

BIGHORN RAM SURVIVAL AND HARVEST IN SOUTHWESTERN ALBERTA

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ABSTRACT: The survival of individually marked bighorn rams was monitored over 6 hunting seasons in southwestern Alberta. The study area included the Sheep River Wildlife Sanctuary, where sheep are easily accessible and hunting is prohibited, and the surrounding areas where hunting is allowed in September and October. Rams with horns exceeding 4/5 of a curl ("legal rams") can be harvested. The number of permits issued is not limited. Seventy-eight rams were tagged. Of these, 43 were or became legal, and 20 were harvested. The median age at which rams became legal was 5 years (range 3-8). The median age at harvest was 6 years (range 4-13), and legal rams survived on average 1.6 hunting seasons (range 0-6). Yearly harvest was about 27% of the legal ram population, and a minimum of 61% of legal ram deaths was due to hunting. Motor vehicle access to most hunting areas is severely restricted. At least 26% of rams that survive to yearling age, however, die before reaching legal horn size. This unexpected mortality of young rams warrants further research. Increasing use of the Sanctuary as a refuge may reduce ram harvests in the study area.

Bighorn sheep (*Ovis canadensis*) are managed as a trophy animal (Hebert et al. 1985; Thorne et al. 1985). The "ideal" management strategy should result in the production of good trophies and the harvest of most of these trophies, while maintaining an age distribution not drastically different from that expected in the absence of hunting. The quality of the hunt, and hunter satisfaction, should also be incorporated in a management scheme. The definition of an harvestable ("legal") ram must be functional, so that it can be used both by hunters in the field and by conservation officers checking the harvested rams.

Heavy harvest of 4- to 6-year-old individuals may result in poor trophy quality (Barichello and Hoefs 1985) and may affect the social behavior and mortality pattern of the population (Geist 1971; Heimer et al. 1984). On the other hand, regulations limiting harvest to full-curl rams may result in the loss of the segment of the population that does not reach this horn size (Nichols 1985). This problem may be especially important for populations where heavy brooming of the horns is common.

It is therefore important to know the effects of different management strategies on ram mortality and trophy quality. These

effects have been assessed in thinhorn sheep (*Ovis dalli*) by analyzing ram harvests (Barichello and Hoefs 1985) and ram survival data (Heimer et al. 1984). Here I report on the survival of individually marked bighorn rams in southwestern Alberta, under an unlimited-entry, 4/5-curl management strategy. I also discuss the effects and potential applications of restricting access to hunting areas as a management tool.

This study would not have been possible without the initiative, support and friendship of W.D. Wishart. Field assistance was received from J.T. Jorgenson, W.J. King, O. Pall and D. Richardson. The Alberta Fish & Wildlife Division and the Natural Sciences and Engineering Research Council of Canada provided financial support. I thank W.E. Heimer for reviewing the manuscript.

STUDY AREA

The study area in southwestern Alberta included the Sheep River Wildlife Sanctuary, established in 1973. The Sanctuary is predominantly a ewe winter range (Festa-Bianchet 1986), but rams can be found in it at any time of the year, with peak numbers in early June and early October (Festa-Bianchet in press). Hunting is prohibited in the Sanctuary and permitted outside it in September and October. Motorized vehicle access is restricted to the main road along the Sheep River. Although many areas used by rams east of the Sanctuary are within a few minutes walk of the road, hunting in the rest of the study area involves backpacking or horseback riding, and very few areas used by rams are less than two hours walk or ride from the road: most sheep hunters camp out one or more nights.

To be legally harvested, rams must have horns of 4/5 of a curl or greater. A legal ram (or trophy sheep) is defined as one whose horn tip extends beyond the continuation of a line drawn from the anterior base of the horn to the front of the eye. Only residents are allowed to hunt in the area, but the number of permits issued is not limited. Successful ram hunters cannot buy a trophy sheep tag in Alberta the year after their kill.

MATERIALS AND METHODS

Rams were captured with tranquilizing drugs as described in Festa-Bianchet and Jorgenson (1985), or in a corral trap, and tagged with plastic ear tags. Data reported here were collected from September 1980 to February 1986. During this period, 43 tagged rams were or became legal. Rams were aged by counting horn annuli (Geist 1966). Information on hunter harvests was obtained through the collaboration of Conservation Officers of

the Alberta Fish & Wildlife Division and field staff of the Alberta Forest Service, interviews of hunters in the study area, and by checking registration forms: all trophy sheep harvested in Alberta must be registered with the Fish & Wildlife Division within 30 days of the kill. Rams were assumed to be dead when they were not seen for over eight months.

