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PSOROPTIC SCABIES IN DESERT BIGHORN SHEEP (*OVIS CANADENSIS NELSONI*) FROM NORTHWESTERN ARIZONA¹

George W. Welsh² and Thomas D. Bunch³

ABSTRACT: Scabies due to infestation by *Psoroptes ovis* was monitored from 1979 through 1981 in Nelson's desert bighorn sheep in northwestern Arizona. Visual examinations for ear lesions and evaluations of ear scrapings were used to assess the prevalence of mites in sheep that were live-captured or killed during the hunting season. The prevalence of psoroptic scabies in live-captured sheep for the years 1979, 1980, and 1981, was 25%, 25%, and 0%, respectively, and was higher in rams (1979, 65%; 1980, 100%) than in ewes (1979, 11%; 1980, 0%). The severity of ear lesions was also greater in the males. The prevalence in harvested rams was 23%, 44%, and 7%, respectively, for the years 1979-1981. The severity of the ear lesions was highest in 1980. Lesions were confined to the ears. An aerial census of bighorns in the Black Mountains during May of 1981 showed a 38% decrease in total observations from the previous year and a drop in the ewe/lamb ratio from 0.52 in 1980 to 0.29 ($P \leq 0.01$) in 1981. In the Lake Mead area, there was a population census decline of 33% in 1981 and a non-significant decline in the ewe/lamb ratio from 0.46 to 0.40. The population decline in 1981 and the increased prevalence and severity of psoroptic scabies in the 1980 survey in both areas were believed to be related to the high bighorn population densities in 1980 and the prevailing drought.

INTRODUCTION

Scabies epizootics have been observed to occur in bighorn sheep for more than 120 years (Hansen, 1967; Carter, 1968; Decker, 1970; Lange et al., 1980). On many ranges, these epizootics have been associated with rapid population declines and extirpation (Packard, 1946; Lange et al., 1980), whereas on others they have not (Carter, 1968; Decker, 1970). Lange et al. (1980) suggested that the recent psoroptic scabies epizootic in the San Andres National Wildlife Refuge in southern New Mexico may have resulted in a population decline of more than 50%. Although they found few specimens for necropsy, the remains of a young ewe that had been dead less than 2 wk had the most severe lesions seen to that date. Their alternative hypothesis for the decline was mass emigration of the sheep from their native range.

As a result of the decline in the San Andres' population, the Arizona Fish and Game Department undertook a study to determine

whether their populations of desert bighorns were infested with *P. ovis*. In 1979, *P. ovis* was identified in Nelson's desert bighorn sheep from the Black Mountains and Lake Mead area of northwestern Arizona (De Vos et al., 1980). This population has been monitored for scabies during the past 3 yr and the results of that survey are presented herein.

MATERIALS AND METHODS

Nelson's desert bighorn sheep inhabiting Arizona's Black Mountains were captured for psoroptic scabies evaluation by chemical immobilization with M99 ("Etorphine," D&M Pharmaceuticals Inc., Rockville, Maryland 21868, USA). Ear scrapings from hunter-killed sheep in the Lake Mead area were taken from the external auditory meatus to the distal end on both ears of each animal sampled. These scrapings were examined for mites by staff at either the USDA Livestock Insects Laboratory, U.S. Department of Agriculture, Kerrville, Texas, or the Department of Entomology, University of Arizona, Tucson. Taxonomic classification of the mite was determined by Dr. W. P. Meleney, USDA Livestock Insects Laboratory. The ears of sheep with dermatitis of exfoliated epidermis were given a score of 1-10 depending on the extensiveness of the lesion. A score of 1 indicated a lesion with little exfoliation, whereas a score of 10 represented extreme exfoliation with crusted serous exudate that contained hairs loosened from the follicles, and blockage of the meatus with hard waxy material. Aerial censuses by helicopter during 1979-1981 established bighorn sheep population structure and numbers. Chi-square analysis was used to compare ewe/lamb ratios. Statistical analysis was not performed on total numbers since there were no replications on annual counts. Representative specimens of mites have been deposited in the Bishop Museum, Honolulu, Hawaii (Accession #1983. 273).

