

AN EVALUATION OF PERMIT HUNTING IN THE SOUTHERN YUKON

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ABSTRACT:

In 1979 permit hunting was established in southern Yukon in response to what was thought to be a declining sheep population, as indicated by surveys and hunter kill statistics. In the following year non-resident hunting in the permit area was discontinued and the full curl rule came into effect.

Permit hunting was designed to reduce and redistribute the kill according to sheep density, in order to (1) increase the number of legal rams, (2) increase hunter success, (3) improve the quality of the hunt and (4) improve the quality of the trophy (average age, horn volume, etc.). Presently, 80 permits are drawn on an annual basis from resident applicants.

Annual surveys to count and classify sheep were carried out in the permit area, an area open to resident and non-resident hunting (no quotas), and an area closed to hunting. Compulsory biological submissions since 1973 provided an evaluation of the hunter kill in the permit area and an adjacent open area (GMZ 7). Four questionnaire surveys in 1982 and 1983 attempted to measure hunter success, hunter effort, hunt quality, and an opinion of the permit system.

Total sheep population numbers, productivity and survivorship demonstrated a strong year effect that was not influenced by permit hunting. Ram numbers in the permit area doubled in three years (16 to 30 per 100 sheep), and the number of legal rams (full curl) increased from 1 to 10 per 100. Meanwhile, legal rams in the open area fluctuated between 0 and 3 per 100.

The resident harvest has nearly doubled since restrictions were imposed. Average age has also increased with permit holders taking significantly older rams than non-permit residents. The total resident harvest of rams with horn volume greater than 2800 cc (on average, 37" rams) has doubled, however there

is no significant difference between permits and non-permits. Horn volume is not correlated to age beyond 7 years.

Hunter success in the permit area is much higher, averaging about 30 animals shot per 100 tags sold compared to 7 per 100 tags, for resident hunters. Permit holders are expending the same effort as residents (4-5 days/hunt). Two independent surveys strongly support (70-80%) the permit system.

INTRODUCTION

In 1979 the Yukon Wildlife Branch proposed restrictive hunting in an area of the Coastal Mountains southwest of Whitehorse. The recommendation followed from a concern that a sheep population appeared to be declining based on helicopter survey results and hunter kill information. The restriction was meant to achieve two results; one, restore the sheep population (numbers) in the area, and two, improve the quality of hunting. It was hoped that hunters would not only enjoy more solitude (reduced hunter-density), but that they would encounter more sheep, enjoy higher success, and take trophy sheep of higher quality. The area chosen had historically produced some of the largest thinhorn sheep trophies in the Yukon; trophies that scored well by North American standards.

Hunting restrictions were imposed in 1979, in an area of about 3140 square kilometres, with a limited number of permits divided evenly between residents and non-residents. In 1980 the outfitter was expelled and permits were allocated to residents only, by subzones within the permit area. The restriction and the allotment served not only to reduce the annual harvest in the area but to redistribute the hunting pressure according to sheep densities and not hunter access. The number of permits increased from 50 to 65 in 1981, and to 80 in 1982. No changes were made in 1983.

Permits were increased in response to what was thought to be an increase in the number of harvestable rams. Presently the number of permits issued represents an estimated 4% of the population (less lambs), while the harvest rate is less than 2%. Data from Sheep Mountain in Kluane National Park indicate that rams attaining full curl (7.5 years) in any one year on average represent about 4.4% of the population (less lambs and rams older than 8 years, Hoefs and Cowan, 1979). If population dynamics of sheep in the permit area are similar to those of the Sheep Mountain population, and the removal of all rams attaining full curl has no detrimental effect on productivity and survivorship of unharvested cohorts, the sheep population could sustain a 4% harvest rate. Presently, then, if sheep are being harvested at less than 2% we should expect a surplus of harvestable rams and consequently an improvement of hunter success and a higher quality of trophies.

In short, the imposition of hunting restrictions and redistribution of hunting pressure was designed to:

- (1) increase the number of rams and in particular the number of legal rams in the area,
- (2) improve the trophy quality of animals (horn length, horn volume and average age), and

(3) increase hunter success and improve the quality of the hunt.

It should be noted however, that three events occurred simultaneously in 1980.

- (1) the number of resident hunters was restricted through permit allocation in the east half of Game Management Zone 7.
- (2) Regulations changed to restrict resident hunting to only full curl rams. Non-residents had previously been restricted to full curl rams.
- (3) Non-resident hunting was discontinued in the permit area (east half of GMZ 7).

Presently hunting by residents and non-residents is restricted to full-curl rams defined by a jig used by the Yukon Wildlife Branch to measure sheep horns (Merchant et al, 1982). The season runs from 1 August to 31 October and the bag limit is one per year.

STUDY AREA

The permit area is located in the southwest part of Yukon and represents, by area, less than 2% of the territory, encompassing 3140 square kilometres. The area is a part of the Coast Mountain ecoregion (Oswald and Senyk, 1977), characterized by dry rugged mountains to 2709 metres. Three major rivers drain the area; the Wheaton, Watson and Takhini. For management purposes it is divided into 10 game management subzones.

A large portion of the area lies above treeline, (about 1050 to 1200 m a.s.l.), much of it considered excellent sheep range.

