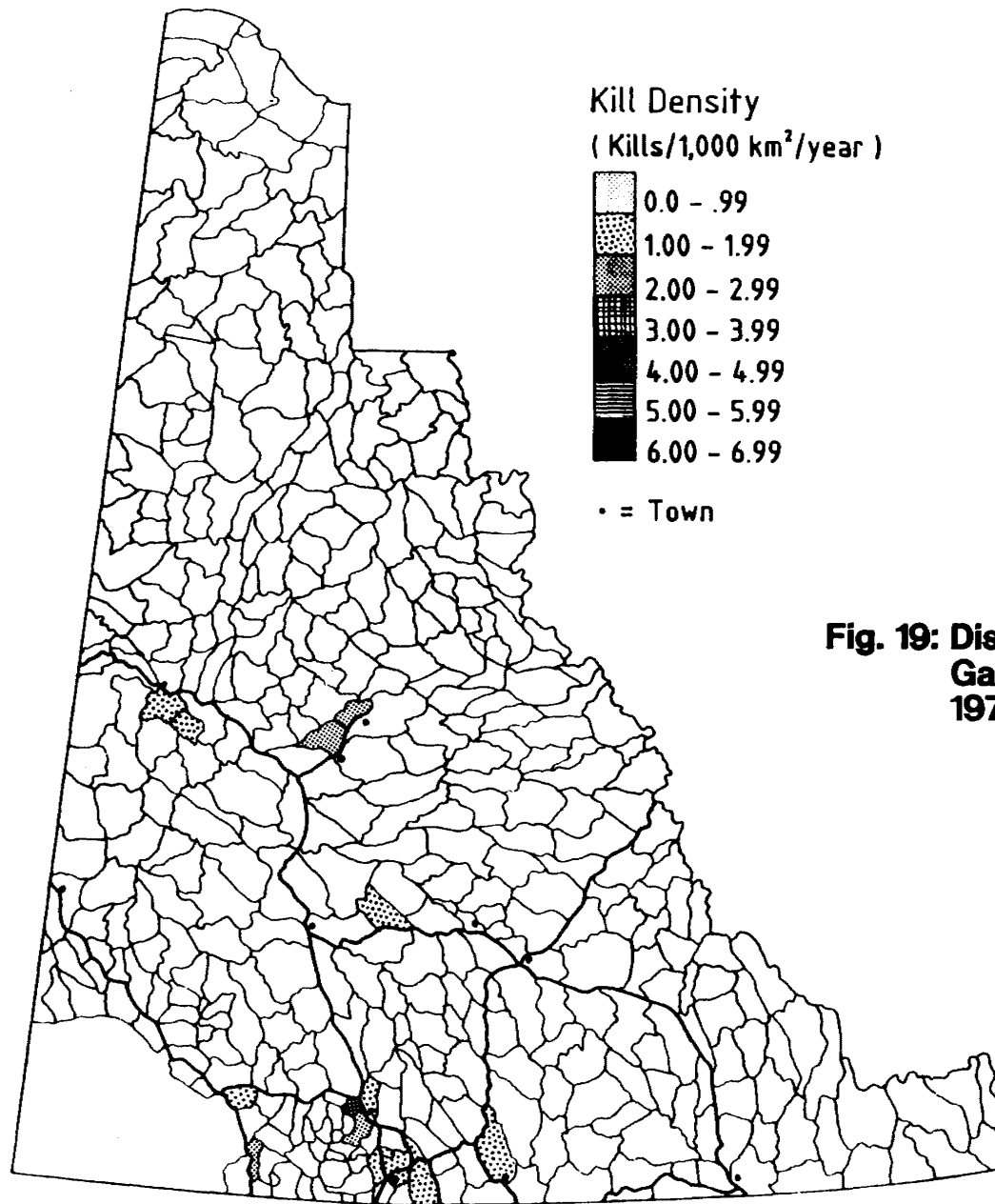


**Fig. 19: Distribution of the control kill by
Game Management Subzone,
1979-1986.**

TABLE 12. The number of control kills and control kill density adjacent to settled areas, 1979 - 1986*.

Immediate area around:	Game Management Subzones	Area (km²)	Total Control Kills	Control Kill Density (Kills/1000 km²/Year)
Dawson	224,302,307	4196	31	0.92
Mayo	258,404	3122	30	1.20
Whitehorse	718,721,813	1193	24	2.51
Teslin	1022	1526	18	1.47
Elsa/Keno	262,405	2463	15	0.76
Tagish to Jake's Corner	907	931	15	2.01
Haines Junction	541,701	1550	9	0.73
Little Salmon	415	1025	9	1.10
Carmacks	414,526	2734	9	0.41
Klukshu	707	386	8	2.59
Carcross	903,904,905	1071	8	0.93

*There is no consideration of human population densities in the assessment of control kills around settlements.

5.0 TRAPPER HARVEST

Little is known about the harvest of black bears by Yukon trappers in the last part of the 19th century and the first half of this century. Between 1956 and 1975 trapper harvest was estimated by wildlife managers (Appendix 6). The estimated mean yearly trapper harvest (52 bears per year) was 40% of the estimated total harvest by all means (primarily sport harvest). Between 1976 and 1988, wildlife managers compiled data on trapper harvest through a fur export permit system. Because some black bear pelts were sold on the local market and black bear pelts could be exported on either a fur export permit or a big game export permit, fur export records were an underestimate of the actual trapper harvest. In 1988 the big game export permits and fur export permits were amalgamated into a wildlife export permit, so a more complete record of trapper exports could be compiled. There is no still system in place to determine the number of pelt purchases by fur dealers for local sale. Trappers are required to report black bear kills through the Yukon Biological Submission process, but there is no specific category in the process for trapper harvest, so trapper kills are recorded as resident sport kills. Based on fur exports only, the mean minimum trapper harvest between 1979 and 1986, was 18 black bears per year (Appendix 6).

Yukon trappers obtain black bears by shooting them; - leg or neck snares, culvert traps or leg-hold traps cannot be used because of the concern that grizzly bears might be captured. Yukon trappers are not permitted to leave black bear pelts in the field and cannot sell any bear parts, other than pelts, without a special permit. Since Canadian trappers only received, on average, \$48.50 for black bear pelts in 1985/86 and \$55.60

in 1986/87, interest in this species remains low. Virtually all trapping is in the winter, while bears are denning, therefore black bear harvest only occurs when bears occasionally emerge in the winter, when bears invade trapper cabins or when trappers see black bears in the vicinity of their camps during the fall.

6.0 NATIVE SUBSISTENCE HARVEST

Black bears and grizzly bears were traditionally hunted by Yukon Indians, however, they were not an important game species. Only the bravest Indians hunted bears because of the bears' strength, size and great spiritual powers (McClellan 1987). Sometimes when a man found a bear den in winter he would return with relatives or friends in the spring, rouse the bear and then kill it. Bears were also caught in strong snares or crushed in deadfalls made by big logs (McClellan 1987).

The most important food product made from bears was grease. The grease was simply eaten or used to preserve dried meat or fish. Some people would not eat bear meat or grease because they feared the spirit power of the bear (McClellan 1987). Few black bears were hunted for their skins by Yukon Indians until white people began to buy them as souvenirs (McClellan 1987).

For the Koyukon people of Alaska, both black bears and grizzly bears have considerable spiritual and practical importance, but the black bear is much more significant in the subsistence economy. It ranks high as a resource and is esteemed as a food and as a ceremonial delicacy. Taking the animal is far more than just a way of getting food - it is a quest for prestige and a high expression of manhood. Fall hunting of black bears in dens is the truest test of a man's hunting skills and a fundamental part of the masculine identity (Nelson 1983).

Yukon Indians continue to hunt black bears today, but the extent of this varies between the different cultures of 13 communities. In 1987, the yearly kill of black bears was estimated for 6 of 13 native communities through interviews with

Indian hunters (Quock 1987). Of 17 black bear kills reported by hunters in the 1987 interviews, only 2 (11.8%) have been reported through the Yukon biological submission process (Quock in prep.). The highest harvest was by Teslin hunters.

7.0 MANAGEMENT OF BLACK BEAR PREDATION

Moose populations in the Carcross and Haines Junction areas underwent substantial declines during the past decade. Between 1980 and 1984 populations declined by 58% and 43%, respectively (Ward 1988). Human harvest and high predation rates are believed to be responsible for keeping moose populations from increasing (Larsen et al. 1985, 1988). Predation is primarily by grizzly bears and wolves, however, black bears are also known to kill moose calves. Black bears were implicated in 2% of radio collared moose calf deaths in 1983 and 8% of moose calf deaths in 1985 (Larsen et al. 1988). Black bear predation on moose calves has also been documented in other northern areas. On the Kenai Peninsula, Alaska, black bears were responsible for 59% of moose calf mortalities (Franzmann et al. 1980, Peterson 1982, Schwartz et al. 1983). In Saskatchewan, fall moose calf/cow ratios increased 200% following black bear removal. There were no other significant predators in the system (Kowal and Runge 1981).

In 1984, Yukon bag limits were increased from two to three black bears and year-round seasons were adopted for special bear reduction subzones. The bear reduction subzones were established in game management zones 5, 7 and 9, encompassing southwest Yukon moose populations. Between 1979 and 1983, the black bear kill in bear reduction subzones averaged six bears per year. After implementation of the liberal hunting regulations in 1984, the average black bear kill increased to 15 bears per year (1984 - 1986; excludes subzones 901, 902 and 904 added to the bear reduction subzones in 1985). The mean sport kill went from three black bears per year to eight black bears per year and the mean non-sport kill went from two

black bears per year to seven black bears per year. The liberalized bag limits increased the average kill of black bears in the southwest Yukon, but it is not known what effect this had on the status of black bears in the area.

Black bears are an important predator of moose calves in adjacent northern areas and available evidence suggests they may be an important predator in the Yukon (Larsen et al. 1988). The role of black bears in regulating moose numbers is not well understood, nevertheless, there is a public attitude that removing black bears will enhance moose populations. In 1988, requests to thin out Pelly River black bears to enhance moose populations were received from Indians in the Pelly Crossing area. No harvest of black bears was reported by natives in the area in 1987 (Quock in prep.). Similar requests may be received over the next few years.

