

LAMB MORTALITY

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Fortunately all of us have one common interest, and that's for the preservation and maintenance of healthy and expanding bighorn sheep herds. The material that Bob Lange and I will present is a problem on Pike's Peak, Colorado. This problem may or may not apply to your area.

Some bighorn sheep herds experience all-age die-offs; others have a low lamb survival, and some have both - other areas have other problems. In Colorado we have both lamb mortality and have had all-age die-offs. We, that is, several personnel of the Colorado Division of Wildlife and personnel of Colorado State University including parasitology, virology, bacterial and pathology, are all working together on this problem of lamb mortality.

The main study area is Pike's Peak. Pike's Peak ranges in altitude from 7,000 to 14,000 feet. Pike's Peak is a range west of Colorado Springs and probably is 250 to 300 square miles in area. Sheep on this range winter and summer on the same area, they do not - or cannot - migrate from the high summer ranges to lower winter ranges.

The history of this herd is rather fuzzy. The population was estimated in 1950 to be about 300+ sheep. Population census, as you know, are at best horrible. But let's use these estimated populations as trends instead of exact numbers. They said there was an all-age die-off in the Pike's Peak, Kenosha and Tarryall herds in 1952-53.

It was said to have started in September 1952 on Pike's Peak. The sheep that were necropsied were said to be in good body flesh, not in a state of malnutrition and the lungs were characterized by a verminous pneumonia. Unfortunately, I do not know any more about the dead animals. An estimated 12 or so animals survived the winter.

Following the die-off, the population steadily increased to an estimated population, by the same biologist, of 300 sheep in 1970. Again I emphasize the difficulty of accurate population census, but the herd did boom following the die-off.

Game biologists noticed a 98 to 99 percent lamb mortality occurring in the summer of 1971. The few lambs seen had a dull yellow, rough hair coat, coughed and lagged behind in the herd.

In the winter of 1972-73, Bob Schmidt captured 75 bighorn sheep on Pike's Peak. The regional biologist told us there were 28 legal rams on the peak; well that winter (trapping for 3 months), we captured 33 legal rams. Again, that is 33 rams, all of which were legal, out of 75 sheep. This winter we trapped 89 sheep and only 4 of the 89 were rams. What happened to the rams, I do not know.

Out of the 75 sheep that we captured in 1972-73, we aged them. Notice we captured only 1 lamb, 0 yearlings, 0 two-year olds and 5 3-year olds.

I realize it is difficult to age ewes over 4 years old, but it is relatively easy to age lambs, yearlings, 2-year olds and rams. So it appears that this lamb mortality has been going on for the past 3 to 4 years. It is also important to notice that this lamb mortality had been going on for 2-1/2 years before it was even observed.

Before we start into the suspected pathogenesis of this lamb mortality, let me tell you some of the habits of the sheep on Pike's Peak. First, the range is in excellent shape; second, several of the ewes in late March of this year, weighed between 165 to 185 pounds and were fat and in extremely good condition. The population now is estimated to be about 100 animals, and about 75 percent of the population is collared.

The sheep have what we call preferred areas. These preferred areas have lots of escape cover and grass. There is a fairly constant number of sheep on these preferred areas, but there is a mixing of these sheep. That is, in a preferred area you find 10 to 15 sheep, but, for example, 4 new sheep will come into this area but 3 will leave, or 6 will come in and 4 will leave, so there is a continual turnover of sheep in these specific preferred areas, although there is a fairly constant number of sheep on each preferred area.

Before we get into the pathogenesis of this lamb mortality, allow me to review with you the life cycle of lungworm of sheep. Adult *Protostrongylus stilesi* live in the parenchyma of the lungs, especially in the posterior dorsal aspect of the diaphragmatic lobes. They deposit eggs, these eggs hatch to stage 1 larvae. These first stage larvae then migrate up the horizontal bronchi, up the tracheae, are coughed up and swallowed, then pass through the alimentary canal and are dropped as feces onto the ground. The first stage larvae on the ground are then ingested by snails and inside the snail develop for 3 to 4 weeks to mature third stage larvae, or infective larvae. Then to complete the life cycle, sheep must eat these snails containing these larvae.

After the snail is eaten, the third stage larvae penetrates the intestinal wall and probably enters the blood stream to go to the lungs. And here they develop to adults and shed eggs again in 30 to 60 days. The main sticker of this life cycle is that some of the third stage larvae do not develop in the lungs but instead stay in a dormant state in somatic tissue of the ewe until pregnancy. During the last half of pregnancy these stored larvae leave these somatic tissue, cross the uterus and infect the fetus. Ok, with a background of these two types of life cycles of *Protostrongylus stilesi*, let's talk about the pathogenesis of this lamb mortality.

An important fact is this lamb mortality could, and possibly does, occur in several of our declining herds in Colorado at a percent of mortality that is from very low - 5 to 10 percent to the extreme on Pike's Peak of 98 to 100 percent mortality. And another important fact is as the population of sheep decreases, and here on Pike's Peak the usable range is the same size, the sheep continually pull themselves into the more highly preferred areas. So you see the sheep remain concentrated on these small areas, thus maintaining a high concentration of lungworms on the range being used. And these preferred areas are not overgrazed.