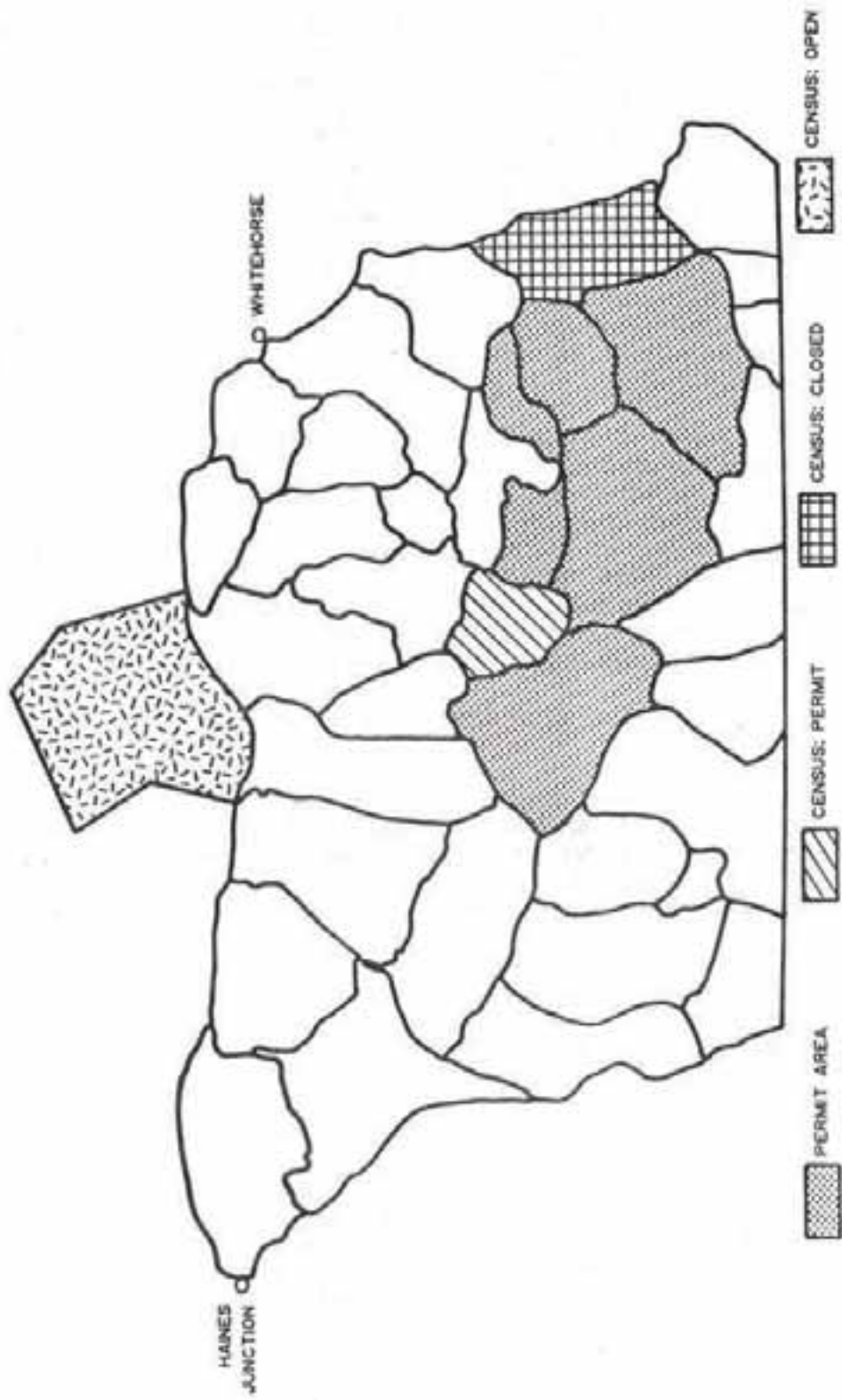
Sheep were observed on three distinct blocks, separated by about 40-50 km and topographically and climatically very similar. Hunter-kill data came from the entire Game Management Zone 7, bordered to the south by the Yukon-B.C. border, to the west by the Haines Road, to the north by the Alaska Highway and to the east by the Carcross Road. The permit area is a subset of this larger portion of the Coastal Mountains (figure 1).

METHODS

POPULATION ESTIMATES AND DEMOGRAPHY

Sheep were counted and classified by aerial census carried out in late June or July. It is assumed that a June-July count is a near-total count, due to the fact that white sheep are on snow-free alpine ranges; very conspicuous, and often concentrated around mineral licks. Replicate counts have been conducted on Sheep Mountain in Kluane National Park revealing only small variations in the count (less than 10%) at this time of year (Hoefs and Cowan, 1979). Helicopters are used to contour mountain blocks above treeline to achieve 100% coverage. Often more than one pass is necessary to get complete coverage. Two observers (not counting the pilot) are used, locations are mapped and sheep are counted and classified as lambs, nursery sheep, and rams

FIG. 1 STUDY AREAS IN SOUTHERN YUKON.
(UNITS REPRESENT GAME MANAGEMENT SUBZONES)



three years and older, which are typed according to horn curl (1/2, 3/4 and 4/4).

Nursery groups are generally comprised of females, lambs, yearling rams and sometimes 2 year old rams. It was impossible to identify yearlings and 2 year olds with any reliability from a one pass aerial survey conducted in July. An estimate of lamb productivity was calculated as lambs per nursery sheep. This index, however, doesn't allow for a highly variable yearling population that does not reproduce. A high lamb crop of the previous year that enjoys an average survival rate, will result in a low ratio of lambs to nursery sheep, due to the higher than average number of immature individuals in the nursery group. To help minimize this distortion we have calculated productivity as lambs per 100 two-year and-older nursery sheep. The number of 2-year-olds-and-older nursery sheep was derived by subtracting from the nursery count, the yearlings which were calculated by surviving the lambs of the previous year by .65 (this was the average survival rate of lambs in the Sheep Mountain study).

Sheep from three mountain blocks (three different subzones) have been surveyed in most years since 1978. One subzone has been restricted to permit hunting (permit area), one is open to both resident and non-resident hunting with only bag limit, full-curl and season restrictions (open area), and one is closed to hunting and has been since 1979 (closed area). The permit subzone (7-23) has about 210 sq. km. of sheep range and presently carries about 250 sheep, the open subzone (5-49) supports about 200 sheep on about 500 square km. of sheep range and the closed subzone (9-03) supports about 100 sheep on 250 sq. km. The areas are separated by about 50 km (figure 1).

Surveys allow us an area to area as well as year to year comparison.

TROPHY EVALUATION

Since 1973 there has been compulsory inspection of sheep horns shot by resident and non-resident hunters. This has allowed us to determine the number of animals shot, their age and horn growth, by year and location. It is assumed that the unrestricted and unknown native harvest is minimal.

Age has been determined using the horn annuli technique (Geist, 1966). Horn measurements include total length and base circumference of the longest horn as well as the length of each annually grown sheath and circumference of each annuli. An index of horn volume has been calculated using the equation of a cone.

$$\text{Volume} = \pi r^2 * \frac{h}{3}$$

Although this does not account for the curvature of the horn and the shape of the horn cross section, it is probably a very good indication of horn growth. Volume is used as the best index of horn quality. Brooming was not common, and when it occurred it generally removed not much more than the lamb tip. We have excluded broomed horns from the horn volume calculations.