8.0 MANAGEMENT CONSIDERATIONS REGARDING THE TOTAL KILL OF YUKON BLACK BEARS

In this section we evaluate the status of black bears in areas where there is a high total kill density and/or a high probable unreported mortality. In several areas, black bears are receiving considerable sport harvest and control kill pressure (see sections 3.0 and 4.0, respectively). In most cases these are areas centered around settlements (Figure 20). A prevailing public attitude that considers black bears a nuisance and of substantially less intrinsic value than other species, has lead to considerable unreported mortality in some areas.

The Dawson area likely sustains greater mortality of black bears than any other area in the Yukon (Table 13). The unreported mortality is probably the highest in the Yukon. Unreported kills are primarily in the intensively mined "triangle" between the Stewart River, the Yukon River and the Klondike Highway. The total reported kill in this area between 1979 and 1986, was 75 black bears. We suspect the actual kill could easily be double this. In this "triangle", grizzly bear sightings are rare. Grizzly bears have probably been locally extirpated over the last century of placer mining. As a result, undisturbed areas could be productive for black bears, however, any bears that migrate into mining camps soon cause problems and are killed. The best way to limit black bear mortality at placer mining camps would be to require each camp install a garbage incinerator. Unfortunately, these restrictions cannot be enforced under current placer mining legislation.

Placer mining has destroyed extensive riparian habitat. It is possible this destruction has

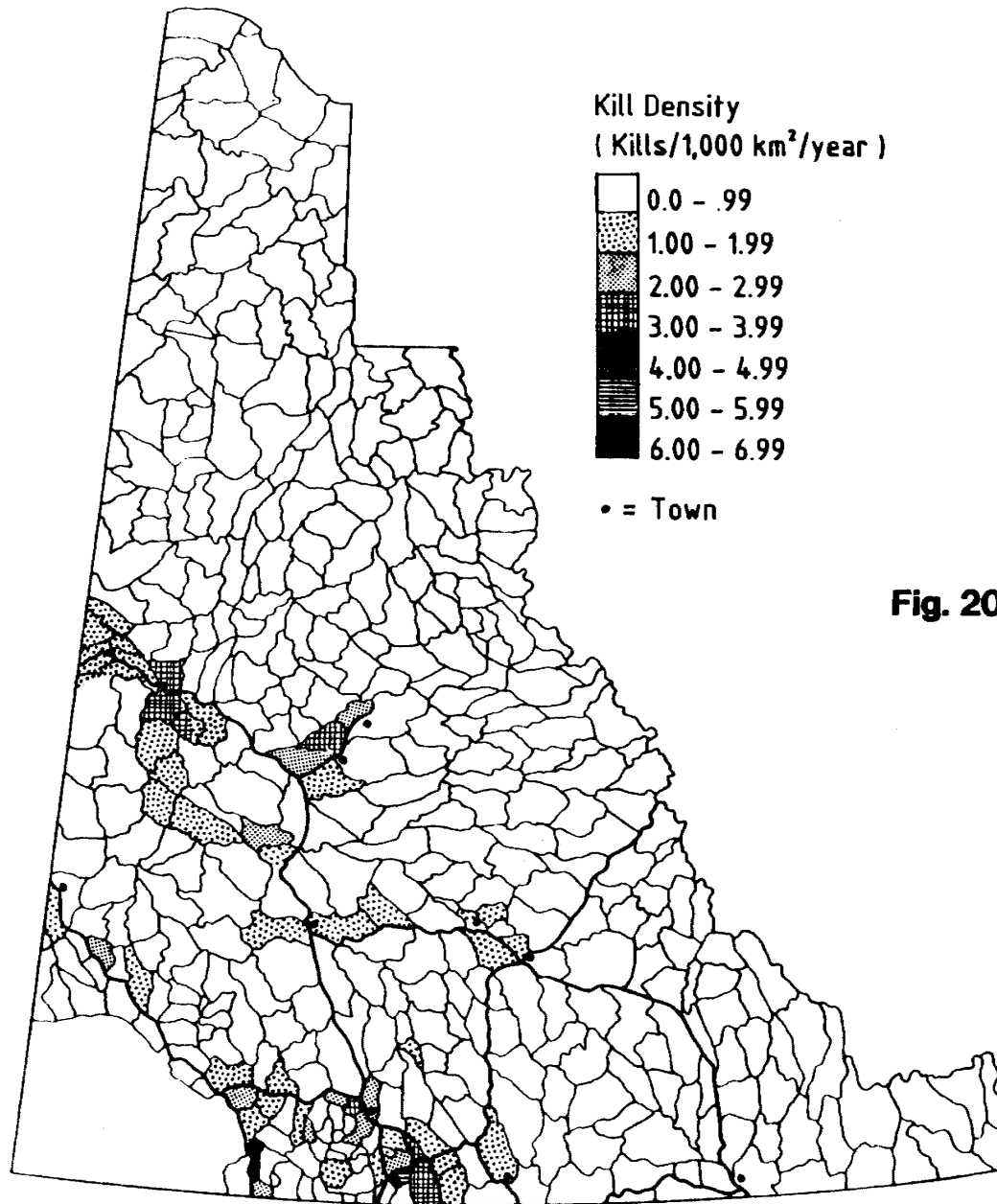


Fig. 20 : Total Yukon kill by Game Management Subzones, 1979-1986.

TABLE 13. The overall black bear kill statistics for seven Yukon areas, 1979-1986.

Area	Kill Type	Subzones	Area (km ²)	Kill	Kill Density (kills/1000 km ² /Year)	No. Females	% Females	Mean Age of Males
Dawson	Sport Total	224,302,307	4196	33 71	0.98 2.12	13 25	39.4 35.2	5.7
Klukshu	Sport Total	612,613,707,709	1195	16 29	1.07 3.03	10 13	62.5 44.8	3.8
Carmacks	Sport Total	414,526	2734	23 35	1.05 1.60	11 14	47.8 40.0	4.8
Carcross	Sport Total	903,904,905	1071	12 22	1.40 2.57	4 5	33.3 22.7	4.3
Haines Junction	Sport Total	541,701	1550	11 20	0.89 1.61	2 3	18.2 15.0	5.4
Mayo/Elsa	Sport Total	257,258,262	2687	26 62	1.21 2.88	6 11	23.1 17.7	8.4
Whitehorse	Sport Total	718,721,813	1193	2 28	0.21 2.93	1 5	50.0 17.9	4.0

contributed to the high incidents of problem black bears at Dawson garbage dumps and the unusually high proportion of females in the control kill (36%).

Declining black bear numbers have been noted along south facing slopes above the Klondike River near Dawson (Reynolds pers. comm.). High reported kill densities and an above average proportion of females in the sport harvest support these observations (Table 13). Several black bear carcasses have been found on sand bars of the Klondike River, which suggests there are additional unreported control kills in the area. An assessment of unreported bear kills in the Dawson area should be a management priority.

We suspect the fate of black bears and probably grizzly bears in the Dawson region will ultimately depend on international gold prices. If gold prices drop and mining activity declines, black bear numbers may rebound, however, if gold prices stay the same or increase little change is expected.

We believe black bears in the Klukshu area have been overharvested. The proportion of females in the sport harvest is excessive and the mean age of sport harvested male bears is very low. The total harvest density is high and the proportion of females in the total kill is high.

There appears to be an overharvest of black bears in the Carmacks area. The sport kill and total kill densities are high, the proportion of females in the sport kill and total kill is high, and the mean age of sport harvested male bears is low. Unreported native harvest probably contributes substantially to the kill rate.

There is evidence that human caused mortality of black bears in the Carcross area needs management attention. Although the reported harvest is not excessive, nor is the proportion of females in the harvest high, the mean age of sport harvested male bears is below the Yukon average. In addition, much of the surrounding area has both a relatively high resident harvest and a high number of control kills, which reduces potential black bear immigrants to the Carcross area. A considerable number of native residents live in the area and the harvest by this segment of the population may be high. It is also suspected that there is a high rate of unreported kills at mining and exploration camps and private residences. A better understanding of native resident harvest and unreported kills of black bears would help management programs. The garbage dumps at Carcross and Tagish need special attention.

Black bears in the Haines Junction area can likely sustain the current sport harvest. There is a low proportion of females in the sport harvest, but the mean age of harvested male bears is below the Yukon average. Changes in the percent of females in the sport harvest and the age of male bears killed should be monitored. The total kill of black bears is high, but not excessive.

Patterns of unreported black bear kills in the Mayo/Elsa area are probably similar to, but less severe and widespread than in the Dawson area. The proportion of females in the reported kill is low and the age of sport harvested male bears is high, which suggests black bears in the area are sustaining current human caused mortality. South facing slopes above the Stewart River and the highway connecting Stewart Crossing and Mayo are a popular sport hunting area. Although black bear numbers in this area are probably stable, changes in future hunter success should be monitored.

Unlike the Dawson area, unreported black bear kills in the Whitehorse area are probably low. The Whitehorse area kill is mainly control kills of subadult black bears, which could be reduced through improvements in garbage handling at rural residential and campground areas. Black bear numbers in the Whitehorse area are likely stable.

9.0 NON-CONSUMPTIVE MANAGEMENT

To date black bears have primarily received attention as a resource for consumptive use by resident (native and non-native) and non-resident hunters. Only recently has any attention been directed toward non-consumptive use of wildlife in the Yukon (Henderson 1987). Black bears can be an important resource for non-consumptive users, because they are one of the most commonly seen large mammals in the Yukon. This is particularly true along major roads and rivers where other large mammal species are heavily hunted. Opportunity to view the flora and fauna was ranked very important to 71% of respondents to a 1986 Dempster Highway interpretive program questionnaire (n=72) (McEwan and Staniforth 1986) and 66% of respondents to a 1985 questionnaire (n=73) (McEwan and Mossop 1985). A 1982 Yukon visitor exit survey found that "viewing wildlife" was one of the leading trip motivators (26.4%) and that not seeing wildlife was one of the major sources of trip dissatisfaction (Yukon Dept. of Tourism 1984).

The same factors which make black bears vulnerable to harvest also make them candidates for viewing. In the spring, black bears in many areas of the Yukon concentrate on open south facing hillsides. This provides opportunity for interested photographers and tourists travelling in the Yukon during the spring, however, it does not provide opportunity for the majority of tourists travelling in the Yukon during the summer months. During the summer, black bears do not concentrate in any specific habitat. The most feasible approach for promoting black bear viewing opportunities would be information brochures available to interested individuals and promotion of May and June travel.

