AGE DISTRIBUTION OF DALL'S SHEEP HARVESTED BY NON-RESIDENTS IN THE MACKENZIE MOUNTAINS, 1986

LES KUTNY[1]

AND

GORDON STENHOUSE[2]

DEPARTMENT OF RENEWABLE RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

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[1] present address: Science Institute of the NWT, Inuvik, NWT
[2] present address: Ducks Unlimited Canada, Yellowknife, NWT

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ABSTRACT

This report examines the age distribution and the incidence of lumpy jaw infection of rams harvested by non-resident hunters in the Mackenzie Mountains in 1986. Comparisons are made between ages obtained from horn annuli and those obtained from tooth sections. Data were received from all eight outfitting areas in wildlife management zone E-1 (Mackenzie Mountains). Jaws were ranked 0-3 depending on the severity of lumpy jaw infection. Mean ages were not significantly different ($p<.05$) for both tooth cementum method (8.7 years) and horn annuli method (9.1 years). A correlation of $r=0.87$ ($p<.0001$) was found between age estimates provided by cementum analysis and those provided by horn annuli counts. The mean age of sheep harvested has not varied significantly ($p<0.05$) from 1984 through 1986. Only 19.5% of the jaws were considered severely infected with lumpy jaw, while 49% were normal. The sheep population of the Mackenzie Mountains appears to be experiencing excessive harvest pressure, assuming that over-harvested sheep populations show a steady decline in the percentage of 8+ year old rams in the harvest sample. The validity of this assumption is a subject of debate among sheep biologists, however. The significance of lumpy jaw infection in wild sheep populations remains unknown, but the incidence and severity of lumpy jaw in the 1986 sample is not believed to be a management concern at this time. No management changes are recommended; however, recommendations for monitoring are presented.

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METHODS

Lower jaws from Dall's sheep taken by non-resident hunters in the Mackenzie Mountains (zone E-1) were submitted by the outfitters to Renewable Resources area offices in Norman Wells, Fort Liard and Fort Simpson, NWT. Jaws were submitted from the eight outfitting areas in the Mackenzie Mountains. The ages of rams that were exported were estimated by counting the horn annuli.

All jaws were sent to Inuvik for comparative age determination and for examining the severity of lumpy jaw infection. Jaws were ranked into one of four degrees of severity of lumpy jaw, based on the presence and extent of infection:

0 = not infected: bone natural and compact;

1 = slightly infected: swelling of mandible in this region as revealed by increase in width, some perforation of bone, but teeth normal, no necrosis or osteolysis;

2 = infection of medium severity: pronounced swelling of mandibular region, increased perforation of bone, some necrosis (erosion of bone) at base of teeth, uneven wear of teeth, angle of teeth affected;

3 = severe infection: severe necrosis and osteolysis, teeth deformed, growing at displaced angles, broken or missing entirely. Severe swelling of mandible. Large holes in mandible, "honey combing" of jaw. Bone

at base of teeth eroded away, resulting in appearance of greatly elongated cheek teeth.

The first incisors (I_1) were removed using the procedures outlined by Turner (1977). The samples were all recorded and renumbered consecutively to ease handling and the recording of data. Original tag numbers were used on all slides to allow comparison with ages determined from the horn annuli.

The procedure for decalcification and sectioning followed that of Latour (1984). Decalcification was done for 18 hours in 4% nitric acid solution. The incisors were then rinsed under running tap water for 24 hours.

A .65 mm section of the root of each tooth was cut off and frozen before being sectioned into 7-10 micron longitudinal sections with a microtome/cryostat (TissueTek II, Miles Ltd.). The tooth sections were floated in quartered Petri dishes of basic water and mounted on albumenated slides. The slides were dried at room temperature, then stained with a toluidine blue solution before being read under a compound microscope (40-100x). When the section was read, one year was added to the age obtained because the permanent primary incisor does not erupt until the animal is about 13 months old (Hemming 1969). The degree of readability of the sectioned teeth was recorded on a scale of A to D (A = easy to read, B = readable, C = difficult to read, D = very difficult to read).

RESULTS AND DISCUSSION

In 1986 the hunter success rate was 68.3% compared with 69.2% for 1985 and 62% for 1984, based on the number of non-resident sheep tags sold (Table 1). Of course it is recognized that although some hunters may purchase a tag for Dall's sheep, they may be primarily hunting for caribou, moose, or grizzly bears, and may only take a sheep if they were fortunate enough to encounter this species while on a hunting foray.

The jaw return rate of 72.3% was lower than for the six areas (E/1-1 to E/1-6) in 1985 (88%) and 1984 (89%). The percentage of missing jaws from the 1986 known harvest by outfitting area ranged from 0% (E/1-2) to 70.6% (E/1-8), with a mean of 28% over all eight outfitting areas. Although no data are available, the authors speculate that the percentage of missing Dall's sheep horns is very low.