RESULTS

Forty-three rams were captured when they were aged between 1 and 2 years. Of these, 17 survived until they reached legal status, 9 were still alive but not legal at the time of writing, and 17 died before reaching legal size. Of the latter, 8 died during a major pneumonia die-off late in 1985, although clear evidence of disease was found in only two. Cause of death of the 9 rams that died outside the die-off could not be determined.

Rams reached legal status at ages 3-8, and over 70% were legal by age 5 (Fig. 1). The average age at harvest was 6.8 years (Fig. 2), and legal rams survived on average 1.6 hunting seasons (Table 1) (legal rams alive at the time of writing were not included in this calculation). During this study, 43 tagged legal rams provided 73 legal-ram-seasons. Since 20 rams were harvested, hunters removed 27% of the available legal rams each year. Harvest of tagged legal rams ranged from 0/6 (0%) in 1980 to 7/16 (44%) in 1983. Hunter harvests accounted for at least 61% of legal ram deaths (Table 2).

DISCUSSION

This study revealed that a sizeable proportion of bighorn rams die after one year of age and before they reach legal status. Even if those that died in the 1985 die-off are excluded from calculations, and those alive but not legal at the time of writing are assumed to all survive to legal size, a minimum of 26% (9/35) would be lost. Mortality among young rams is assumed to be low (Geist 1971), but Heimer et al. (1984) suggested that it may increase if these young rams were to actively participate in the rut. This study, and those of Heimer et al. (1984) and Jorgenson and Wishart (1986) have shown considerable mortality of rams aged 1-5. Geist (1971) suggested that physical exertion during the rut would lead to heavier overwinter mortality. If hunting removed most or all of the older rams, younger ones may take over as breeders, and as a consequence suffer an increase in death rate. In most of North America, mountain sheep rams are not hunted between age 1 and when they reach legal status on the assumption that survival of young rams is very high (ram lambs can be hunted in Alberta as non-trophy sheep). The loss of over one quarter of the young ram population indicates a strong need

Table 1. Hunting seasons survived by bighorn rams in southwestern Alberta after their horns had grown to legal size.

Years survived	No. rams	%
0	13	43.3
1	6	20.0
2	4	13.3
3+	7	23.3

Table 2. Causes of death of tagged bighorn rams with legal-sized horns (N = 33)

Cause of death	No. rams	%
Hunter kill	20	61
Poached	2	6
Total man-caused	22	67
Other	3	9
Unknown ^a	8	24

^a Rams that disappeared. Probably includes some hunter kills

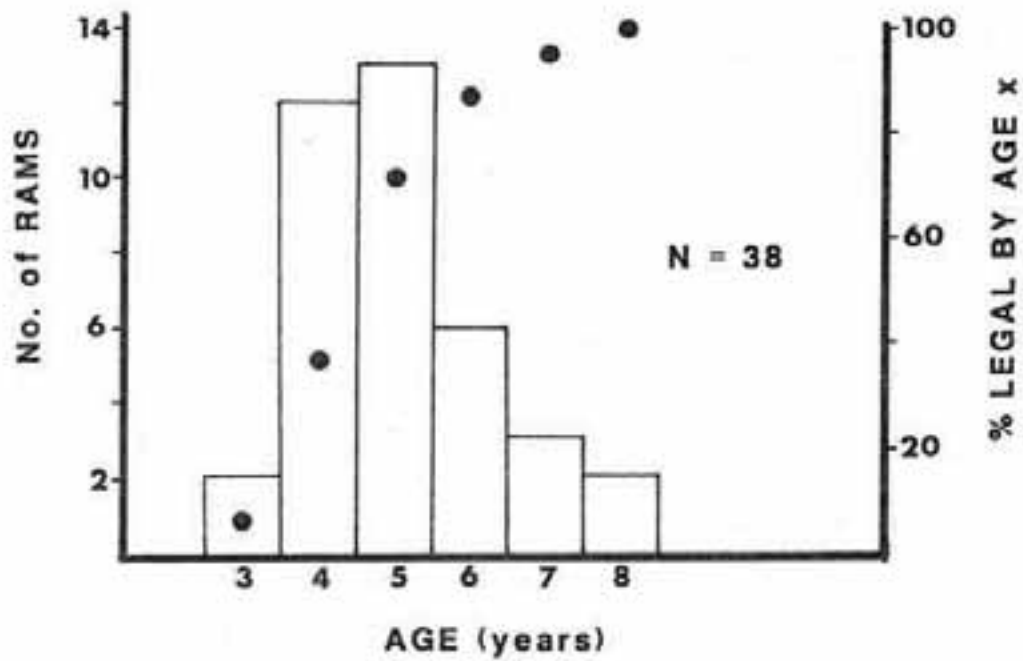


Fig. 1. Age of bighorn rams when their horns grew to legal size.