There are other specific black bear viewing opportunities which could be exploited by interested individuals or commercial interests. Spring river trips may be an excellent way for people to see black bears, as well as grizzly bears, ungulates and non-game species. As an example of the potential for this, spring bear hunters on the Yukon River, between Minto and Dawson, regularly report seeing 50+ black bears and 5+ grizzlies in a five or six day trip.

10.0 MANAGEMENT RECOMMENDATIONS

In proceeding sections of this report, we have attempted to provide a comprehensive summary of available information on the ecology, harvest, and status of Yukon black bears. In doing so, we have identified concerns relating to our current knowledge and management of Yukon black bears, which has hampered and will continue to hamper effective management. In this section, we provide management recommendations to address these major concerns. Strategies to implement these management recommendations will be addressed in a separate management plan.

Long-term black bear population study is necessary to provide scientifically credible estimates of population density and reproductive rates for the determination of sustainable yields.

A program to evaluate major fluctuations in the availability of important black bear foods is necessary to allow for adjustments in sustainable yields and to help predict increases in the number of problem bears.

Educational programs should emphasize that individuals and establishments are responsible for proper garbage management and these programs must be supported by strict waste management guidelines and associated enforcement.

The financial costs of problem bear management and property damage by bears is sufficiently high to warrant mandatory forced-air, fuel-fired incineration of garbage in chronic problem areas. This should be legislative priority.

It is necessary to document the amount and impact of unreported black bear kills by the mining

industry and by rural native and non-native residents.

Available evidence suggests that black bear populations in the Dawson, Klushu, Carmacks, and Carcross areas need greater management focus if they are to be maintained.

Promotion of opportunities to view black bears will help meet the increasing demands for non-consumptive use of Yukon wildlife.

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APPENDIX 1. Spatial distribution of black bears in the Pelly River Valley, Yukon.

Home Range Size

Relocation data for 9 female and 6 male black bears from the Pelly River Valley was evaluated to determine home range size (Table 14). The mean home range for male bears was 103.5 km^2 (range = $54.7\text{--}164.6 \text{ km}^2$) and the mean home range for females was 28.1 km^2 (range = $6.8\text{--}75.4 \text{ km}^2$). There was only a small sample of relocation points for each bear; therefore, no allowance has been made for the probability that relocation points include atypical movements or exploratory excursions. Home range size is designated as the area encompassing 100% of relocation points. Data was analyzed using the minimum convex polygon method (Mohr 1947).

Although female bears have smaller home ranges than males, the distribution of their ranges is such that they encompass habitats which produce preferred foods. In Tennessee, Beeman (1975 in Penner *et al.* 1980) felt that the close association of important habitat types allowed female bears to confine their movements to relatively small areas. In the Pelly River Valley, female home ranges were generally concentrated in the hillside and higher elevation areas north of the Pelly River, while male home ranges were generally scattered on the valley bottom. Differences in the habitat suitability of the two areas are discussed under habitat use.

In 1984, two male black bears from the Pelly River Valley made apparent excursionary movements away from their most common area of activity to an old burn in the northeast corner of the study area, during the late summer. Although it was never verified, we suspect the area was productive for berries.

TABLE 14. Occupied areas of radio-collared black bears in the Pelly River Valley, 1984 and 1986 data combined.

Animal*	1984 Age (Years)	Number of Locations	Minimum convex polygon area (km²)
BM54	5	11	129.7
BM55	3	7	54.7
BM56	6	13	63.3
BM57	5	10	91.3
BM59	6	16	164.6
BM70	3	6	117.3
BF53	12	17	23.2
BF58	8	17	18.9
BF61	4	17	74.5
BF62	4	13	18.1
BF63	10	12	75.4
BF65	6	17	13.0
BF67	7	14	8.5
BF68	16	9	6.8
BF69	16	12	14.2

*BM = Male
BF = Female

Means: All females = 28.1 km²
All males = 103.5 km²

APPENDIX 2. Morphological data for 21 black bears from the Pelly River Valley near Ross River, 1984.

ID*	DATE	AGE IN 1984	Weight (kg.)	Total L.	Tail L.	Neck Girth	Heart Girth	Shd. Ht.	Sk. L.	Zyg. Wth.	Hind Ft. L.	Front Pad W.	Front Pad L.	Ear L.
BF53	MAY 23	12+	50	1370	75	470	795	535	243	170	--	95	--	120
BM54	MAY 23	5+	34	1350	117	385	600	610	---	135	198	103	--	124
BM55	MAY 24	3+	43	1395	110	443	694	545	---	143	223	93	--	120
BM56	MAY 26	6+	54	1435	60	495	740	630	239	160	234	98	--	127
BM57	JUNE 11	5+	45	1447	114	430	675	696	232	146	220	96	56	123
BF58	JUNE 15	8+	45	1490	90	450	744	560	252	161	204	100	52	116
BM59	JUNE 3	6+	64	1520	124	500	790	545	285	165	---	120	100	105
BM60	JUNE 16	2+	43	1332	74	463	725	520	234	135	---	76	45	124
BF61	JUNE 19	4+	36	1289	98	408	639	488	230	133	203	93	57	118
BF62	JUNE 21	4+	44	1420	120	450	691	593	249	148	206	103	51	118
BF63	JUNE 21	10+	50	1390	98	447	745	575	248	155	205	89	47	115
BM64	JUNE 29	1+	27	1147	72	337	559	508	209	121	199	76	43	112

APPENDIX 2. CONTINUED

ID*	DATE	AGE IN 1984	Weight (kg.)	Total L.	Tail L.	Neck Girth	Heart Girth	Shd. Ht.	Sk. L.	Zyg. Wth.	Hind Ft. L.	Front Pad W.	Front Pad L.	Ear L.
BF65	JULY 1	6+	40	1341	102	393	636	582	260	142	196	82	49	104
BM66	JULY 4	1+	27	1120	95	385	585	450	218	120	197	83	38	107
BF67	JULY 10	7+	48	1405	95	450	725	622	252	145	210	94	47	110
BF68	JULY 14	16+	59	1420	110	510	854	513	254	154	218	90	50	90
BF69	JULY 14	16+	64	1435	100	525	870	603	223	161	230	90	48	120
BM70	JULY 17	3+	42	1368	119	407	700	530	254	141	221	92	49	123
BM71	JULY 19	1+	25	1150	90	326	565	455	202	109	195	90	43	113
PBF1	JULY 31	8+	72	1580	129	495	765	708	---	163	220	102	52	121
PBM2	JULY 31	-	72	1634	98	548	858	653	263	160	223	105	47	130

* BF, PBF = Female
BM, PBM = Male

APPENDIX 3. Common and scientific names of plant species mentioned in this report.

Alpine fir	<u>Abies lasiocarpa</u>
Black spruce	<u>Picea mariana</u>
White spruce	<u>Picea glauca</u>
Jackpine	<u>Pinus banksiana</u>
Alder	<u>Alnus</u> spp.
Aspen, poplar	<u>Populus tremuloides</u>
Balsam poplar	<u>Populus balsamifera</u>
Cottonwood	<u>Populus</u> sp.
Shrub birch	<u>Betula glandulosa</u>
Willow	<u>Salix</u> spp.
Alpine Bearberry	<u>Arctostaphylos rubra</u>
Bearberry	<u>Arctostaphylos uva-ursi</u>
Blueberry	<u>Vaccinium</u>
Cranberry, lowbush cranberry	<u>Vaccinium vitis-idaea</u>
Comandra	<u>Geocaulon lividum</u>
Cow parsnip	<u>Heracleum lonatum</u>
Crowberry	<u>Empetrum nigrum</u>
Crocus	<u>Anemone patens</u>
Current	<u>Ribes</u> spp.
Dandelion	<u>Taraxacum</u> spp.
Devils Club	<u>Echinoparax horridum</u>
Fauria	<u>Fauria crista-galli</u>
Fireweed	<u>Epilobium angustifolium</u>
Grasses	Gramineae
Horsetail	<u>Equisetum</u> spp.
Huckleberry	<u>Vaccinium</u> sp.
Labrador Tea	<u>Ledum groenlandicum</u>
Lichens	<u>Cladonia</u> spp.; <u>Cladina</u> spp.; <u>Peltigera</u> spp.
Lupine	<u>Lupinus arcticus</u>
Mosses	<u>Dicranum</u> spp.; <u>Pleurozium</u> spp.; <u>Polytrichum</u> spp.
Raspberry	<u>Rubus idaeus</u>
Rose	<u>Rosa acicularis</u>
Sagewort	<u>Artemesia frigida</u>

APPENDIX 3 Continued

Salmonberry	<u>Rubus spectabilis</u>
Saskatoon	<u>Amelanchier alnifolia</u>
Skunk Cabbage	<u>Lysichiton americanum</u>
Soapberry	<u>Sheperdia canadensis</u>
Sedges	Cyperaceae
Snowberry	<u>Symphoricarpus albus</u>
Strawberry	<u>Fragaria virginiana</u>
Sweet Clover	<u>Melilotus</u> sp.
Yarrow	<u>Achillea borealis</u>
Vetchling	<u>Lathyrus</u> sp.

APPENDIX 4a. Feeding ecology and habitat use of black bears in the Pelly River Valley near Ross River, Yukon.

Diet

MacHutchon (1989, MS) are detailed accounts of black bear food habits in the Pelly River Valley.

