

# Management of bighorn sheep in Alberta is not based on science

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Alberta is home to about 10,000 bighorn sheep. Of these, nearly all the 7,000 or so that are not on provincial lands are subject to sport harvest. There are two kinds of hunting permits: 'non-trophy' and trophy permits. Non-trophy permits are issued by lottery with local quotas. The number of non-trophy permits peaked at over 1,000 in the mid-1980s. Since then between 200 and 350 permits are generally issued annually. If your non-trophy application is drawn, you can take either a ewe or a lamb. As for trophy permits, an unlimited number are available to Alberta residents and an additional 70 to 80 trophy permits are sold to non-resident hunters. Non-residents must purchase the services of a guide.

The provincial sheep population overall has been stable for about 30 years. This stability has been maintained despite some local population declines in the southern part of their distribution and some increases in the north. As elsewhere in North America, sheep hunters in Alberta have been at the forefront of conservation. They have been particularly active in habitat restoration through prescribed burning. They also have played an important role in the issue that poses the greatest threat to bighorn sheep: exotic pneumonia transmitted by domestic sheep, goats, and possibly other livestock. Alberta still has bighorn sheep in nearly all available habitat, possibly because historically the domestic sheep industry mostly stayed away from the distribution of wild sheep, unlike the situation in BC and in many American states.

The management of 'trophy sheep' in Al-

berta is relatively simple. A resident hunter buys a tag and then hunts for a ram whose horns describe 4/5 of a curl. The hunting season generally runs between late August (or early September in the south of the province) and the end of October. With a few tweaks, that management regime has been in place for about 50 years. The problem with this regime is that it selects for small-horned rams. It's time for a change to remove this unhealthy evolutionary effect. Such a change was long discussed, recommended by provincial wildlife biologists, but

denied by elected officials. Here is why the provincial government's decision is wrong.

Trophy sheep harvest is based on horn size and shape. A ram whose horns fit the 'legal' definition can be shot, a ram whose horns are too short cannot be shot. That sets up a selective process, as is evident in all jurisdictions that, unlike Alberta, measure the annual horn increments of harvested rams: those with rapid horn growth early in life get shot at 4-5 years, those shot when 9-10 years of age had slower horn growth early in life. Of course, we do not know about those with



*This photo and the following two photos were taken at Ram Mountain, where there is a temporary hunting ban. A seven-year-old ram with horns that do not meet the legal definition of 4/5-curl (green tag) – he would do very well in a hunted population as his competitors would be shot.*

PHOTO: © M. FESTA-BIANCHET



*Of these three rams, the one on the left is seven years old. Although barely legal in June he would be legal in late August and would probably be shot. The other two would survive and breed in the fall. PHOTO: © M. FESTA-BIANCHET*

really slow growth, because they cannot be harvested and die of old age. There is no question that the hunt is selective: small-horned rams cannot be shot.

A vital question is: does the hunt affect the evolution of sheep in Alberta? Yes, it does. That has been demonstrated at Ram Mountain, with a very conservative analysis of a pedigree up to eight generations deep. Ram horn size is affected by habitat quality, population density and weather. However, it also has a strong genetic component. This is not rocket science: most physical traits in mammals, domestic or wild, have a genetic component, which typically explains 20 to 40 percent of their variability. Ram horns are larger in populations with better habitat, they shrink at high population density, and grow larger if weather is favourable to vegetation growth. Once those environmental factors are accounted for, the horn size of daddy, mummy, and earlier ancestors still matters. If rams with big horns are shot, those with smaller horns will do the breeding, and over time horn size will decrease. Those results are available in international scientific jour-

nals, the kind that wildlife management is supposed to pay attention to.

Intense selective harvest over about seven sheep generations has affected ram horn size in most of the province, as shown by records of harvested rams. Rams shot in the last few years, once age is accounted for, have horns about three centimetres shorter than 35 years ago. The most dramatic change, however, is the proportion of four or five-year old rams in the harvest. To be 'legal' at four or five years of age, a bighorn ram needs to have rapid horn growth in its first few years of life. In the 1980s, rams aged four or five years made up over a quarter of the harvest. Now, this age group constitute less than 10 percent of those shot. The reason for this change is that slower horn growth means that it takes longer for rams to become 'legal'. The change in age structure of the harvest is more revealing than the change in average horn length because rams with small horns are illegal to harvest and therefore do not show up in the harvest records.

Genetic changes in the horn size of breeding rams through intensive trophy hunting

are the best explanation for this decline. There are several reasons to expect that the genetic effect of trophy hunting in bighorn sheep would be stronger than in other species. First, there is their mating pattern: rams with large horns do very well if they survive to rut as 7-year-olds or older, but those same rams are at risk of getting shot by the time they are four or five years old, when they become legal. Including natural mortality and a 40 percent harvest rate, a ram with fast-growing horns that becomes legal as a 5-year-old has a 16 percent chance of surviving to rut at age 7, compared to a 74 percent chance for a ram with slow-growing horns that becomes legal at age eight.