HUNTER SUCCESS AND HUNT QUALITY

Hunter success was estimated in a number of ways. The simplest approach was to measure the number of sheep tags filled. However, this gave us no

measure of the number of sheep tags filled. However, this gave us no measure of effort. Three separate questionnaires have attempted to evaluate hunter effort. One questionnaire was a voluntary response directed to all resident license holders in 1983 to determine days hunted by month, the location of the hunt, and the success. The second was a compulsory questionnaire to all permit holders in 1983 which addressed the same questions. A third questionnaire was a phone survey to all permit hunt applicants in 1982 to determine success rate, an opinion of the permit system and whether or not hunters had enjoyed a high quality hunt. A further evaluation of hunt quality was determined from a voluntary opinion survey of the local fish and game association in 1983. The 1983 opinion survey was directed to all hunters in the organization and not only to permit hunt applicants, as was the case in 1982.

RESULTS AND DISCUSSION

POPULATION CHANGES

The imposition of hunting restrictions appeared to have no influence on either sheep density or productivity. Changes in population number, productivity, and the rate of survival in the three areas (permit, open and closed areas) followed a very similar pattern (figure 2). Population changes appear to be influenced more by lamb production and over-winter survival, both of which are likely dictated by weather and to a smaller degree sheep density than to hunting restrictions. Major fluctuations prior to 1979 could be the influence of less restrictive hunting, notably the allowance of 3/4 curl rams.

Ram numbers have increased in the permit area from 16 per 100 sheep (1+ years) in 1979 to almost 30 per 100 in 1982 (figure 3). Rams in the open subzone have held steady at between 22 and 25 per 100 since 1979. It should be mentioned that the permit subzone is a very accessible area to hunting, most of it above treeline and bordered by two large lakes. The low number of rams observed in 1979 in this area probably reflects its vulnerability to open hunting.

It is only when we look at the number of legal rams that we see a significant area effect. There has been a marked increase in the permit area in the number of legal rams per 100 sheep (1+ years), since restrictions were imposed (figure 4). No such increase has been observed in the open area. The number of full curl rams in the permit area increased to about 10 rams per 100 sheep (1+ years) in 1982. This compares favourably to legal ram counts in both Kluane National Park and an unhunted population in the northern Yukon. The open area has sustained between 1 and 3 legal rams per 100 sheep since 1978.

QUALITY OF THE KILL

Numbers of Animals Shot

The total kill in GMZ 7 (east and west) has ranged from 50 to 87 animals per year in the 10 years since 1973. In 1979 there was a decline in the kill which since imposition of permit restrictions has not increased, but has stabilized to about 50-55 animals. The resident kill, however has shown a substantial increase since 1979 (figure 5). The average resident kill from 1973 to 1979 was 20 animals, and has since increased to 41 animals. In

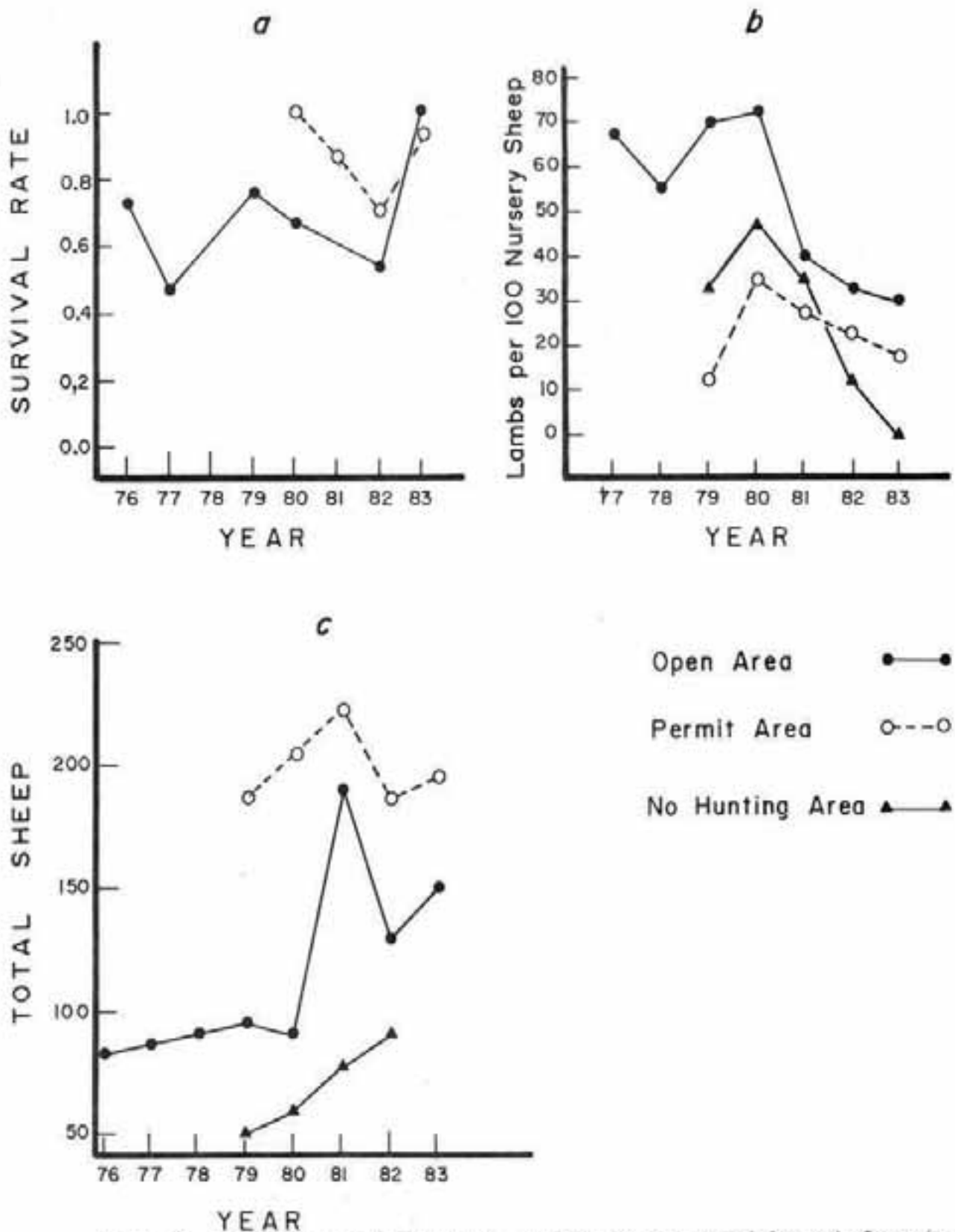


Figure 2: Dall sheep population count, an estimate of productivity and of survival rate against year within three mountain blocks in the southern Yukon.