Habitat Use - Active Season

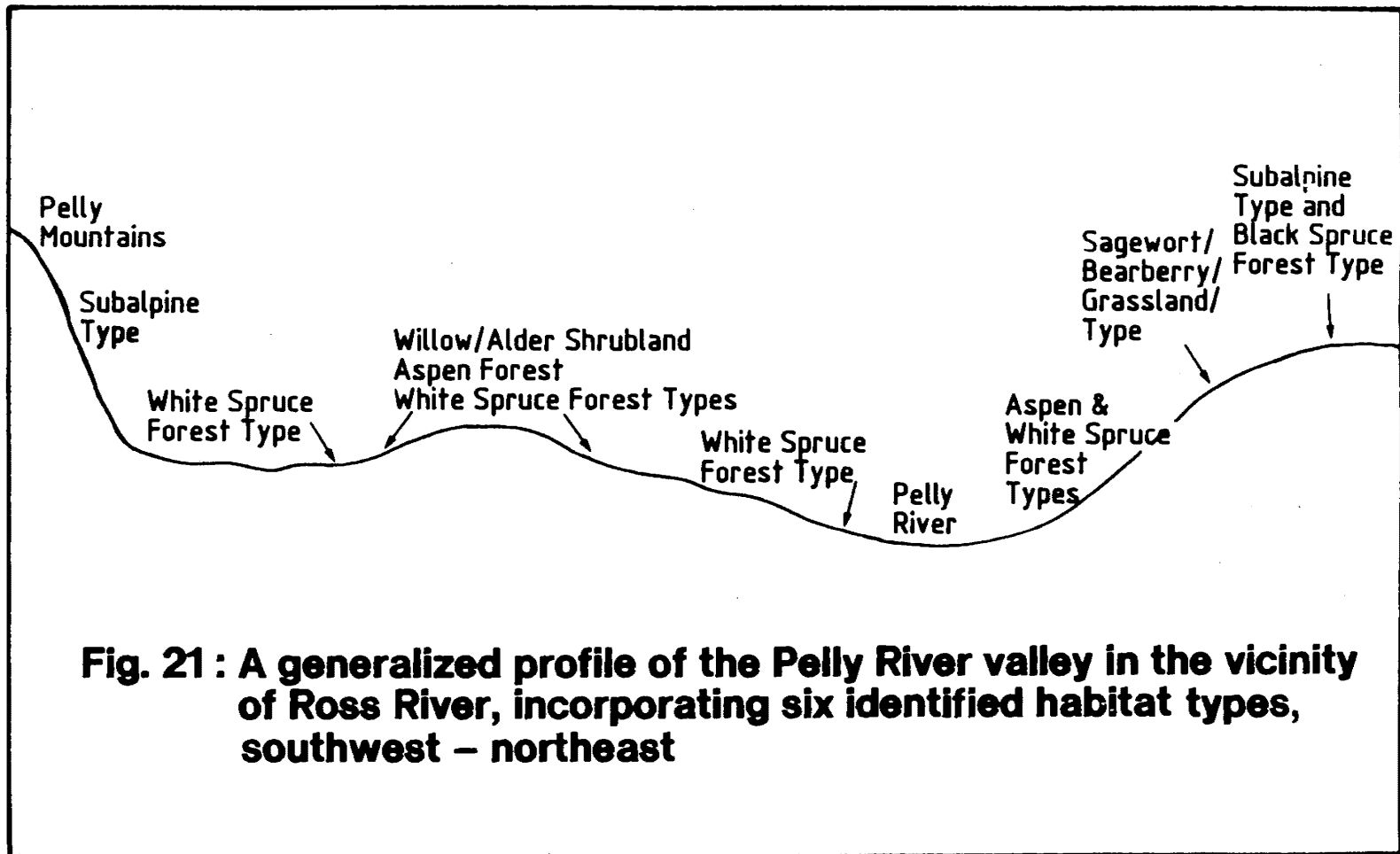
In 1984 and 1986, a series of telemetry surveys were conducted in the Pelly River Valley to relocate radio collared bears. Each relocation point was marked on a 1:50,000 scale topographic map, a description of the habitat was recorded and photographs of the site taken. The data was compiled and analyzed to try and establish seasonal changes in habitat use for black bears in the area. The data suggests general trends, however, the results are based on a small sample size spread over a short period of the bear's active season. The findings are speculative and only represent a best guess of habitat use.

The Pelly River Valley near Ross River lies in the Pelly River ecoregion (Oswald and Senyk, 1977) and is dominated by white and black spruce forest. White spruce is dominant on drier sites, black spruce in wetter areas and both occur on mesic sites. Aspen and balsam poplar occupy disturbed areas and alpine fir occurs sparsely at treeline (1350 to 1500 m).

Six habitat types were identified for the Pelly River Valley and each relocation point assigned to a type. Habitat types were defined by the dominant cover species present which broadly reflects the resident moisture regime, soil drainage, slope and expected understory vegetation. The six habitat types are listed below and described in detail in Appendix 4b.

- 1) White spruce forest type
- 2) Black spruce forest type
- 3) Aspen forest type
- 4) Willow/alder shrubland type
- 5) Subalpine type
- 6) Sagewort/bearberry/grassland type

Although the Pelly River Valley near Ross River has been described elsewhere (MacHutchon, 1984), a brief review of the habitat mosaic is included here to provide some background for a discussion of habitat use. The Pelly River Valley drains from the southeast to the northwest in the vicinity of Ross River. Figure 21 is a generalized profile of the valley from the southwest to the northeast, indicating major habitat types and their associations. The specific distribution and patchiness of habitat types is influenced by elevation, climate, slope, soils, aspect and fire history. North of Pelly River Valley, the habitat is dominated by



subalpine, black spruce forest and aspen forest types. The distribution of these types has been greatly influenced by fire. South of the river valley, subalpine is the dominant habitat type in the Pelly Mountains.

Table 15 outlines the proportion of black bear relocations occurring in each of the six habitat types described. For this discussion, it is assumed that occurrence in a habitat equates with the use of that habitat. Determination of habitat selection or preference by black bears was not possible because no quantitative information on habitat availability exists. Qualitative evaluations are made, however.

TABLE 15. The percentage of black bear relocations in each of six habitat types in the Pelly River Valley.

Habitat Type	Black Bear Sex		
	Female (n=106)	Male (n=46)	Both (n=152)
1. White spruce forest	24.5	43.5	30.3
2. Black spruce forest	6.6	2.2	5.3
3. Aspen forest	26.4	15.2	23.0
4. Willow/alder shrubland	3.8	19.6	8.6
5. Subalpine	20.8	6.5	16.4
6. Sagewort/bearberry/grassland	17.9	13.0	16.4

Black bears use all available habitats. The white spruce forest type receives the greatest use, but apparently not to the extent it is available. Smaller, discontinuous habitats such as aspen forest, subalpine and open grass slopes (sagewort/bearberry/grassland) appear to be used disproportionately more than they are available. Proportionately greater use of these habitats is likely the result of a greater availability of black bear foods. The black spruce forest type and the willow/alder shrubland received minimal use.

Sexual differences in habitat use are evident. Females make more use of the aspen forest, subalpine, and sagewort/bearberry/grassland habitat types than males. Male bears appear to use habitats in a fashion comparable to their relative availability. Sex specific differences in habitat use are probably a function of habitat distribution and home range size (Ruff, 1978). The six habitat types are not uniformly distributed over

the study area, but are clumped in some areas. Home ranges of female bears are small and primarily concentrated on the north side of the Pelly River where a significant proportion of the subalpine, sagewort/bearberry/grassland and aspen forest habitat exists. Female home ranges may only encompass a small proportion of available habitat types. In contrast, male home ranges are large and widespread, encompassing a greater proportion of available habitat. Black bears make use of the habitat types common to their home ranges and because the proportion of habitat types in each home range is different, there is a great deal of between-bear variability (Appendix 4c).

To get a clearer understanding of seasonal trends in habitat use for black bears in the Pelly River Valley, relocation data was summarized by month (Table 16). Several trends are evident which substantiate earlier qualitative predictions about changes in habitat use through the summer, as a result of changes in the availability of preferred foods (MacHutchon 1984, 1985).

TABLE 16. The percentage of black bear relocations in each habitat type by month.

Habitat Type	June (n=37)	July (n=60)	August (n=45)
1. White spruce forest	35.1	33.3	26.7
2. Black spruce forest	2.7	5.0	6.7
3. Aspen forest	16.2	20.0	31.1
4. Willow/alder shrubland	0.0	11.7	11.1
5. Subalpine	10.8	13.3	22.2
6. Sagewort/bearberry/grassland	35.1	16.7	2.2

Seasonal use of habitats:

Early April to late May: No relocation flights were conducted in early spring (April to early June), so the specific habitat use of radio-collared bears during this time is not known. However, black bears are commonly observed on open, south facing slopes north of the Pelly River as early as April and consistently during the warm part of the day through May (Witham pers. comm.). Open, south

facing slopes are dominated by the sagewort/bearberry/grassland habitat type with the aspen forest type in drainage gullies and flat benchlands. The hillsides are snow free early and likely the most productive habitat for food in the early spring. It is expected bears feed on grasses, overwintered berries and other early emerging herbs. South facing slopes are the main area where bears were observed early in the spring, but this is probably a consequence of the openness of the habitat, particularly before trees and shrubs have leaved. It is not known what percentage of the local population the sighted bears represent, therefore it is not known how important open slopes are in relation to other habitats. A large proportion of June relocations were in the sagewort/bearberry/grassland habitat type, suggesting south facing slopes may be important for bears throughout the spring and early summer.

June to mid-July: River valley bottoms begin to green in early June and bears become less common on open slopes (Witham pers. comm.). The observed decline in use of open slopes is substantiated by relocation data. Between June and August, there was a decrease in the proportion of black bears relocated in the sagewort/bearberry/grassland habitat type. Two other habitat types, white spruce forest and aspen forest, account for a large proportion of June relocations. Horsetails are common in moist to mesic white spruce forest, and are likely the attraction of this habitat to bears. Horsetails are an important black bear food from spring to mid-July. There was a decline in the proportion of relocations in the white spruce forest type in July and August, although it still accounted for a large percentage of total habitat use.

The increase in use of aspen forest during the summer may reflect an increase in the importance of soapberries. Soapberries are found in openings and margins of both aspen forests and upland white spruce stands and are an important component of the black bear diet in mid to late summer. Three female bears in the Pelly River Valley were relocated within .5 km of each other on July 16 and another was found in the same area on July 23. The area is an open regenerating stand of white spruce and aspen (white spruce forest habitat type) with numerous soapberry plants in canopy openings. Considerable sign of bear activity was observed in the area on July 27. One of the females located in the area on July 16 was observed feeding on soapberry plants approximately 2 km east of the area on July 21st. In this case the soapberry plants were at the edge of a mixed aspen and white spruce stand. It appears the female was feeding on soapberries throughout the middle of July.

Mid-July to Den Entry: There was a two-fold increase in the percent use of the subalpine habitat type between June and August. Crowberries become important to black bears in late summer and are common in these subalpine areas. Blueberries are likely another important attraction of subalpine habitats.

