

A DIE-OFF DUE TO PNEUMONIA IN A SEMI-CAPTIVE HERD  
OF ROCKY MOUNTAIN BIGHORN SHEEP<sup>1</sup>

by

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ABSTRACT

A die-off in a semi-captive herd of 17 Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) is described. Many of the deaths were caused by pneumonia and the course of the disease and gross pathology is described. Some information about the parasitic infection of several sheep involved was known prior to the outbreak. The probable lack of lungworm or poor nutrition as influencing factors is mentioned.

INTRODUCTION

Rocky Mountain bighorn sheep are host to many pathogenic parasites and microorganisms (Honest and Winter 1956, Post 1958, Howe et al 1966, and Becklund and Senger 1967). Verminous pneumonia or the lungworm-pneumonia complex has been reported as responsible for most of the mortalities in bighorn sheep (Hunter and Pillmore 1954, Buechner 1960). However, two small die-offs were investigated by Post (1962) who felt that these mortalities were due to pasteurellosis rather than verminous pneumonia. He also suggested that historic rapid die-offs were indicative of a virulent microorganism rather than the usually slow and debilitating effects characteristic of parasitism. Inadequate and poor quality feed has been mentioned as an important factor predisposing bighorn sheep to disease (Honest and Winter 1955).

The purpose of this paper is to describe a rapid die-off which occurred in a small confined herd of bighorn sheep. The available information indicates that lungworms and inadequate feed were of little or no importance in this die-off.

DIE-OFF DESCRIPTION

In late November and early December 1970, mortalities occurred in a herd of 17 bighorn sheep held in a 60-acre pasture at the Wyoming Game and Fish Commission's Sybille Big Game Research Unit. The pasture is on the north slope of a rugged mountain side. The predominant vegetation consists of western wheatgrass (*Agropyron smithii*), Sandberg bluegrass (*Poa secunda*), Junegrass (*Koeleria cristata*), big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and mountain mahogany (*Cercocarpus montanus*). In addition to natural forage, the

<sup>1</sup>A contribution of Federal Aid in Wildlife Restoration Project, Wyoming FW-3-R.

sheep were supplemented with high quality third cutting alfalfa hay, and pellets consisting of ground corn, ground oats, pure bran, linseed hulls, and molasses. The grain pellets contained 20,000 units of vitamin A per pound.

The herd was composed of a mature ram approximately 8 years old, 2 each 2-year-old rams, 10 mature ewes, and 3 lambs. The mature ram and 4 ewes had been trapped and transported to Sybille as adults in 1964; 3 mature ewes were acquired in the spring of 1969; a 2-year-old ram and a mature ewe were released in September 1970; a 2-year-old ram, a 2-year-old ewe, 2 yearling ewes, and 3 lambs were born within the pasture.

On the morning of November 23, the mature ram was observed to be ill. Breathing was labored, and a rattling sound was audible when he was approached. That same afternoon he was discovered dead and he was necropsied the following day. On the 24th, the 2-year-old ram born at Sybille was observed ill, and on the 25th two mature ewes from the 1965 and 1969 transplants were discovered dead. Neither ewe was suitable for necropsy due to postmortem changes and having been fed on by coyotes. The ill 2-year-old ram was found dead on November 26, and was necropsied on the 27th. During the next 2 weeks sheep with symptoms of pneumonia continued to die, but none suitable for necropsy were located.

Six of the 17 sheep survived. These were the 2-year-old ram and ewe released in September 1970, a lamb born in 1970, a 2-year-old ewe, and 2 other mature ewes, one from the 1969 release and the other from the 1964 release. The lamb was the only surviving animal that had been observed to be ill.