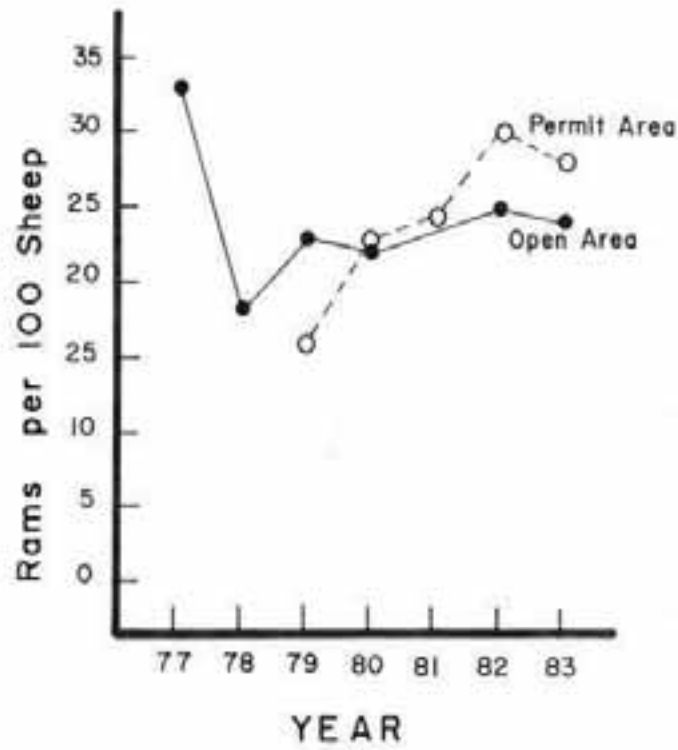


Figure 3: Rams per 100 sheep against year, by area.

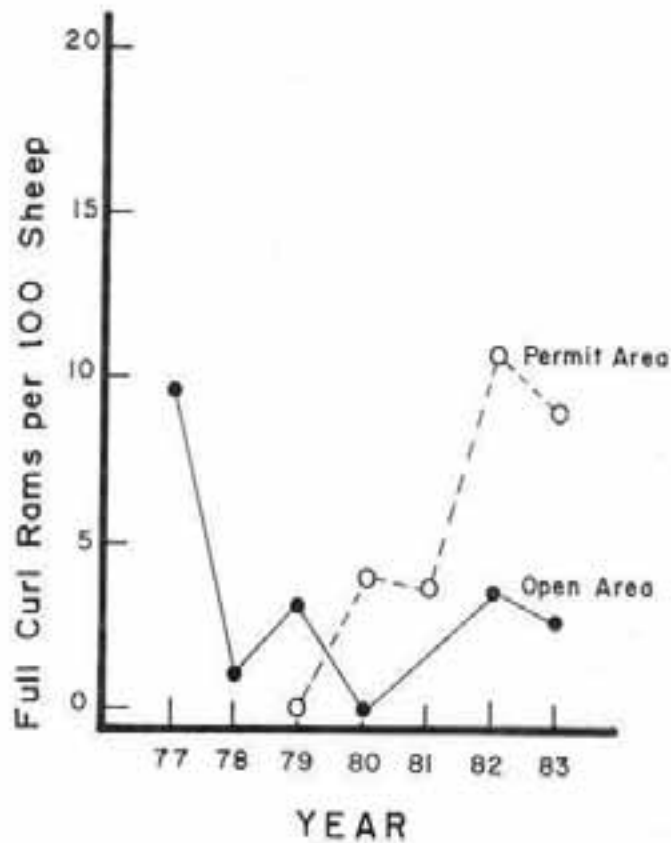


Figure 4: Full curl rams (legal) per 100 sheep against years by area.

fact 29% of all sheep shot by residents in GMZ 7 since 1973 were shot in the last two years.

Average Age

The trend in numbers as well as average age of the kill was used as an index of population viability. The age distribution of all animals shot by residents and non-residents in GMZ 7 since 1973 is shown in figure 6. The average age of rams shot during this period is approximately 8 years.

The average age of resident-shot animals has shown an increase since 1979 (figure 7). Contributing to this most certainly is the imposition of full curl restrictions. However comparing resident (non-permit) to permit holders we see that there has been a recent divergence in average age of the kill. In 1983 rams shot by permit holders were significantly older (at 90% confidence) than resident (non-permit) shot rams. The difference in average age also shows up when we look at the age distribution of the kill since 1979, with the permit harvest shifting to older age animals (figure 8).

The results however are not so clear cut. If we examine the cohort distribution of the kill we see an interesting shift. It was found that certain cohorts were more strongly represented in the kill over time. For instance the 1973 cohort was strongly represented in the kill as 6 year olds in 1979, 7 year olds in 1980, 8 year olds in 1981, etc. The 1983 kill included many 10 year old rams, possibly the influence of a strong 1973 cohort. This should be considered when comparing average age from year to year (figure 9).

The average age of the kill in 1983, by resident and permit hunters is significantly different however, leading us to conclude that average age is more a result of restrictive hunting than the strength of different cohorts (figure 7). Average age is likely an expression of the availability of full curl rams. Our survey data support this.

Horn Quality

One might assume that if permit holders were shooting older animals, trophy quality (horn volume) would improve. This has not shown to be the case. There is no significant difference in horn volume between permit and non-permit resident hunters and in fact no significant difference since 1974. Horn length as well has shown no significant difference. If we look at horn volume by age of all rams shot in GMZ 7 since 1973 we see a plateauing at about 8 or 9 years. Older age rams have not produced (on average) significantly larger horns (figure 10). In fact we found that older rams (greater than 9 years old) often suffered poorer early growth and poorer overall horn growth, than younger shot rams.

However if we look at the number of animals shot having horn volume greater than 2800 cc (generally a 37" ram or better) (by all residents), we find proportionally more bigger heads shot since 1980 (figure 11). This probably reflects the regulation change in 1980 to full curl only rams.