There is a general increase in the proportion of relocations in the black spruce forest type over the summer. It is expected this increase also corresponds with increasing use of berries, particularly blueberry, which is frequently common on the forest floor (Hatler, 1967). In Alaska, McIlroy (1970) and Miller (1983) found that black bear movements in late summer were motivated by blueberry abundance. The majority of black spruce forest is found at higher elevations to the north and west of the Pelly River. It is possible the increasing use of black spruce forest and subalpine habitats in the late summer, also reflects a trend in movement toward higher elevations where denning will eventually occur.

Sex differences in seasonal habitat use:

Male and female black bears in the Pelly River Valley had similar season trends in habitat use, but the magnitude of use varied (Table 17). Generally, the extent of habitat use mirrored the availability within, and distribution of, home ranges. Female bears, in all months of the summer, were relocated in habitats commonly found north of the Pelly River, including sagewort/bearberry/grassland and aspen forest on hillsides, and black spruce forest and subalpine habitats at higher elevations. The home ranges of most radio-collared females were concentrated north of the Pelly River. In contrast, male black bears were most often relocated in white spruce forest type, aspen forest and willow/alder shrubland, all commonly found on the valley bottom. This represents a broad generalization of habitat distribution and use, but it suggests there may be a spatial segregation of the sexes during the summer.

TABLE 17. The percentage of black bear relocations in each of six habitat types by sex and month.

Habitat Type	Female			Male		
	June (n=26)	July (n=39)	August (n=31)	June (n=11)	July (n=21)	August (n=14)
1. White spruce forest	26.9	25.6	25.8	54.5	47.5	28.6
2. Black spruce forest	3.8	7.7	6.5	0.0	0.0	7.1
3. Aspen forest	19.3	20.5	38.7	9.1	19.1	14.3
4. Willow/alder shrubland	0.0	7.7	0.0	0.0	19.1	35.7
5. Subalpine	15.4	18.0	25.8	0.0	4.8	14.3
6. Sagewort/bearberry/grassland	34.6	20.5	3.2	36.4	9.5	0.0

Habitat Use - Denning Season:

On March 13, 1985, nine dens of radio-collared black bears were located in the Pelly River Valley. Only one den was visited, and the habitat type of only four sites was accurately determined. From this information little can be said about the den requirements of Yukon black bears. The mean elevation of located dens was 985 m (range = 792-1326).

Denning is expected to commence in late September or early October, however, there is only circumstantial evidence to support this. Six of seven female bears in the Ross River area were relocated within one km of their eventual den site on September 25, 1984 and one female, with cubs of the year, was located 1.1 km away from her den site. Two adult males located on September 25 were 4.7 and 4.8 km away from their eventual den sites. This suggests that female bears den in late September or early October before male bears.

APPENDIX 4b. Six major habitat types identified for the Pelly River Valley.

1. White Spruce Forest Type - White spruce forests are found extensively south and west of Ross River. They are dominant on moderately to well drained, dry to mesic sites. White spruce is the majority species on old flood plains and obtains its maximum height there (Nassiopoulos, 1982). Feathermoss is the dominant understory species in closed stands, but as trees become less dense, willows and ericaceous shrubs are common. (Oswald and Senyk 1977, Nassiopoulos 1982). Horsetails are also present and likely represent the principal food component of these stands for black bears. White spruce stands on dry, well drained benchlands north of the Pelly River are more open and less dominated by mosses in the understory. Often a large percentage of the ground cover is leaf litter, dead fall or bare soil, with some scattered willows and forbs. These stands are not considered productive for black bear food species, however, soapberry is often found in stand openings and along stand margins, particularly on south facing exposures. Other prevalent understory species of the white spruce forest type are Labrador tea, comandra, low bush cranberry, bearberry, rose, fireweed and lichens.

2. Black Spruce Forest Type - Black spruce is predominantly found in wet, poorly drained lowlands and north facing, permafrost inundated slopes (Nassiopoulos, 1982). This type of terrain is found north of Ross River along the Canol Highway. North of Tenas Creek, both black and white spruce make up extensive open to closed stands. The extent of ground moisture determines the relative abundance of understory species. Mosses are usually dominant, with feathermosses abundant in moist to mesic sites and sphagnum mosses prevalent in wet areas. Willows and shrub birch are abundant in open stands. Blueberries are not abundant in the Pelly River Valley near Ross River, but may be common in black spruce stands at higher elevations to the north and west of Ross River. In interior Alaska, blueberries are common in poorly drained black spruce stands (Hatler, 1967). Other understory species include: Labrador tea, low bush cranberry, horsetail and various lichens.

3. Aspen Forest Type - Aspen forests are found on dry, well drained disturbed sites, such as old burns and associated with grass/sagewort hillsides. Aspen is a major successional tree species following fires if site conditions are favourable (Nassiopoulos 1982). In many areas near Ross River, fires have disrupted the continuity of conifer forests, resulting in large aspen stands. Extensive areas east of the Lapie River burned and are dominated by aspen forest and willow shrublands (Nassiopoulos 1982). An estimated 20-30% of forest cover along the Pelly River Valley is aspen forest. For black bears, the most productive component of aspen stands are mats of bearberry and clumps of

soapberry associated with open southerly exposures. Other common species of aspen forest are: fireweed, rose, crocus, and lupine.

4. Willow/Alder Shrubland Type - Willow/Alder shrublands are intermixed with aspen stands in extensive, recently burned areas south of the Robert Campbell Highway and east of the Lapie River. These shrublands have numerous snags and deadfall. Normally, ground vegetation is sparse comprised of grasses and a variety of forbs including: bearberry, fireweed, and lupine. Bare soil and leaf litter are common. White spruce and aspen are the major successional species and their abundance is largely site specific. Overall, this habitat type is not expected to be productive for black bear foods.

5. Subalpine Type - As elevation increases, there is a trend in vegetation from mixed white spruce/black spruce forest to open alpine fir and finally ericaceous shrubs and prostrate willow. The area below treeline (1350-1500 m) is most important for black bears. This area is dominated by white spruce and alpine fir. Lichens and moss are important components of the understory. Subalpine habitat is productive for black bears where there are patches of blueberry or crowberry.

6. Sagewort/Bearberry/Grassland Type - Sagewort and grasses are dominant species on steep south facing hillsides. As the slope decreases, bearberry and grasses become dominant. Aspen is the main tree species associated with south facing hillsides but is restricted to drainage gullies and terraces. Sagewort/bearberry/grass habitats are found throughout the Pelly River Valley, but are particularly extensive on the north side of the Pelly River and along the Ross River and Robert Campbell Highway. This habitat type represents approximately 10-15% of the area around Ross River. Few forbs are found on steep sagewort/grass hillsides and much of the ground cover is rocky soil. As the slope becomes more moderate, allowing moisture to collect, the diversity of forbs increases. Crocus, yarrow, strawberry, rose, and soapberry are commonly found in these open areas with bearberry and grass. Bearberry, soapberry and grasses are the important black bear foods of sagewort/bearberry/grassland habitats.

APPENDIX 4C. The habitat type* individual bears were relocated in during telemetry surveys conducted in the Pelly River Valley, 1984 and 1986.

DATE	BF53	EM54	EM55	EM56	EM57	BF58	EM59	BF61	BF62	BF63	BF65	BF67	BF68	BF69	EM70
13 03	5										1	3	6		
22 05	2														
03 06		1			1	5	6	6	1		3	6		3	
09 06	5			1	6	1	6	6			1	2		3	
15 06						3		1			6	6		6	
20/22 06	3			1	6	1	3	6	1	5					
23 06					1	5	1	1			6	6			
01/02 07	2	1	3	1	1	3	4	6	3	5/5					
09 07	1	1	3	3	1	1	4	5	4	6	1				
16 07	1	4	4	1	1	1	1	1	4	2	6	4	3	5	
23 07	1		1	5		5	3	2	3	1	6	3	6	1	6
30 07	5			6		3	1	1	3	5	6	3	6	6	
09 08	5	3		3		3	4	1	1		6	2	3	3	2
14 08	5	5		1		3	4	1	1	5	5	3	2	5	4
21 08	5	5		1		5	4	1	1	1	1	3	3	3	4
01 09					1	3	1	3			5	3		3	
25 09	5					5					3	3	4		

1. White spruce forest
2. Black spruce forest
3. Aspen forest
4. Willow/Alder shrubland
5. Subalpine
6. Sagewort/bearberry/grassland

APPENDIX 4d. Spring habitat use of black bears in the Dezadeash Range near Haines Junction, Yukon.

A grizzly and black bear study was carried out in the spring of 1984 in the Dezadeash Range near Haines Junction (Smith and Sumanik 1988). During the study, two male and two female black bears were captured and radio-collared. Intensive radio tracking of the collared black bears was carried out from 15 May to 11 June. Each relocation was marked on a 1:250,000 scale topographic map and a description of the habitat recorded. Detailed vegetation classifications for each site were determined from maps produced by Oswald *et al.* (1981). To facilitate comparison with the work carried out in the Pelly River Valley, each relocation point was placed in one of the six habitat types described for the Pelly River Valley (Appendix 4b). The majority of relocations were in the sagewort/bearberry/grassland habitat (Table 18). There is also a high percentage of relocations in the sagewort/bearberry/grassland habitat type. This is not a dominate habitat type and is restricted to south facing hillsides along roads and rivers. As in the Pelly River Valley, sagewort/bearberry/grassland habitats appear to be important to black bears in the spring and early summer. Aspen forest and subalpine habitat received a moderate amount of use and black spruce forest and willow/alder shrubland received minimal use. The pattern of habitat use in the Dezadeash Range during late May and early June is similar to that found in the Pelly River Valley in June (see Table 16 in Appendix 4a).

¹Appendix 4e outlines the habitat type for each relocation point, by individual bear.

TABLE 18. The percentage of black bear relocations in each of six habitat types in the Dezadeash Range, 16 May - 11 June, 1984 (n=45).

Habitat Type	Percent
1. White spruce forest	33.3
2. Black spruce forest	0.0
3. Aspen forest	19.9
4. Willow/alder shrubland	2.0
5. Subalpine	4.4
6. Sagewort/bearberry/grassland	40.4

APPENDIX 4e The habitat type* individual bears were relocated in during telemetry surveys conducted in the Dezadeash Range, 1984.