Two of the jaws received did not have incisors that were suitable for age determination (1-E/1-4, 1-E/1-6). There were 46 individuals that did not have estimates of age by horn annuli. There was comparable information for 61% (72) of the total sample, which was lower than the 72% recorded in 1985.

Table 1. Summary of non-resident hunter kill of Dall's sheep in the Mackenzie Mountains, 1986.

Outfitter area	# of tags sold	# of sheep taken	# of jaws ret'd	# of missing jaws	Average age (yrs) Horn(S.D.)	Teeth (S.D.)	Sheep 8+ yrs
E1-1	28	21	20	1	9.0(1.7)	9.0(1.7)	80%
E1-2	23	10	10	0	9.4(.64)	9.3(.75)	100%
E1-3	42	33	15	18	9.2(1.3)	9.2(1.2)	90%
E1-4	48	31	23	8	9.2(1.0)	8.8(1.2)	80%
E1-5	12	11	9	2	n.a.*	8.7(1.6)	78%
E1-6	25	25	23	2	8.5(1.1)	8.6(1.3)	83%
E1-7	20	18	15	3	8.8(.98)	8.8(1.5)	87%
E1-8	24	17	5	12	n.a.	7.4(.49)	40%
TOTAL	222	166	120	46	9.1	8.7	79.8%

* n.a. = not available

Age Structure of Harvested Sheep

The ages determined from cementum annuli were the same in 83% (73) of the samples as the ages from the horn annuli. A correlation of $r=.87$ ($p<.0001$) was found between age estimates provided by cementum analysis and those provided by horn annuli counts. A difference of one year was found in 13% (11) of horn versus cementum annuli while only 3% (3) had a difference of two years or greater.

The mean ages were not significantly different ($p<.05$) for both teeth (8.7 years) and horn (9.1 years). The ages determined from cementum annuli ranged from 6 to 12 years, while ages from 6 to 13 years were determined using the horn annuli method (Figures 1 and 2). Although sample sizes differ across years, the mean age of the sheep harvested has not varied significantly ($p<.05$) from 1984 through 1986 (1984-8.6 years, 1985-8.4 years, 1986-8.7 years). Although these data should be encouraging to managers and outfitters, it must be stressed that a large percentage of the non-resident sheep harvest remains untracked in terms of horn size (we assume they are legal, 3/4 curl, rams), and most significantly, age. It is not known whether or not this untracked segment of the population would differ from the current data base of harvested sheep.

