

SHEEP MANAGEMENT DILEMMAS

by

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Regrettably, the paper I am writing on sheep management is not yet finished, but what appears below will be part of it. Most biologists at the meeting will be interested in how to manage sheep for public hunting, and only this objective will be considered here, although there are other management goals of equal or greater importance.

There are a number of attributes of sheep biology which run contrary to general principles as taught and expounded in American wildlife schools. These attributes can be disregarded only at the biologist's and mountain sheep's peril.

1. Sheep produce no harvestable surplus of young adults as do quail, rabbits, deer, or moose. The input of young adults (yearlings) into the sheep population equals on the average the mortality of adults, which in stable, un hunted populations appear to be about 10-11 percent. The sheep population biology is geared to long-lived adults, minimum reproduction, and retention of young adults within the population. This is quite different from the population biology of rabbits or deer, in which reproduction and dispersal of young adults is maximized. The population dynamics of mountain sheep appear to be quite similar to that of musk-oxen and caribou which are also highly gregarious ruminants, exploiting climax plant communities.

2. Hunting mortality for sheep is largely additive, not compensatory. Whereas there exists a sound, logical basis for hunting, compensating for natural mortality, in such species as grouse, quail, rabbits and squirrels, and to quite an extent also white-tailed deer and moose, there is no factual basis whatsoever for hunting compensating for natural mortality in rams. One can state quite exactly how much hunting "compensates" for the natural mortality of rams. Assuming a stable population it will be about 4 percent or less for rams younger than eight years. That is, from 100 rams shot of that age class, at least 96 would have continued to live. For rams older than eight years, the picture changes only a little. Given an average maximum mortality of 23 percent, as is apparently the case for the bighorns I am studying now, 77 out of 100 rams of that age class shot by hunters would have continued living. One cannot, for instance, argue in front of sportsmen that the full curl unharvested in fall will die next winter; the chances of being proven a liar are 77 out of 100.

The implications of this second major point are quite important. Rams which survive the hunting season can be expected to die at least at the same rate as those of the same age class in an unhunted population, and not at a reduced rate as would be expected for pheasant, quail, squirrels or rabbits. What this means we can show by a little calculation: we start hunting a previously unhunted population, harvesting by permit full curls only (8 years old or older). There are about 30 percent of the rams full curls and 70 percent rams seven years old or less including long-yearlings. Let us assume we have 100 rams. Of the young rams, 4 percent (i.e. 2.8 or 3 rams) will die; of the full curls, 23 percent (i.e. 6.9 or 7 rams) will die. Total deaths expected equals 10 rams or 10 percent. Assuming 7 percent of the rams, all full curls, are killed by hunters, then 23 full curls are left. The total mortality of full curls will then be not 7, but  $7 + 23/100 = 7 + 3.29$ , which is approximately 10 rams. Total ram mortality will now be not 10 percent, but 13 percent of the pre-hunting population. That is quite an inroad, since only 10 long-yearling rams are added on the average to the population. If the objectives is to maintain the trophy-quality of the pre-hunting population, it cannot be achieved. The mortality of the full curls will always be  $N_{\text{full curls left}} = N_{\text{f.c. pre-hunting}}(1-m_1) \times (1-m_2)$ , where  $m_1$  = hunting mortality and  $m_2$  natural mortality expressed in decimals. The number of full curls will shrink progressively to stabilize at about  $\frac{7}{7+70} \times 100 = 11$  percent, assuming no other complications. These full curls will all be those that just became eight years old, and hence carry horns typical of their age. The number of huntable full curls cannot be increased by removing full curls, but by increasing the number of young rams produced by the females. That is a separate problem.

3. Behaviourally, sheep cannot be equated with small game or even deer. Their home-range patterns are entirely different from those of deer; they are highly gregarious and maintain tradition; and they adjust their response to humans on the basis of past experience with them, and do not have an "innate" response to humans. From personal experience I can attest to the excellent memory of sheep. Thus, sheep running from humans act no more "natural" than those ignoring them or even running to them looking for hand-outs. This adaptability will cause trouble and complications unless respected, as I will indicate later.

In addition, shooting selectively for various sex-age classes will affect the biology of the unhunted sex-age classes as well.

What can one expect to happen if full curls are hunted during a long hunting season with many hunters participating?

1. Rams will withdraw from most of their accustomed areas and desert them in favour of rugged, secluded terrain-- if such is available. If no secluded localities are present, (that is hunters are stalking everywhere the rams turn) desertion of favoured feeding areas is unlikely. If secluded terrain is available, the rams begin to act ecologically atypical, and begin to derive their sustenance from probably second- or third-rate range. This alone would cause trophy-quality and body size of rams to decline.

2. Psychic stress can be expected to appear for the first time. This is enormously costly in food-energy and is highly detrimental to the normal physiological functioning of the animal's body. It takes surprisingly little stress to produce, as agricultural and psychological experiments on sheep and goats have shown. For the present, however, it can only be said that it will be most likely severe only in relatively small, relic populations, while sheep in high quality populations travelling in large bands, are likely to be more forgiving.

3. Hunting will select in favour of nervous, jittery rams that spook at the slightest chance of trouble. This point was raised and argued convincingly by Dr. Chuck Hanson at the Desert Bighorn Council. It implies that nervous, jittery sheep, that easily desert ranges and are inefficient food converters, will be selected for on the whole. In the long run this means a smaller female population, decreased reproduction, and fewer trophy rams for harvest.

4. Removal of full curl rams must affect younger rams in several ways. (a) Normally, full curls guard estrous females and prevent younger rams from guarding. This means, in the presence of full curls, young rams feed and rest, and do not waste energy by guarding non-estrous females. If the full curls are removed, the field is open for the highly active six- and seven-year-olds, which now are permitted to lose their fat resources. Secondly, the overall reduction in rams, coupled with the more intense guarding by the six- and seven-year-old rams, allows young rams to guard non-estrous females. That is grim. For such young rams virtually stop feeding. We can hence expect an increased winter mortality of four- to seven-year-old rams, and a considerably reduced growth of the survivors, (b) Removal of full curls should lead to an over-exploitation of the winter-ranges of females. Normally, full curls move right after the rutting season to different wintering areas from those of the females. They are

accompanied by a segment of the young ram population, while the remainder stays with the ewes at least until mid-March, and then searches out the older rams. Removal of full curls should lead to more young rams remaining with the females, which, in the long run, will lead to smaller female populations and a smaller output of rams, (c) If there are more young rams with the females, particularly in spring, expect an increased harassment of the females. Young rams are more prone to court throughout the year, and are far more rough with the females than old rams. Although I do not know how extensive this would influence the birth weight and hence neonatal survival of the lambs, I would not laugh it off.

There are a few other complications, but these will suffice as examples. The foregoing does read like gloom and doom, but it should not. One can counteract these problems, but not by looking at how it is done with quail, squirrels or deer, which, after all, is what texts on North American game management are based upon.