Date	BEAR ID			
	1440	1821	1940	1281
13 05		6		
16 05	6			
17 05	3	6		
21 05	6	6		
21 05	3			
22 05			6	
23 05	1	6	6	
26 05		5	1	
28 05	1	1	1	
30 05	3			
31 05	1	3		
04 06	1	6		
05 06	1	6		
06 06	1	1		
06 06	1	1		
06 06	6	6		
07 06	1	3		
07 06		6		
08 06	1	3		
08 06	6	1		
08 06	6	6		
09 06	1	5		
09 06		1		
10 06	1			5
11 06			1	

- *1 White spruce forest
- 2 Black spruce forest
- 3 Aspen forest
- 4 Willow/alder shrubland
- 5 Subalpine
- 6 Sagewort/bearberry/grassland

APPENDIX 5. Population biology data for Yukon black bears.

Mating Season

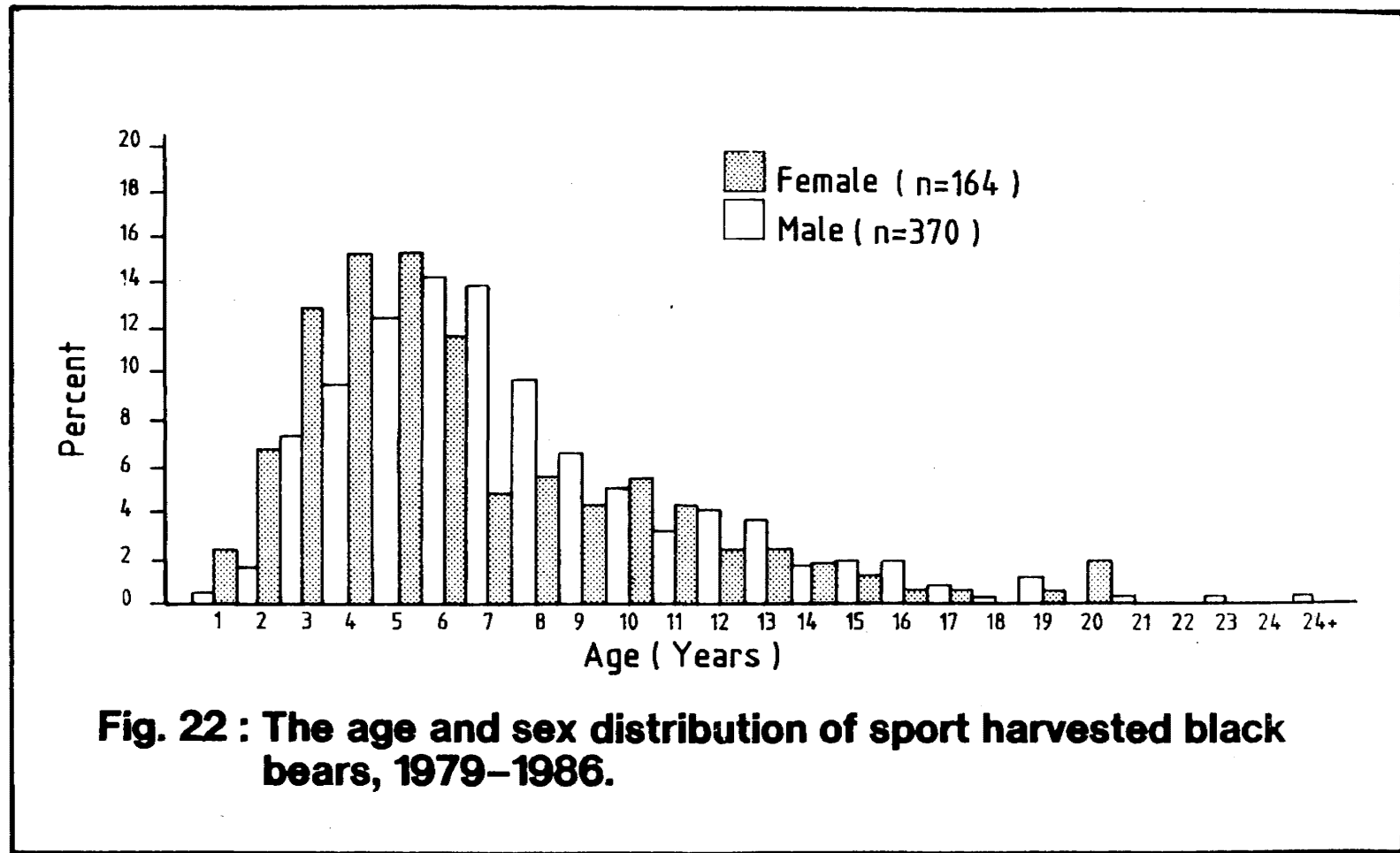
On June 21, 1984 a female bear (4+ years of age) from the Pelly River Valley study area was observed with another bear of unknown sex. These bears may have mated, but the female showed no physical signs of estrous when captured three days previous. No surveys were conducted in the spring of 1985 to determine whether the female produced cubs. She was observed alone in June 1986.

On June 23, 1984 two previously marked bears, a male (6+ years of age) and a female (12+ years of age) were captured together at the same site. The female was not relocated in 1985 and by 1986 she had dropped her radio collar, therefore it is not known whether she mated successfully in 1984.

On July 23, 1984 a collared male (6 years of age) and a collared female (4+ years of age) were observed together. The female was not relocated in 1985 and she died by the spring of 1986 therefore it is not known whether she bred in 1984.

Age of First Litter Production

One female from the Pelly River Valley is known to have produced young at 6+ years of age. It is assumed this was her first litter. A female, associated with a male on July 23, 1984, would have produced her first litter at 5+ years of age if she mated successfully in 1984, however, it was never verified whether she produced cubs in 1985.



Yukon black bear harvest data provides some insight into the age of first litter production. In the Yukon it is illegal to shoot female bears accompanied by young, therefore it is expected that at the age of first litter production females will be less prevalent in the harvest. Figure 22 illustrates the age distribution of 534 Yukon black bears harvested from 1979 to 1986. There is a decline in the proportion of female bears in the harvest at 7 to 8 years of age, suggesting most females produce their first litter at 7+ years of age or older. This data is particularly relevant for the central and southern Yukon where the majority of the sport harvest occurs.

Interval between Litters

Estimating age at family breakup is best done from a set of reproductive histories of marked females monitored over several reproductive cycles. However, this information is not available for Yukon black bears. A less precise method relies on the appearance of young bears in the sport harvest. Young are only vulnerable to harvest after they have left their mother's protection. The percentage of kills for animals in the first four age classes suggests that some animals leave the protection of their mother as yearlings (1+ years of age), but the majority are with the female until the spring of their third year (2+ years of age) (Figure 23).

One family breakup was documented in the Pelly River Valley. Two young bears, suspected to be yearlings, were accompanying a female on May 23, 1984. There was no evidence of the young with the female after June 14 and the female was observed with a male on June 23. Two yearlings were caught on June 29 and July 4, 1984. These were thought to be the offspring of the above female. Another small male bear was caught on July 19, 1984. Tooth analysis and

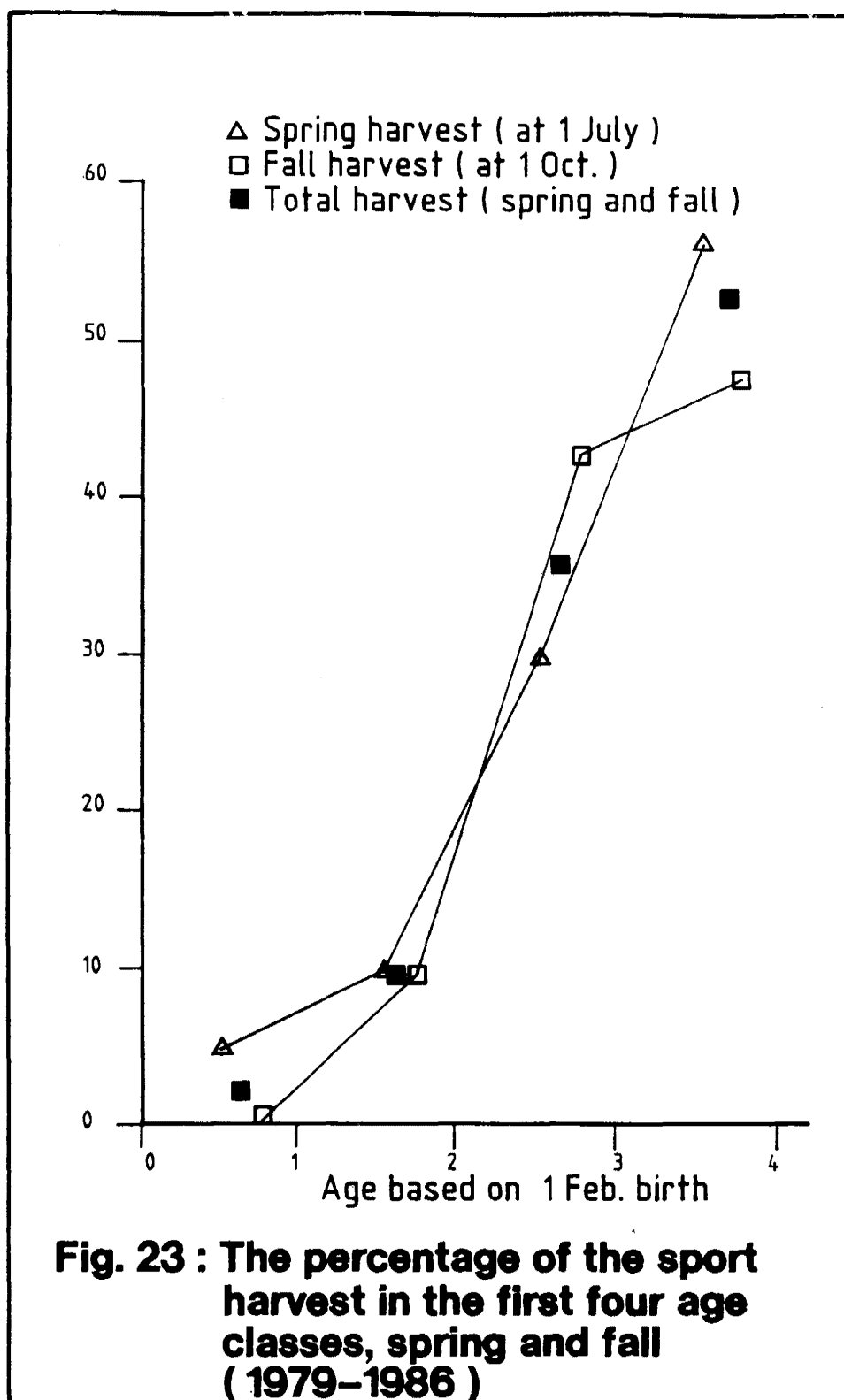




Fig. 24 : The spring sport harvest age and sex distribution, 1979–1986

weight measurements indicated it was a yearling, suggesting it recently left its mother. One other female on the study area had cubs of the year in 1984 and had cubs of the year again in 1986. Either the first litter died during the winter or spring of 1984-1985 or they left the mother as yearlings in the spring of 1985.