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RESULTS

During November of 1979, three of 12 live-captured sheep (1 of 9 ewes and 2 of 3 rams) from the Black Mountains had psoroptic scabies dermatitis. The dermatitis was confined to the inner surface of the ears and was more extensive in the rams. During November of 1980, psoroptic scabies dermatitis was observed in two of eight captured sheep and only in rams. The dermatitis was extensive and the external surface of the ears of one of the rams was void of hair and had reddish, serum-crusts epidermis. In November and December of 1981, 51 sheep were captured and none had psoroptic scabies dermatitis. At no time were lesions observed anywhere except on the ears.

The prevalence of psoroptic scabies dermatitis in hunter-killed rams in 1979 through 1981 was 25%, 50%, and 12% for the Black Mountains and 20%, 37%, and 0% for the Lake Mead areas, respectively. The severity of the dermatitis was notably greater during 1980, with five of eight rams having an infestation rated 10, two as 5 and one as 1. In 1979, only one of three was rated as 10, and the other two as 2. Mites were identified as *Psoroptes ovis*.

Population structures and numbers for 1979 through 1982 are compared in Table 1. Total numbers peaked in 1980 in the Black Mountains and then declined by 38% in 1981. A decline of 33% was also noted in the Lake Mead area between 1980 and 1981. The ewe/lamb ratio for 1981 in the Black Mountains decreased from 0.52 in 1980 to 0.29 ($P \leq 0.01$). A non-significant decrease from 0.46 to 0.40 in the ewe/lamb ratio occurred in the Lake Mead area during the same period of time.

DISCUSSION

Nelson's desert bighorn sheep inhabiting the Black Mountains and Lake Mead area of northwestern Arizona were first observed with *P. ovis* in November of 1979 (De vos et al., 1980). *Psoroptes ovis* may have been present in this population prior to 1979; however, there were no attempts to examine them for scabies until attention was drawn to the serious implications of the epizootic that had occurred in the San Andres National Wildlife Refuge in southern New Mexico in 1978 (Lange et al., 1980).

The prevalence of psoroptic scabies peaked during 1980 in the Black Mountains and Lake Mead area and then declined to a near zero

TABLE 1. Population census of Nelson's desert bighorn sheep in the Black Mountains and Lake Mead areas of northwestern Arizona from 1979 to 1981.

Area	Year*	Rams	Ewes	Lambs	Ewe/lamb ratio	Total numbers
Black Mtns.	1979	92	211	87	0.41	390
	1980	117	260	134	0.52 ^b	511
	1981	79	182	52	0.29 ^c	313
Lake Mead	1979	32	151	80	0.53	263
	1980	87	235	109	0.46	431
	1981	60	164	65	0.40	289

* All censuses were taken during May of each year.

^b Significant at $P \leq 0.05$.

^c Significant at $P \leq 0.01$.

observance level in 1981. Reasons for the decline of infested sheep are not fully understood. Surveys were conducted by the same biologists and any experimental error should have been minimized. One possibility, however, is that sheep with serious scabies infestations in the fall of 1980 died prior to the 1981 survey. There is some evidence to support this supposition in both survey areas since a decline occurred in total numbers of sheep and in the ewe/lamb ratios in the Black Mountains. Even if scabies entered a latent period following the 1980 survey, animals that had severe encrustations of the ear in 1980 would most likely still have some epidermal exfoliation in 1981. Of 65 sheep examined in 1981, only one ram had a minor infestation. During the 1980 survey, nine of 26 sheep were infested with scabies.

Another possible contributing factor to the population decline and occurrence of scabies was the prevailing drought that commenced in northwestern Arizona in April of 1979, and did not subside until March of 1981. Sheep that were live-captured in 1980 were in much poorer body condition than either 1979 or 1981. Sheep with severe scabies infestations may have been affected more adversely by the drought and therefore were eliminated from the population. Predation may also have been involved, however, there was no evidence for this in the study areas.

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