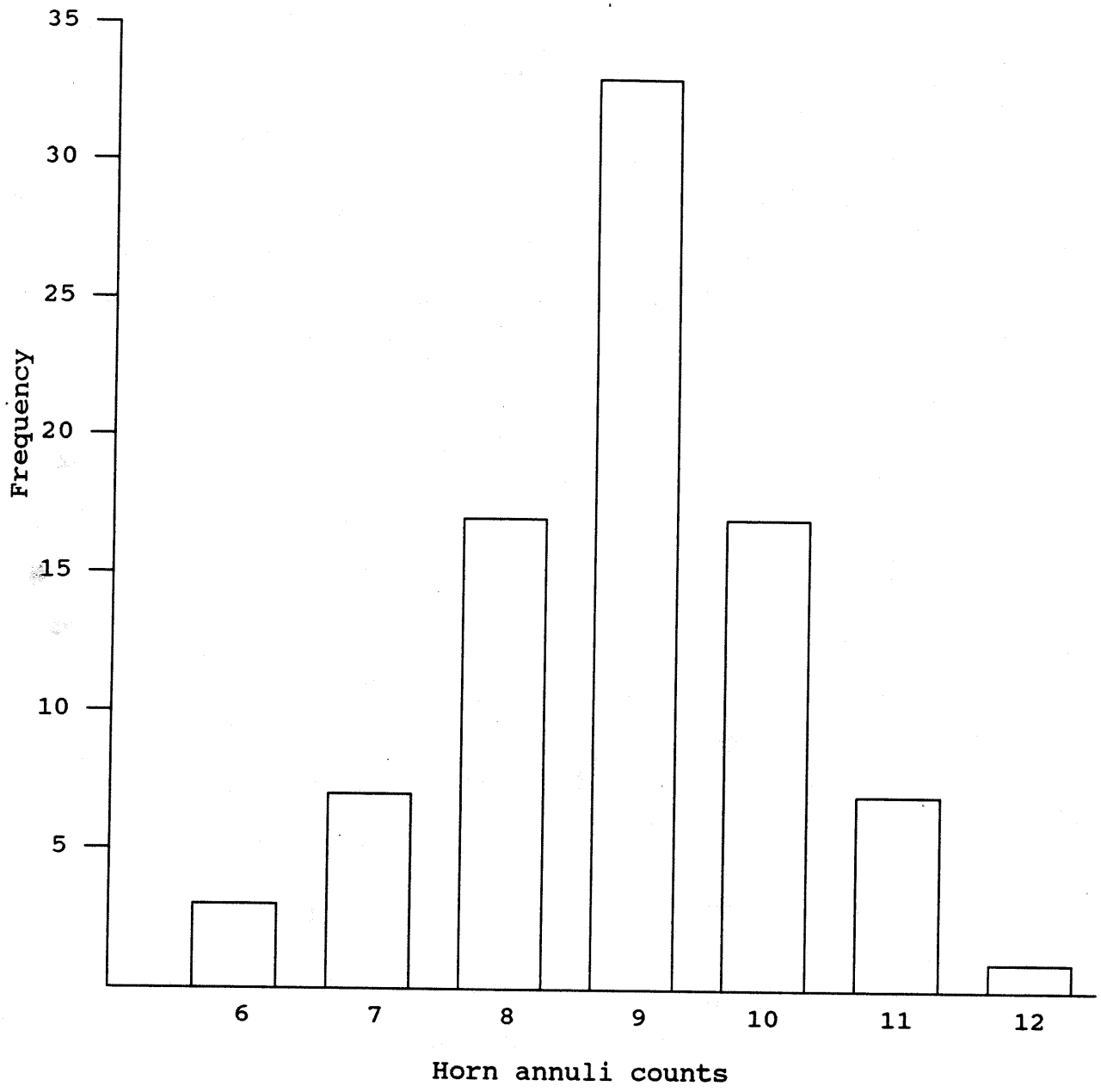

Figure 1. Age frequency of Dall's sheep, as determined by horn annuli counts, for sheep harvested by non-residents in the Mackenzie Mountains, NWT, 1986.