When a black bear population is at maximum production, females will breed successfully after abandoning a litter and produce cubs the following winter. An examination of the Yukon spring harvest of black bears (1979-1986) (Figure 24) reveals that some female black bears older than 7+ years of age are killed. The implication is that some adult females do not have young during the spring hunting season. This can arise if:

- a) there is total litter mortality prior to hunting season;
- b) families break up during the hunting season;
- c) some females do not breed successfully in the previous mating season or miss at least one year after weaning young, before breeding again.

Of seven adult females (7+ years of age or older) monitored in the Pelly River Valley in 1984, 2 or 29% were observed with young. In 1986, 2 of 5 (40%) monitored adult females were accompanied by young. The mean for the two years is 33%. Although the sample size is small and the sample period is sporadic, the data suggests more than half of mature females either lose their litters during the winter and spring or miss at least one year between family breakup and subsequent litter production.

Cub Production Rate

Determination of mean natality rates requires an assessment of cub production over several generations for a number of females in a population. Litter sizes are usually measured after den emergence. With 25 to 30% mortality of black bear cubs in the first year the timing of sampling to determine litter size affects the degree to which mortality is included or excluded from natality rate estimates (Bunnell and Tait 1985). In the Pelly River investigations, data on litter production was sporadically obtained during a three year period. As a result, we are not confident in using litter size or interval between litter estimates to determine a natality rate. As an alternative estimate of population productivity we examined the proportion of marked adult females with cubs of the year during early July. A census at this time takes into account the mortality of cubs in the early spring and gives the best measure of cub recruitment given the sporadic nature of the data. Assuming females became sexually mature at 5+ years of age, we sampled 13 adult female years in late June and early July. For the 13 adult female years, 2 cub of the year (COY) litters of 2 young were observed. This represents 4 COYS/13 adult female years or .308 COYS (early July)/adult female/year.

Maximum Age of Reproduction

Two bears out of 537 known aged bears killed in the Yukon between 1979 and 1986 were over 20 years of age. This data suggests few black bears live longer than 20+ years. One bear over 20 years was a 25 year old male bear shot near Ross River in 1984. It was in poor shape, the teeth were worn to small enamel chips and it was found scrounging at a trappers cabin. Based on this information, 20+ years of age is a hypothesized maximum age of

reproduction. Many bears in the population will cease to reproduce before this. Two 16+ year old female bears captured near Ross River in 1984 were not accompanied by young. Only one of the females was monitored after 1984. She was not accompanied by cubs in 1986. It is suspected she did not produce cubs in 1985 or they failed to survive the winter of 1985-1986.

APPENDIX 6. The estimated and reported kill¹ of black bears in the Yukon, 1952 - 1986.

	Non- Resident Hunters	Resident (Non-Native) Hunters	Trappers ²	Other ³	TOTAL
1952					38
1953					57
1954					107
1955					106
1956	6	74	28		108
1957	10	59	40		109
1958	10	53	48		111
1959	19	84	59		162
1960	16	85	34		135
1961	7	64	37		108
1962	11	81	68		160
1963	7	57	69	1	134
1964	14	49	86	2	151
1965	14	55	55		124
1966	4	68	52		124
1967	4	51	65		120
1968	6	65	54		125
1969	13	73	50		136
1970	16	54	22	20	112
1971	15	32	27		74
1972	13	46	56		115
1973	26	70	108		204
1974	8	71	42	12	133
1975	8	35	42	3	88
1976	16	59	9		84
1977	11	102			113
1978		50			
1979	20	17	24	45	82
1980	15	48	11	54	117
1981	15	91	12	81	187
1982	12	48	11	36	96
1983	12	63	27	37	112
1984	22	99	34	74	195
1985	21	74	13	31	126
1986	15	68	15	41	124

¹ Harvests were estimated by managers between 1956 and 1978; From 1979 to 1986 non-resident, resident and control kills were taken from biological submissions. Trapper harvest (1976-1986) comes from the number of fur export permits granted.

² Some trapper harvest, 1979-1986 is also recorded in the resident sport harvest, so trapper harvest, as recorded, is not included in the total harvest.

³ Includes non-sport kills and some reported native harvest; non-sport kills include control kills, bears found dead, road kills and bears confiscated.

APPENDIX 7. The number and percentage of licenced resident (non-native and native) sport hunters, non-resident sport hunters and resident trappers acquiring black bear tags, 1979 - 1986.

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
<u>Non-Native Resident Sport Hunters</u>								
Licences Bought	3750	3713	3923	4372	3812	3665	3457	3179
Black Bear Tags Bought	668	856	899	934	946	1053	978	931
% of Hunters Buying Tags	17.8	23.1	22.9	21.4	24.8	28.7	28.3	29.3
<u>Non-Resident Sport Hunters</u>								
Licences Bought	459	418	412	383	371	406	446	504
Black Bear Tags Bought	257	250	222	206	227	286	306	309
% of Hunters Buying Tags	56.0	59.8	53.9	53.8	61.1	70.4	68.6	61.3
<u>Resident Trappers (Native & Non-Native)</u>								
Licences Bought	322	332	285	226	225	200	177	159
Black Bear Tags Bought	59	108	113	101	108	111	104	88
% of Trappers Buying Tags	18.3	32.5	39.7	44.7	48.0	55.5	58.8	55.3
<u>Native Resident Hunters</u>								
Licences Aquired	485	403	524	648	608	657	692	787
Black Bear Tags Aquired	52	37	68	64	104	136	142	184
% of Hunters Aquiring Tags	10.7	9.2	13.0	9.9	17.1	20.7	20.5	23.4

APPENDIX 8. Territorial revenue gained through black bear tag sales and trophy fees paid (1979 - 1986) (\$5.00 tag, \$75.00 trophy fee; \$2.00 tag replacement fee).

	NUMBER		REVENUE		
	Tags Sold	Trophy Fees Collected	Tags	Trophy Fees	Total
1979	906	20	4534	1500	6034
1980	1107	15	5520	1125	6645
1981	1134	16	5652	1200	6852
1982	1158	13	5722	975	6679
1983	1193	12	5932	900	6832
1984	1364	21	6782	1575	8357
1985	1303	21	6500	1575	8075
1986	1232	15	6149	1125	7274
ALL	9397	133	46791	9975	56766
MEAN	1175	17	5849	1247	7096

APPENDIX 9. The history of sport harvest regulations affecting Yukon black bears*.

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- | | |
|------------------|---|
| 1984 | <ul style="list-style-type: none"> - Northwest Game Act - No restrictions on black bear harvest. |
| 1901-1928 | <ul style="list-style-type: none"> - The Yukon Game Ordinance; An Ordinance inspecting the Preservation of Game in the Yukon Territory - No restrictions on black bear harvest. |
| 1928 | <ul style="list-style-type: none"> - Bag limit of 6 bears imposed. |
| 1933 | <ul style="list-style-type: none"> - Bag limit for bears repealed - Non-residents must retain a guide to hunt bears. |
| 1949 | <ul style="list-style-type: none"> - Special bear licence \$25.00 - \$50.00 - Bag limit of 1 black bear; Season 1 May-30 June. |
| 1951 | <ul style="list-style-type: none"> - Bag limit of 2 black bears. |
| 1972 | <ul style="list-style-type: none"> - Bag limit of 1 black bear; Seasons: 15 April - 15 June and 1 August - 31 October - Black bear tag (for residents only) - \$1.00 - Black bear trophy fee for non-residents-\$50.00 - Protection of cubs and female bears accompanied by cubs. |
| 1976 | <ul style="list-style-type: none"> - Seasons 1 May - 15 June and 1 August - 31 October - Black bear tag for non-residents - \$1.00 - Spring bear hunting licence for non-residents - \$25.00 Canadian or British Subject; \$50.00 Alien - Protection of cubs, females with cubs and bears in dens. |
| 1977/78 | <ul style="list-style-type: none"> - Bag limit for trappers increased to 2 provided one bear is taken from the registered trapline - Hunting with dogs prohibited - Trapping of bears prohibited - It is unlawful to kill any bear and not take care of the hide. |
| 1979/80 | <ul style="list-style-type: none"> - All persons killing black bears must submit the entire skull and from male bears the baculum (penis bone) to a wildlife branch office. - Trappers may hunt a second black bear from their registered trapping areas from 1 August - 31 October - Black bear tag (for non-native resident, non-native trappers, non-residents) - \$5.00 - Black bear trophy fee for non-residents - \$75.00 |

Appendix 9 Continued

- 1980/81
 - It is an offense for anyone to kill a big game animal which has been marked with a device to monitor its activities
 - Hunters are requested to submit reproductive tracts from female bears.
- 1981/82
 - Spring, 1 bear; Season: in the north, 1 May - 15 June, in the south, 15 April - 15 June
 - Fall, 1 bear; Season: 1 August - 31 October.
- 1982/83
 - Bag limit increased to 2 bears if one bear is taken in certain game management subzones and as long as at least one bear is taken in the spring (1 May - 15 June).
- 1983/84
 - Two bears can be taken in all open game management zones as long as at least one is taken in the spring (1 May - 15 June)
 - Trappers may hunt a second black bear on the same basis as residents.
- 1984/85
 - The bag limit for black bears is increased to 3 as long as at least one is taken from certain Bear Reduction Subzones
 - The season in all Bear Reduction Subzones is 1 April - 31 March next following year.
 - Trappers may hunt black bears on the same basis as residents.
- 1985/86
 - The bag limit for black bears is 2 bears per licensing year in all open zones including Bear Reduction Subzones
 - The two bears can be taken in any season.
- 1986/87
 - Hunters no longer required to submit the baculum of male black bears.