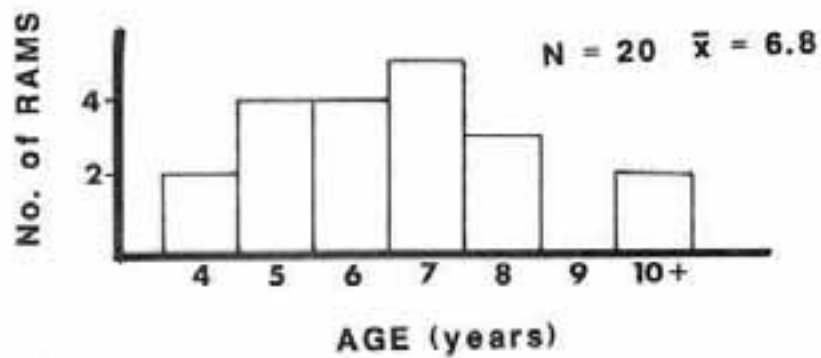


Fig. 2. Age of bighorn rams harvested by hunters in the study area.

for research to determine the causes of this mortality. This research should involve a study of ram social behavior and nutrition, to test both the hypothesis put forward by Geist (1971) and Heimer et al. (1984), that removal of mature rams will affect the behavior of younger ones, and that advanced by Clutton-Brock et al. (1985), that young males may suffer heavy mortality under food stress because of their greater requirements. At Sheep River, 27% of legal rams were harvested each year, and 23% survived three or more seasons. If this relatively low level of ram harvest resulted in major alterations of social behavior, more severe consequences may be expected in areas where a much larger proportion of legal rams is removed during the hunting season (Nichols 1978).

Despite the fact that rams spent much of the hunting season within the Sanctuary (Festa-Bianchet in press), hunter harvest accounted for a minimum of 61% of legal ram deaths. Therefore, protection of rams within the Sanctuary did not result in a major loss of hunting opportunities.

It appears that a combination of protection within the Sanctuary and limits on access to hunting areas has a number of beneficial effects. It limits harvest, likely allowing some rams to grow greater than the minimum legal size, and preventing a more severe alteration of the age structure. Within the Sanctuary, rams are tame and provide good viewing and photographing opportunities, enhanced by the presence of a few exceptionally large individuals. Hunting in the alpine areas west of the Sanctuary provides the serious sheep hunter with a challenging wilderness experience, in contrast to the killing of tame rams within a short distance of the road that takes place east of the Sanctuary.

While there is at present no evidence that rams are altering their normal migration patterns to use the Sanctuary as a refuge from hunters, this possibility merits further investigation. In the absence of excessive harassment from hunters, rams should continue to spend time outside the Sanctuary for at least part of the hunting season. Protection from hunting within easily accessible ranges and limits to motorized access to hunting areas should be considered a valuable and effective tool in the management of mountain sheep.

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QUESTIONS AND ANSWERS

John Emmerich, Wyoming: Marco, what's your post-season ratio of class 3 and 4 rams to ewes?

Marco: Over the past 5 years, the ratio of rams with horns of 3/4 curl or greater to ewes has averaged 0.25, one ram every four ewes. This ratio has ranged 0.20 to 0.32 over the years. If all rams are included, the ratio averages 0.37.

Emmerich: What's the lamb/ewe ratio in that herd, Marco, in the post-rut?

Marco: It's variable. The past year by October, it was down to 0.5 so 50 lambs per 100 ewes. In 1981 it was 0.8, in 1982-84 it averaged close to 70 lambs/100 ewes. So it's very variable.

Emmerich: But it's pretty high on the average?

Marco: It's pretty high if you exclude last year.

Daryll Hebert, BC: Marco, I'm not sure of how often Orval is tracking those cougars, and the preliminary finding is that it appears that cougars are selecting for rams after the rut, and maybe selecting for them as late as January or February.

Marco: He's tracking them quite regularly, but maybe I should explain that there's a cougar study going on in the area, and the person doing it has about 20 cats radiocollared, so I think he's got most of the cats in the area. He finds elk, mule deer and moose kills fairly regularly. When he finds evidence of a kill he goes in and checks it. He had evidence of only one male lamb taken by a cougar, and this study has gone on for 4 years. Last year a ewe was apparently attacked by a cougar and had a large wound in the neck, but those are the only two episodes of cougar predation on sheep that we know of. Cougars live right in the Sanctuary but for some reason won't go after the sheep. Often the sheep are close to the road, and possibly cougars avoid the road.

Hebert: yes, you have a much more varied prey base than we do. The main prey in our study area is sheep with some mule deer. So that may make a difference in terms of cougar predation.

Marco: Could be very different if there were more wolves in the area.