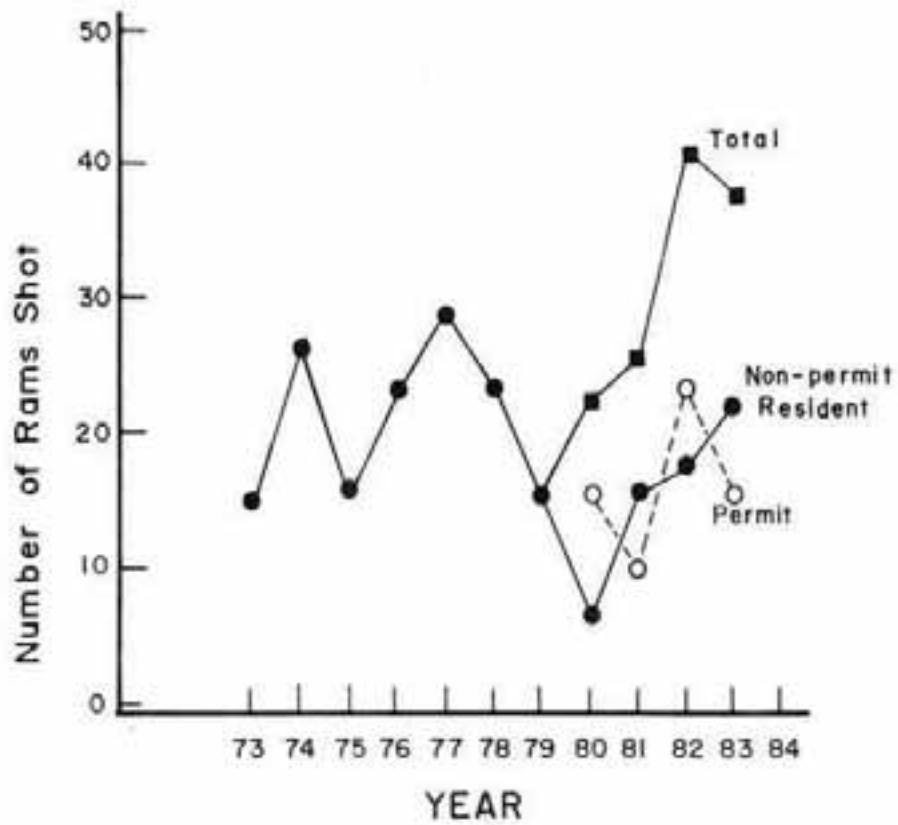


Figure 5: Number of rams shot against year by permit holders and non-permit-resident hunters in GMZ 7.

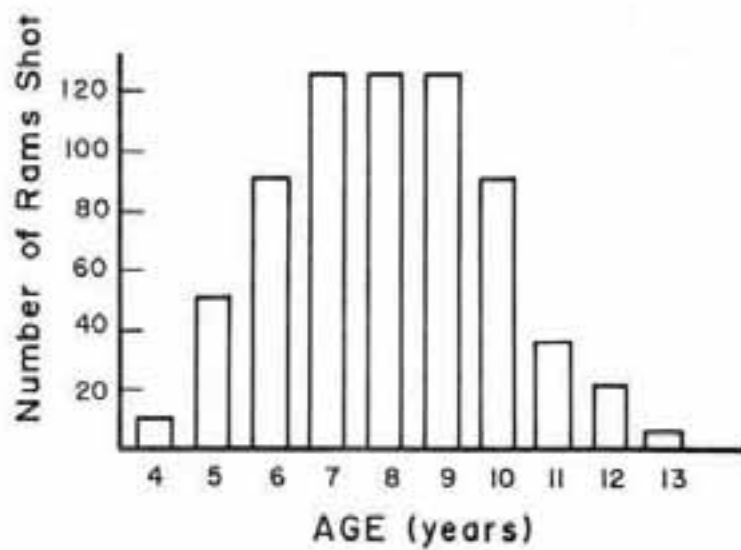


Figure 6: Age distribution of the sheep kill by resident and non-resident hunters in GMZ 7.

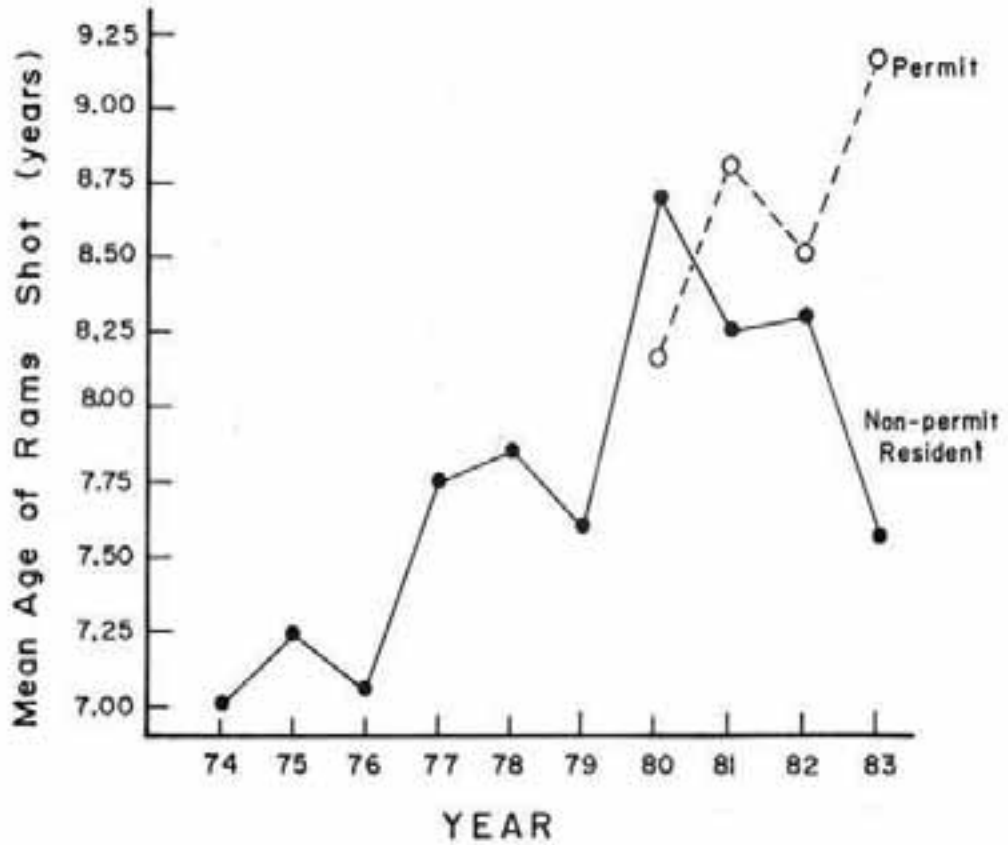


Figure 7: Average age of the resident sheep kill against year by permit and non-permit hunters in GIZ 7.