*The years 1894 - 1975 are from McCandless (1986).

The years 1976 - 1986 are from Yukon Hunting Regulation Synopsis.

APPENDIX 10. The yearly reported resident (non-native) and non-resident black bear sport harvest, 1979 - 1986.

Year	Resident Sport				Non-Resident Sport			
	All	Sex			All	Sex		
		?	Male	Female		?	Male	Female
1979	17	-	13	4	20	1	14	5
1980	48	-	28	20	15	-	7	8
1981	91	4	54	33	15	-	8	7
1982	48	2	30	16	12	-	6	6
1983	63	-	50	13	12	-	8	4
1984	99	2	69	28	22	-	18	4
1985	74	1	46	27	21	-	14	7
1986	68	-	61	7	15	-	14	1
ALL	508	9	351	148	132	1	89	42

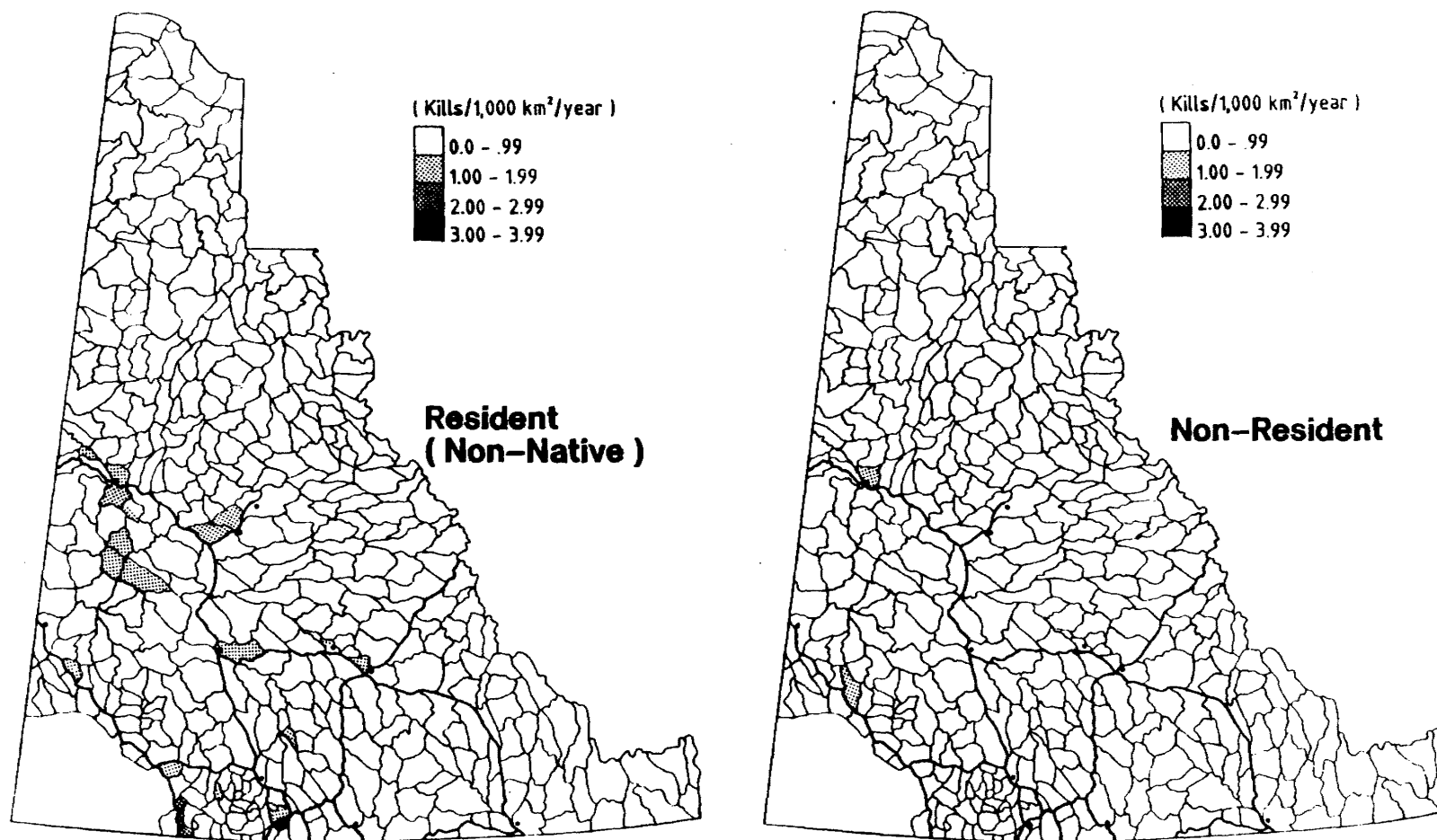
APPENDIX 11. The yearly resident (non-native) and non-resident sport harvest, by season, 1979 - 1986.

Season	Year	Resident Sport				Non-Resident Sport			
		Sex				Sex			
		All	?	Male	Female	All	?	Male	Female
Unknown	1979	1	-	1	-	4	1	2	1
	1980	1	-	1	-	-	-	-	-
	1981	7	3	2	2	-	-	-	-
	1982	8	1	6	1	-	-	-	-
	1983	4	-	2	2	-	-	-	-
	1984	1	1	-	-	-	-	-	-
	1985	4	-	4	-	-	-	-	-
	1986	2	-	2	-	-	-	-	-
	ALL	28	5	18	5	4	1	2	1
Spring	1979	5	-	4	1	3	-	3	-
	1980	20	-	16	4	3	-	3	-
	1981	48	-	37	10	2	-	1	1
	1982	21	1	14	6	4	-	2	2
	1983	44	-	37	7	3	-	3	-
	1984	56	1	46	9	9	-	6	3
	1985	55	1	36	18	9	-	6	3
	1986	55	-	49	6	5	-	5	5
	ALL	304	4	239	61	38	-	29	9
Fall	1979	11	-	8	3	13	-	9	4
	1980	27	-	11	16	12	-	4	8
	1981	36	-	15	21	13	-	7	6
	1982	19	-	10	9	8	-	4	4
	1983	15	-	11	4	9	-	5	4
	1984	42	-	23	19	13	-	12	1
	1985	15	-	6	9	12	-	8	4
	1986	11	-	10	1	10	-	9	1
	ALL	176	-	94	82	90	-	58	32
TOTAL		508	9	351	148	132	1	89	42

**APPENDIX 12. The mean age of sport harvested black bears,
1979 - 1986.**

Year	Harvest	Male		Female		Total	
		#	Mean Age	#	Mean Age	#	Mean Age
1979	Resident	10	5.8	4	8.3	14	6.5
	Total Sport	10	5.8	4	8.3	14	6.5
1980	Resident	27	5.5	18	6.4	45	5.8
	Non-Resident	7	4.0	8	5.3	15	4.7
	Total Sport	34	5.2	26	6.0	60	5.5
1981	Resident	50	6.5	27	6.8	77	6.6
	Non-Resident	7	5.9	7	4.3	14	5.1
	Total Sport	57	6.4	34	6.3	91	6.4
1982	Resident	26	5.5	14	6.7	40	5.9
	Non-Resident	6	6.2	5	9.0	11	7.5
	Total Sport	32	5.6	19	7.3	51	6.3
1983	Resident	46	5.7	12	5.2	58	5.6
	Non-Resident	7	4.7	3	10.0	10	6.3
	Total Sport	53	5.5	15	6.1	68	5.7
1984	Resident	59	7.5	25	5.8	84	7.0
	Non-Resident	15	6.3	4	4.0	19	5.8
	Total Sport	74	7.3	29	5.5	103	6.8
1985	Resident	37	8.6	26	7.4	63	8.1
	Non-Resident	11	7.5	4	8.0	15	7.7
	Total Sport	48	8.3	30	7.5	78	8.0
1986	Resident	53	7.3	7	6.6	60	7.2
	Non-Resident	11	7.7	1	14.0	12	8.3
	Total Sport	64	7.4	8	7.5	72	7.4
ALL YEARS	Resident	308	6.8	133	6.5	441	6.7
	Non-Resident	64	6.3	32	6.5	96	6.4
	Total Sport	372	6.7	165	6.5	537	6.6

Fig. 25 : The distribution of the resident (non-native) and the non-resident sport harvest by Game Management Subzone, 1979-1986.



APPENDIX 14. Estimated costs (\$) of bear problems reported in Yukon Territory, 1979 to 1986. Manpower^a, handling^b, travel^c, and damage^d costs were compiled from 1,012 problem bear interview forms completed by conservation officers. Education^e and management^f costs were estimated by B. Smith.

Cost Factor	Year								Total
	1979	1980	1981	1982	1983	1984	1985	1986	
Manpower	3,800	16,500	22,400	16,800	9,200	16,000	7,500	7,900	100,100
Handling	6,200	6,500	4,600	6,800	1,000	1,500	800	1,700	29,100
Travel	1,900	16,000	10,100	5,600	2,800	5,600	2,500	7,400	51,900
Damage	1,100	13,800	7,400	12,400	7,600	4,000	5,600	8,000	59,900
Education	200	6,000	9,500	6,000	7,500	7,000	19,200	4,500	59,900
Management	7,000	3,000	3,500	12,500	10,000	6,200	0	4,000	46,200
Total	20,200	61,800	57,500	60,100	38,100	40,300	35,600	33,500	347,100

^aManpower costs were estimated by multiplying the person hours spent on bear problems by the average conservation officer wage at the time. Overtime was not recognized, therefore, these costs are a minimum.

^bHandling costs included helicopter and fixed-wing flight time and drugs and darts for immobilizing bears.

^cTravel costs equal the total kilometers traveled by land vehicle multiplied by the years conservation factor (i.e. total km x 0.26 for 1986).

^dDamage costs were estimated by the conservation officer(s) at the scene of the incident or by complainants.

^eEducation costs included preparing education materials such as pamphlets, reprinting, and bear safety talks.

^fManagement costs involved data analysis and reporting and drug administration and handling courses.