#### PATHOLOGY

At necropsy the mature ram weighed 195 pounds, pelage was good, and body condition was excellent with much stored body fat present. Postmortem drainage of blood tinged fluid from the nostrils was extensive. A few asymmetrical subcutaneous hemorrhages were present. The atlantal and mandibular lymph nodes were swollen and juicy, and the prescapular and axillary nodes were extremely hemorrhagic. The apical lobes of the lungs and ventral portions of the other lobes were very consolidated and undergoing red hepatization. The remaining portions of the lungs were congested and edematous, and there was a large amount of blood and foam in the trachea and bronchi. Although a single nodule about 5 mm in diameter, resembling a lungworm nodule, was located near the dorsal margin at the right diaphragmatic lobe, no lungworms were detected by a careful dissection of the bronchi. There was a weak fibrinous adhesion between the left diaphragmatic lobe and the parietal pleura. The pericardial fluid was red and slightly increased in volume. Superficial cardiac blood vessels were engorged and the heart was soft and flabby. Mediastinal lymph nodes were enlarged and juicy. The kidneys were soft and pulpy, and the splenic pulp was soft and juicy.

A Pasteurella sp. closely resembling P. multocida, a Streptococcus sp. and a Bacillus sp. were isolated from the lungs. The Bacillus, and Staphylococcus epidermidis which was recovered from blood were thought to be contaminants.

Upon necropsy, the two-year-old ram was found to be in good body condition and weighed 125 pounds. Postmortem changes were advanced and only the heart and lungs were examined. There was an increased amount of blood tinged fluid in the pleural cavity and pericardial sac. The heart was soft and flabby. The lungs were extremely consolidated with the primary changes following a ventral distribution. The dorsal portions were congested. No lungworms were detected in the bronchi, but several small nodules were present along the dorsal aspect of the diaphragmatic lobes. A Pasteurella sp. was also isolated from the lungs of this ram.

Pasteurellosis was diagnosed as the cause of death in the two rams which were necropsied. Several other sheep that later died were observed coughing and debilitated in a manner similar to the two rams, but coyotes devoured their remains before they could be necropsied. It is felt that some of the other 9 sheep lost may have been killed outright by coyotes because they were observed healthy on one day, and on the next, portions of their devoured carcass were discovered.

#### DISCUSSION

Inadequate feed was not thought to be involved in this die-off. Range conditions were fair, supplemental feed was provided, and the 2 sheep necropsied were in excellent body condition. Other sheep which were observed before death appeared to also be in good body condition.

Because of previous lungworm studies and incidental parasite examinations, the parasitic burden of some of the sheep involved was known. A fecal sample from the mature ram was examined on July 22, 1969 and found to be free of parasitic larva and ova. On July 5, 1969 the ewes released into the pasture that date were treated with tetramisole, a drug which shows promise as a lungworm control agent in bighorn sheep. Fecal samples collected on July 22 and on August 28, 1969 for some of these treated sheep showed elimination or reduction of lungworms and gastrointestinal nematodes. One of the two ewes found dead on the 25th of November was negative for lungworms on both July 22 and August 28, 1969. Another of the ewes which died during the epizootic was one of the treated sheep. Thus it is known that at least 3 of the sheep which died, the mature ram and 2 ewes, were apparently free from or carrying a low load of lungworms during 1969. Although these fecal examinations were made over a year prior to this pneumonia onset, it is doubtful if these adult sheep could have acquired a sufficient lungworm infection to have been important in producing pneumonia. The two yearling ewes were also checked for parasites as lambs in August 1969, and both were passing moderate numbers of lungworm larvae. One of these sheep died and one survived the die-off.

Provided that lungworms and poor range conditions were not involved, two possible factors which might have initiated this die-off should be mentioned: (1) it is possible that the number of sheep in the pasture (17) had exceeded the number of suitable well sheltered bedding sites within the pasture and that crowding was taking place. This may have facilitated rapid transmission of a pathogen; (2) a second possible suggestion is that coyote harassment and attempted predation was taking place before the die-off started and that nighttime activities of hunting coyotes may have been sufficient stress to initiate pneumonia. There are probably just as many unknown important factors and any of those mentioned or unknown could have been enough to initiate the die-off individually or in combination.