That selective pressure is enormous, the breeding odds are almost 5-to-1 in favour of the ram with smaller horns. The 40 percent harvest rate was observed at Ram Mountain; in the rest of the province that rate is unknown. Trying to underplay this very heavy harvest, some have claimed that the ram harvest is only eight percent, but that includes all adult rams, nearly all of which are illegal to harvest. The harvest rate for 'le-

gal' rams in Alberta is probably somewhere between 30 and 70 percent, and it would be good to know what it is. In the Yukon, about 71 percent of Dall sheep legal rams are harvested either the year they become legal, or the following year – with an unlimited number of permits, the harvest rate in Alberta is likely very high. Two other lines of evidence point to a very high harvest rate. First, the success rate of resident hunters has declined to about four to five percent, presumably because most hunters cannot find a legal ram. Second, nonresident hunters, who hire expert guides, do not kill rams with larger horns than Alberta residents. Large-horned rams are simply unavailable. In other jurisdictions, guided hunters take larger rams, as one would expect.

There are at least two alternative mechanisms that could explain a decline in ram horn size. One is climate change. Ram horns have shrunk while the climate was warming, so perhaps a warmer climate has a negative effect on sheep nutrition, reducing horn growth. Recent analyses from Ram Mountain, however, confirm a trend first detected for Alpine ibex: a warming climate, at least over a few decades, should increase, not decrease, ram horn growth rate. The other alternative is that bighorn sheep population density has increased, leading to a density-dependent decline in ram horn growth. There are two problems with this second interpretation. One, the overall number of sheep in Alberta has been mostly stable over the past three decades. Two, numbers of sheep have increased North of the Brazeau River and that is where ram horn size has not declined.

Why have ram horns not shrunk in the northern part of the species' distribution in Alberta, despite an increase in population size? One possibility is that the selective effect of the hunt is swamped by immigrants from protected areas. Bighorn sheep rams in October-November will prospect for breeding opportunities as far as 60 to 80 km from their winter range. Large-horned rams that are not quite at the top of the hierarchy in protected areas may do well by moving into provincial lands where many of their stron-

ger competitors have been shot. In most of the northern areas, such as the Willmore, there is little harvest of rams in the last week of October. That may be because access in late October is difficult. In the rest of the province, particularly in areas just east of Banff Park, there is a very strong peak in harvest in the last week of October, just before the season ends. The evidence suggests that much of that harvest includes rams coming out of the National Parks and other protected areas, looking for breeding opportunities. Rams shot near the Parks in late October have larger horns and are a bit older than those shot elsewhere in the province or near the Parks in late August. This is consistent with the possibility that the late-season harvest is partly made up of rams from protected areas that are not subject to the selective effects of the trophy hunt. It seems likely that rams that come out of much of Jasper Park survive to breed in provincial lands, possibly swamping the selective effects of the hunt. Many of those that exit Banff, Waterton Lakes, and other protected areas, however, may be shot in late October.

It would be good to have more precise data on ram movements in and out of protected areas, but it currently appears that a substantial proportion of the provincial harvest may involve rams that spend most of their lives in protected areas. That raises

questions about the effectiveness of those protected areas. On average, rams shot in late October are about 20 percent closer to the boundaries of protected areas than rams shot in the first 10 days of the hunting season. It appears that a substantial proportion of the late-season harvest relies on rams originally from 'protected' populations in the National Parks.

Faced with strong, published scientific evidence that the current management selects for smaller horns, Alberta Fish & Wildlife biologists proposed changes to the sheep hunting regulations. Suggested changes included a more restrictive definition of 'legal' ram as a full-curl for areas south of the Brazeau River, and an earlier closing of the hunting seasons. All suggestions were rejected by the Alberta government; it preferred the status quo. There will be no changes in the definition of a 'legal' ram and no changes in the duration of the hunting season. A management regime that selects for small horns and may rely on harvesting rams from protected populations is not based on science and goes against the principles of the 'North American Model' of wildlife management. Research on many aspects of this issue continues, but the decision was political. If changes will come, they will have to be driven by public opinion, particularly the opinions of sheep hunters. 🐾



*M23, legal since the age of six years, is now 10 years old. He fathered at least 16 lambs when between the ages of four and eight (we don't know what he did last year yet but presumably he added to his total). Had he been shot at aged six, all but two of those lambs would likely have been fathered by competitors with smaller horns. The yearling behind him is one of his sons. PHOTO: © M. FESTA-BIANCHET*