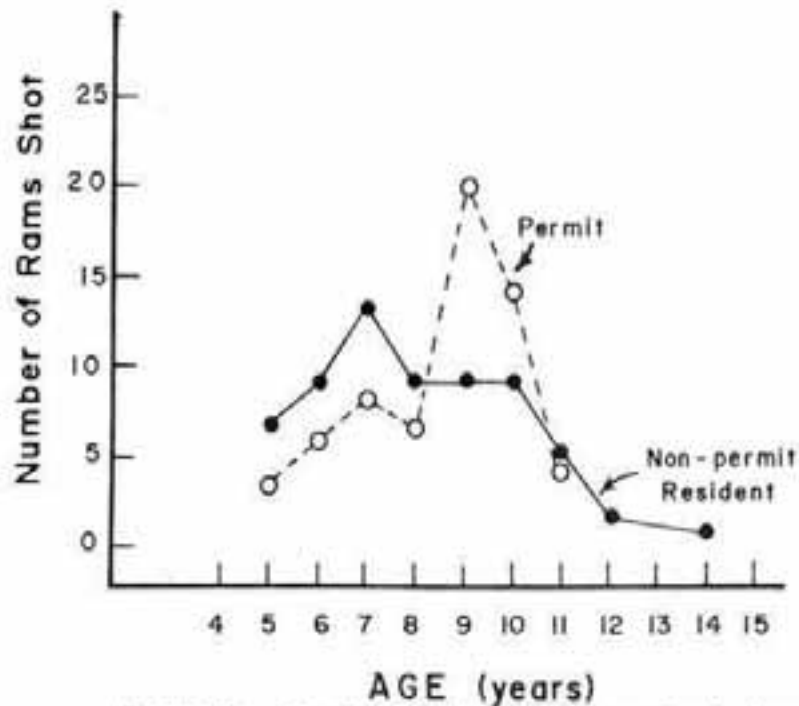


Figure 3: Age distribution of the resident sheep kill against year by permit and non-permit hunters in GIZ 7.

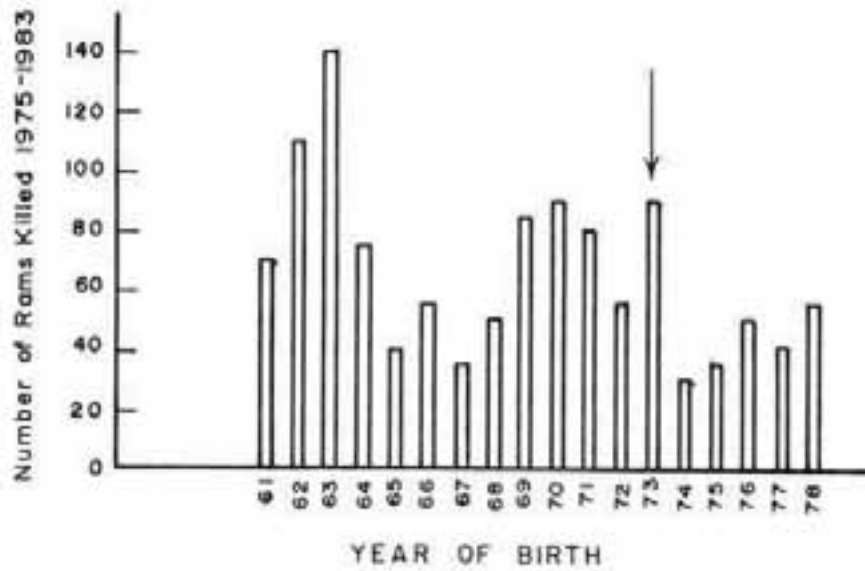


Figure 9: Distribution of the sheep kill by cohorts shot from 1975 to 1983, corrected to allow for cohorts not counted (at both ends of the distribution).

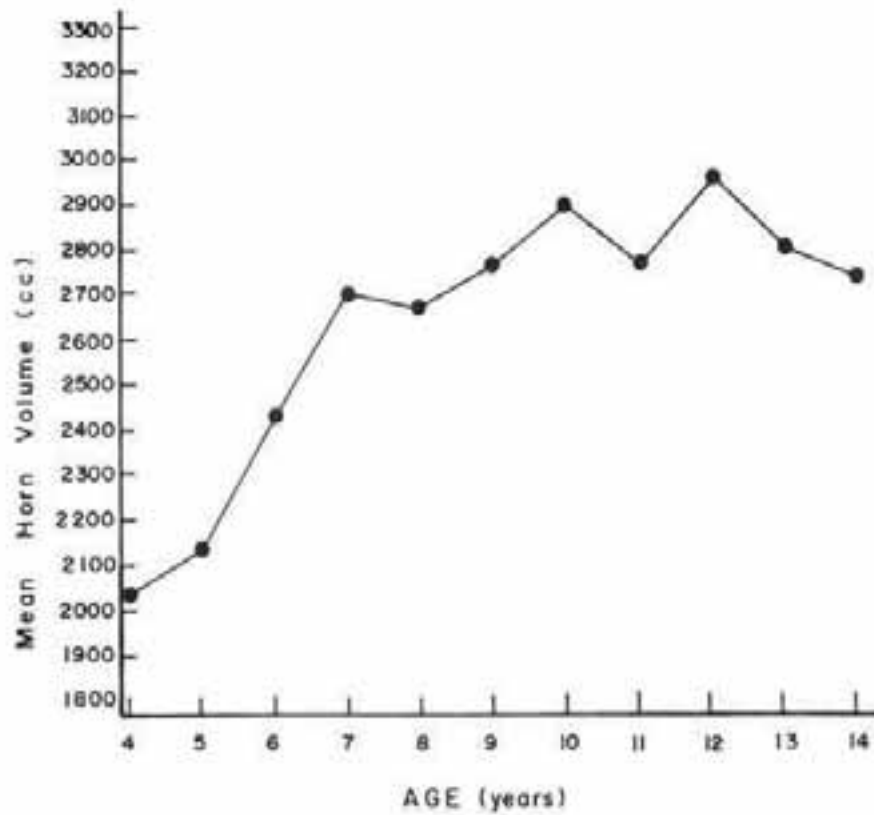


Figure 10: Mean horn volume against age of sheep shot in GAZ 7.