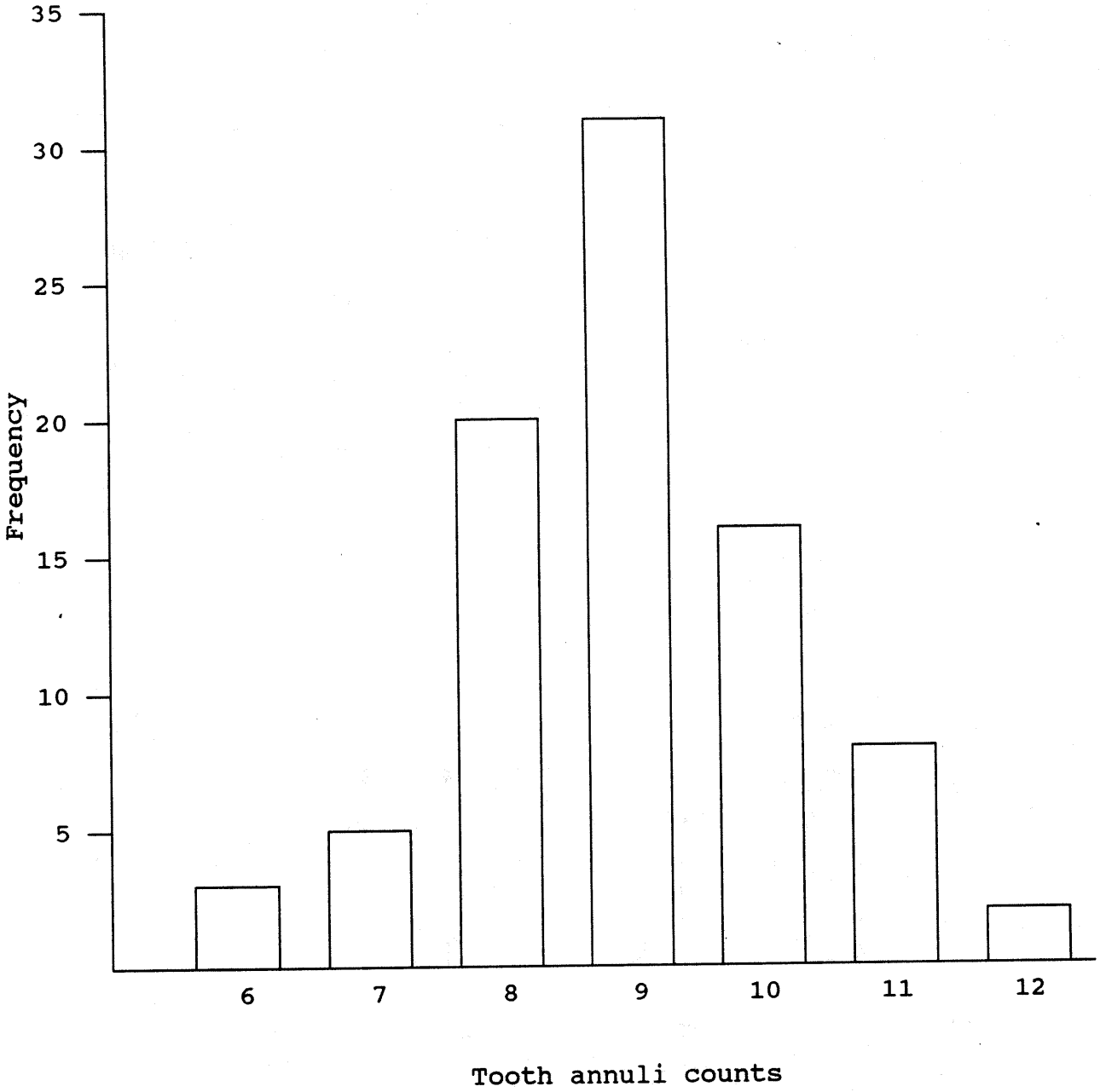

Figure 2. Age frequency of Dall's sheep, as determined by tooth cementum annuli counts, for sheep harvested by non-residents in the Mackenzie Mountains, NWT, 1986.

Lumpy Jaw

Approximately half (49%) of the jaws were categorized normal, while only 19.5% were considered to be severely infected (Table 2). Although the current sample of sheep jaws is smaller than that which was collected from the 1985 hunting season (Kutny and Jingfors 1986), the jaws from the 1986 hunting season showed an overall decrease in the number of "normal" jaws and an increase in the number of "moderately" affected jaws. The changes between these two years were statistically significant ($t=8.23$, $p<.05$). As in previous years (Kutny and Jingfors 1986), a great deal of variation was found in the incidence of lumpy jaw between the outfitting areas. It is unclear whether this variation is real or a function of small sample size, or of some other factor.

It is important to note that of the 82 jaws submitted for analysis, 79% were complete jaws and 21% were half jaws. The incidence of lumpy jaw in these half jaw samples was 6.6%. This finding could be an artifact of the way samples were selected by outfitters for submission.

Table 2. Incidence and severity of lumpy jaw infection in Dall's Sheep harvested by non-residents in the Mackenzie Mountains, NWT, 1986.

Area	Complete Jaws	Half Jaws	Normal (0)	Light (1)	Moderate (2)	Severe (3)
E/1-1	3	0	1(33%)	2(67%)	0	0
E/1-2	10	0	3(30%)	3(30%)	3(30%)	1(10%)
E/1-3	4	2	2(33%)	0	0	4(67%)
E/1-4	16	0	6(38%)	2(12%)	5(31%)	3(19%)
E/1-5	9	0	4(45%)	1(11%)	3(33%)	1(11%)
E/1-6	23	0	10(44%)	1(4%)	5(22%)	7(30%)
E/1-7	0	15	14(93%)	1(7%)	0	0
TOTAL	65	17	40(49%)	10(12%)	16(19.5%)	16(19.5%)

CONCLUSION

If we assume that overharvested sheep populations would show a steady decline in the percentage of 8+ year old rams in the harvest sample, the sheep population in the Mackenzie Mountains appears to be experiencing excessive harvesting pressure. Unfortunately, sheep biologists and managers currently cannot agree on the validity of this assumption. Only a long term study with both harvesting and non-harvesting zones in which annual population size/composition surveys are conducted will test this hypothesis.

The significance of lumpy jaw infection in wild sheep populations is unknown. It is generally believed that lumpy jaw is related to the habitat available on sheep range. The coarser vegetation and various mineral components in the forage are believed to have an impact on tooth wear and to play a major role in the etiology of lumpy jaw. The incidence and severity of lumpy jaw in the 1986 sample is not a management concern at this time.

Our current data base does not suggest the need to alter the current management regime in place for the harvesting of Dall's sheep in the Mackenzie Mountains.

RECOMMENDATIONS

1. If the monitoring program for Dall's sheep is to be more effective, it is essential to improve the collection process. All lower jaws (complete) should be submitted from all sheep harvested. The number of jaws received should be equal to the number of tags distributed the following season.

2. All sheep horns processed through GNWT Renewable Resources offices should be measured by trained staff on a standard sheep measuring jig, and horn annuli counts should be made at this time.

3. Data from resident Dall's sheep hunters should include: success, horn annuli count, horn length (L + R), complete lower jaw, and location of harvest. This data should be analyzed and included in a single annual report for sheep harvested in the Mackenzie Mountains.

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