#### LITERATURE CITED

- Becklund, W. W., and C. M. Senger. 1967. Parasites of Ovis canadensis canadensis in Montana, with a check list of the internal and external parasites of the Rocky Mountain bighorn sheep in North America. J. Parasitol. 53(1):157-165.
- Buechner, H. K. 1960. The bighorn sheep in the United States, its past, present, and future. Wildl. Monogr. 4. 174 p.
- Honess, R. F., and K. B. Winter. 1955. Incidence of lungworm parasitism in bighorn sheep. Federal Aid in Fish and Wildlife Restoration, Wyoming Game and Fish Commission, Project No. FW-3-R-2, Work Plan No. 11, Job No. 1:58-61.
- Honess, R. F., and K. B. Winter. 1956. Diseases of Wildlife in Wyoming. Wyo. Game and Fish Comm. Bull. 9. 279 p.
- Howe, D. L., Woods, G. T., and Marquis, G., Infection of bighorn sheep (Ovis canadensis) with myxovirus parainfluenza-3 and other respiratory viruses. Results of serologic tests and culture of nasal swabs and lung tissue. Bull. Wildlife Disease Assoc. 2:34, 1966.
- Hunter, G. N., and R. E. Pillmore. 1954. Hunting as a technique in studying lungworm infestations in bighorn sheep. Trans. N. Amer. Wildl. Conf. 19:117-131.
- Post, G. 1958. Study of pasteurellosis in bighorn sheep. Federal Aid in Fish and Wildlife Restoration, Wyoming Game and Fish Commission, Project No. FW-3-R-5, Work Plan No. 1, Job No. 2W:14-19.
- Post, G. 1962. Pasteurellosis of Rocky Mountain bighorn sheep (Ovis canadensis canadensis). Wildl. Dis. 23:1-14.

DISCUSSION

QUESTION BY CHARLES HIBLER, CSU: What was the weather condition when this outbreak occurred? Did you have a turn of inclement weather?

REPLY BY THORNE: We discussed this and we don't feel it was important. We did have slightly colder weather. It was our first cool spell. It was not a cold spell. We did have one snow. Weather is a possible factor, but we didn't feel that it was that great.

REPLY BY HIBLER: Of the sheep that survived, did you examine these sheep for Pasteurella?

REPLY BY THORNE: No, we didn't. We didn't want to catch them or upset them any more than necessary.

QUESTION BY BILL BRADSHAW, USFS, WYOMING: The western range is short of phosphorous as most stockmen know, and they supplement the feed or put the phosphorous in salt. I wondered if you thought that might help the sheep.

REPLY BY THORNE: I haven't done any work on that. We do normally salt our sheep at Sybille. Colorado has done some work with phosphorous. I think it is something which should be looked into. It could be a factor in some of the die-offs or diseases we have had. Perhaps somebody from Colorado would know more about this than I do.

REPLY BY GEORGE POST, CSU: I'd just like to make a comment on this. This is one of the things I was trying to bring across. They do need to know some of these things like what is the phosphorous requirement of bighorn sheep and we just cannot find out with wild-ranging sheep. We can keep some phosphorous blocks out there and maybe after five years we'll have some inconclusive evidence. We need to be able to hold these animals in captivity to be able to handle them, to be able to say this is the phosphorous requirement.

This pneumonia complex keeps breaking into any studies we attempt. It is a real tough situation.

REPLY BY HIBLER: Tom Thorne is highly qualified to do necropsy work to determine the actual cause of death of these animals. I would like to make a plea to these other states to have highly qualified individuals do postmortem examinations so that a complete and thorough postmortem examination is done. Wyoming, of course, has an individual highly qualified to do that. I think Idaho does too. Some of the rest of us don't, except CSU has a bunch of people if we can get them stirred up to do it.

QUESTION BY MILT FRAN, BSF & W: I'm not disputing your diagnosis of Pasteurellosis. I believe at that time, late October, there was an outbreak of EHD sweeping across North Dakota and into Montana.

REPLY BY THORNE: We had it in Wyoming, too.

REPLY BY FRAN: Was any screening done on this outbreak for viral agents such as closely associated blue-tongue virus?

REPLY BY THORNE: No, there wasn't. That is the point George brought out. We should be checking these sheep for viral agents and as you mentioned, for mycoplasma.

REPLY BY FRAN: Did you see any lesions on the heart that suggested this?

REPLY BY THORNE: No, I didn't. Of course we don't know what the pathology would be in sheep, but I didn't see anything to indicate anything like EHD. Actually, this die-off was about a month later than the EHD die-off. The EHD die-off occurred in extreme northeastern Wyoming but we did have at least one deer brought into Sybille for necropsy in October. You are right. Viruses ought to be checked but they were not in this case.