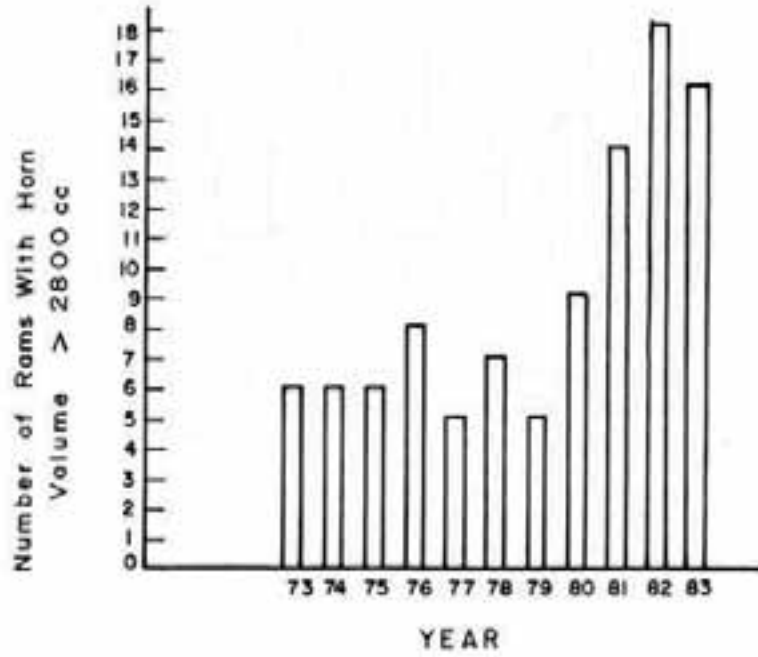


Figure 11: Number of rams with horn volume greater than 2800 cc, against year, in G12 7.

Hunter Success and Quality of the Hunt

Hunter success is not easy to determine. License sales may not fairly represent effort, and voluntary questionnaires are possibly biased to successful hunters. However three independent questionnaires and calculations based on license sales tell the same story: permit hunters enjoy far better success than resident hunters. Five to ten percent of resident sheep tags are filled compared to 22 to 30 percent of the permits bought (figure 12). From questionnaire data residents in 1983 were 19% successful compared to permit hunters who have been 55 and 35% successful in 1982 and 1983 (figure 13). Contributing to the increase in success could be the expulsion of non-resident hunters in the east half of GMZ 7. This however does not explain the almost doubling of the resident kill since 1979. Resident hunters generally have lower success than non-residents; not surprising since they spend fewer days hunting (on average) and usually do not have the resources (horses, camps, aircraft, etc.) that outfitters provide. The increase in the resident kill is probably the result of an increase in the number of available rams, whether due to the permit system or full-curl restrictions. The redistribution of hunters in the permit area, preventing local concentration of hunters, likely contributes to higher hunter success (more animals shot).

It should be noted that since 1979 the number of residents who purchased sheep tags has not increased, and access into GMZ 7 has not increased significantly. In addition rams subjected to reduced hunting pressure are possibly less wary, and therefore more vulnerable.

Permit hunters are putting in an effort equal to that of resident hunters averaging 4.3 and 4.2 days per successful hunt, and 5.6 and 5.0 days per unsuccessful hunt, respectively.

Since the permit system was adopted, the number of permit applicants has varied between 77 and 136. Eighty permits were issued in 1983; 70% of the applicants were awarded a hunt. In 1984 preference will be given to unsuccessful or first time permit applicants, likely guaranteeing hunters a permit at least once every two years. Based on probability, the odds of success are better for permit hunters hunting every other year than non-permit residents hunting every year (14% vs 8% respectively). With no preference given the odds are still better for permit hunters (10% vs 8%).

Trophy quality has not been a major objective of the permit program. The quality of the hunt has been emphasized, not the quality of the head. Traditional hunters certainly must applaud the efforts to restrict the hunter density. Too many people competing for too few, harrassed sheep must depreciate the experience.

At worst the only cost of the permit program to the resident hunters has been a sacrifice of hunting for one year in two, in the permit area. The advantages are reduced hunter density, higher success, and a higher quality of trophy for those selective hunters.

Opinion of Permit Hunting

The Yukon's permit hunting program has suffered from a lot of criticism. This is partly due to the fact that its justification has been conjecture.

FIG. 12 HUNTER SUCCESS BY YEAR AND LICENCE TYPE
(NUMBER OF RAMS SHOT AS A PERCENT OF LICENCES SOLD)

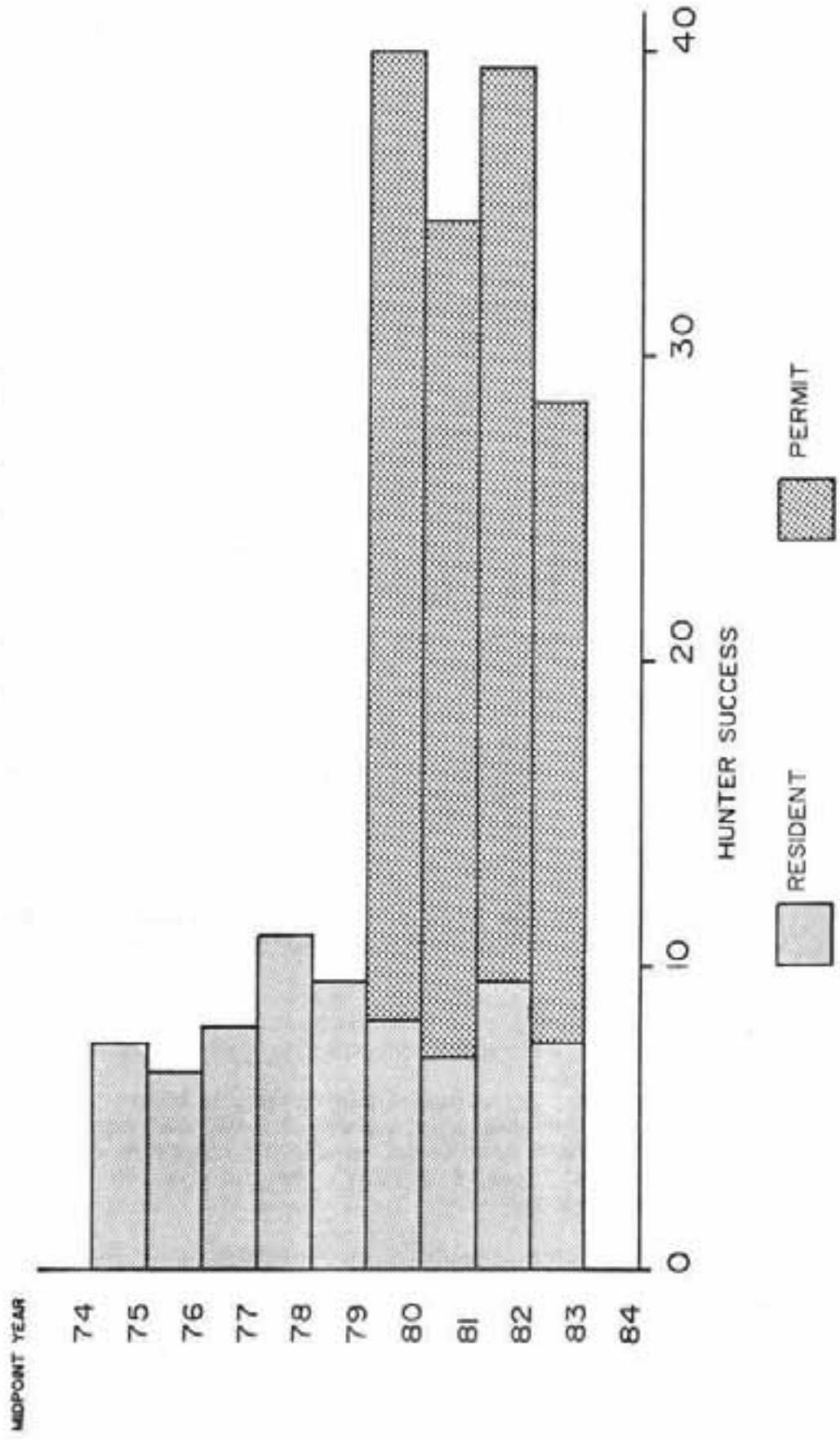
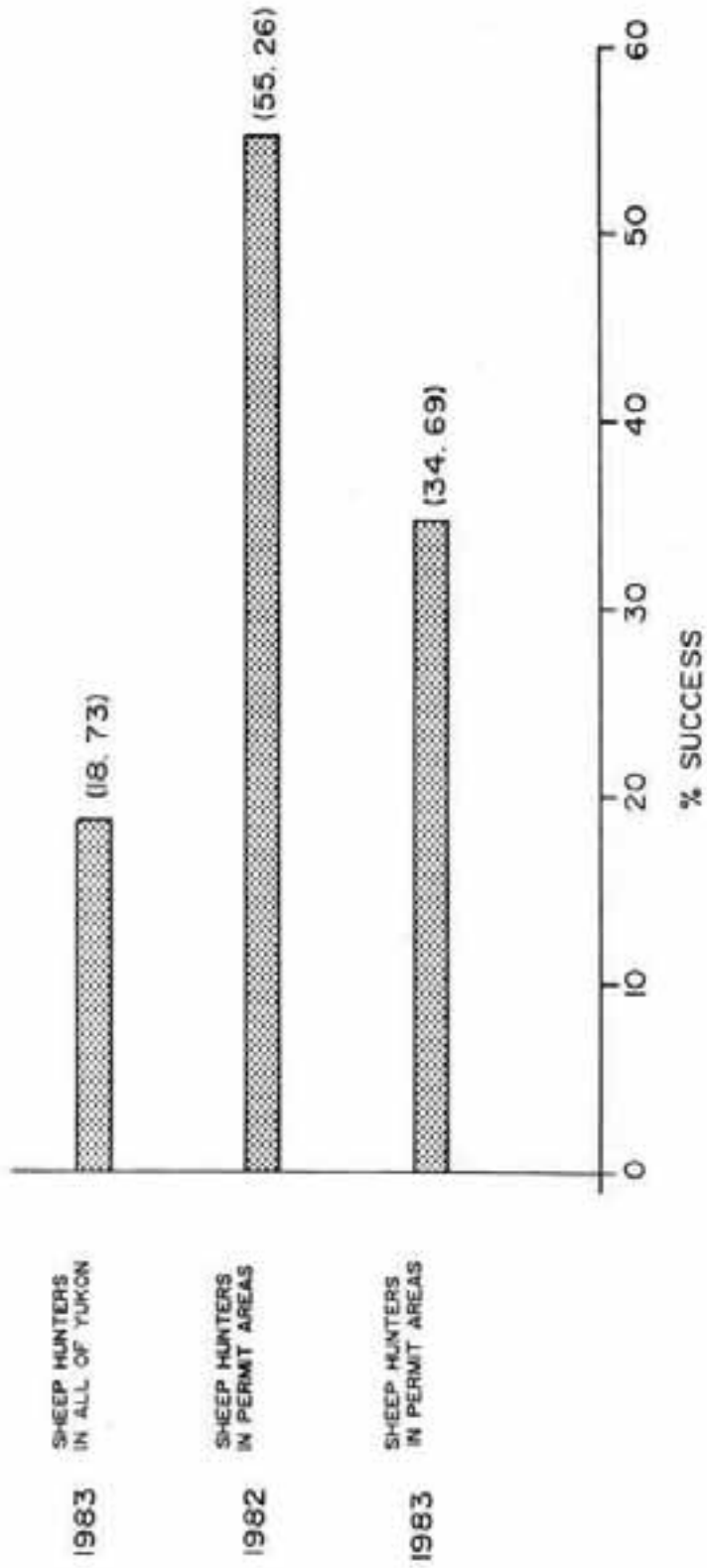


FIG. 13 SHEEP HUNTERS' SUCCESS RATES



Effects of restrictive hunting take time to surface. Many dissenters oppose any form of regulation, others believe that the permit system was imposed only to improve trophy quality, and that sheep should not be managed for trophies.

Two opinion surveys, one conducted on permit applicants, the other on members of the Yukon Fish and Game Association, however, have produced the same results; strong support of the program, 82% and 79% in favour, respectively.

Since permit hunting has been imposed in the southern Yukon:

- (1) There has been an increase in the number of legal rams in the population in the permit area; significantly more than an adjacent area offering open-hunting.
- (2) There has been an increase in the resident harvest.
- (3) The age distribution of the harvest in the permit area has shifted to older animals. The average age of permit shot sheep in 1983 was significantly higher (at 90% confidence) than resident shot sheep in an adjacent area.
- (4) Permit hunters enjoy substantially higher success than resident hunters in adjacent areas.