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Larry M. Shults  
*University of Wyoming, Laramie*

Nancy L. Stanton  
*University of Wyoming, Laramie*

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## HELMINTH PARASITES OF THE WYOMING GROUND SQUIRREL, *SPERMOPHILUS ELEGANS* KENNICOTT, 1863

Larry M. Shults<sup>1</sup> and Nancy L. Stanton<sup>1</sup>

ABSTRACT.—Helminth parasites of the Wyoming ground squirrel, *Spermophilus elegans* Kennicott, 1863, were surveyed from two environmentally different habitats within Wyoming. A total of four helminth species were identified. Three helminth species were found in 419 hosts collected in a mesic habitat including one species of adult cestode, *Hymenolepis citelli*, and two species of nematodes, *Citellinema bifurcatum* and *Syphacia citelli*. Only larval cestodes (*Taenia taxidiensis*) were found infecting 335 Wyoming ground squirrels collected from a xeric habitat.

The helminth parasites of ground squirrels belonging to the genus *Spermophilus* have not been investigated throughout much of their range. Such studies as those of Jenkins and Grundmann (1973), Babero (1973), and McGee (1980) examined helminths from these hosts in Utah, Nevada, and Saskatchewan, respectively.

In conjunction with studies on the coccidian parasites of the Wyoming ground squirrel, *Spermophilus elegans* Kennicott, 1863, each host was also examined for the presence of helminths. Until 1984, *S. elegans* was classified as a subspecies of *S. richardsoni*; thus, this is the first report of helminths from *S. elegans*.

The ground squirrels we examined were collected from two study areas in Wyoming by snap trapping and shooting. The first area is a sprinkler-irrigated alfalfa and brome grass field (105°33'W, 41°12'N) located approximately 18 km south of Laramie, Wyoming, at an elevation of about 2,250 m with annual precipitation of 26 cm. The second study area of desert shrub-steppe (107°45'W, 41°17'N) is approximately 33 km north of Baggs, Wyoming, at an elevation of about 1,950 m with an annual precipitation of 15 cm. Approximately 240 km separate the two study sites. We hypothesized that a greater number of squirrels would be infected with helminths in the more mesic irrigated alfalfa and that different helminth species would be found in the two host populations because of differing climatic moisture conditions.

### MATERIALS AND METHODS

Each ground squirrel collected from 1983 to 1985 was weighed, sexed, and individually bagged for shipment to the laboratory in Laramie where the animals were necropsied. The small intestine, caecum, and large intestine were opened in containers of tap water. After the contents of the digestive tract were stripped into their respective containers, the water was decanted, and the remaining sediment was examined for the presence of helminths using a dissecting microscope.

Recovered cestodes were relaxed in tap water containing several drops of pentobarbital sodium, fixed in hot 10% formalin, and stained in Semichon's acetocarmine. Following staining, representative specimens were cleared in terpeneol, washed in xylene, and mounted permanently in Permount. Nematodes were fixed using hot 70% ethyl alcohol, cleared in 70% ethyl alcohol + 5% glycerine, and mounted permanently in glycerine jelly. Scolices from metacestodes were mounted in Hoyer's solution. Representative specimens have been deposited in the National Parasite Collection, Agricultural Research Service, Beltsville, Maryland (USNM Helm. Coll. No. ).

### RESULTS AND DISCUSSION

From the 419 ground squirrels examined from the irrigated field, two species of nematodes and one species of cestode were found. From the 335 squirrels collected from the shrub-steppe, no adult helminths were

<sup>1</sup>Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming 82071.

TABLE 1. The occurrence of helminths in two populations of the Wyoming ground squirrel.

	Number of hosts positive	
	Mesic (irrigated) n = 419	Xeric (desert) n = 335
CESTODES		
<i>Hymenolepis citelli</i>	3 (0.7%)	0
<i>Taenia taxidiensis</i>	0	3 (0.9%)
NEMATODES		
<i>Citellinema bifurcatum</i>	88 (21.0%)	0
<i>Csyphacia citelli</i>	77 (18.4%)	0

found, and only one species of metacestode was present (Table 1).

### Cestodes

*Hymenolepis citelli* McLeod, 1933 (U.S. Helminthol. Coll. No. 79052). Cestodes of this species were found in 3 of 419 (0.7%) squirrels collected in the irrigated study site. This low incidence of infection is considerably below those reported from Utah in *S. variegatus* (3%), *S. lateralis* (2%), and *Ammospermophilus leucurus* (6%) (Jenkins and Grundmann 1973). McGee (1980) found 6 of 209 *S. richardsoni* (3%), 8 of 31 *S. tridecemlineatus* (26%), and 7 of 46 *S. franklini* (15%) infected with this cestode. No hosts from the desert study area were infected with this helminth. It is possible that the irrigated field provided a more suitable environment for the invertebrate intermediate host of this cestode.

*Taenia taxidiensis* Skinker, 1935 (U.S. Helminthol. Coll. No. 79051). Metacestodes of this species were found in 3 hosts from the desert study site (0.9%). Jenkins and Grundmann (1973) and McGee (1980) reported 2% of 154 *S. variegatus* and 2% of 46 *S. franklini* to be infected with this metacestode in Utah and Saskatchewan, respectively. No metacestodes of this species were found in hosts collected in the irrigated study area although badgers, *Taxidea taxus*, the definitive host for this helminth, were frequently encountered on the study area and were known to harbor adults of this species.

### Nematodes

*Citellinema bifurcatum* Hall, 1916 (U.S. Helminthol. Coll. No. 79050). Nematodes of

this species were found in the small intestine of 88 of 419 (21%) hosts collected in the irrigated study area. No individuals from the desert were infected. This level of infection is comparable to values reported by Jenkins and Grundmann (1973) and McGee (1980). This nematode appears to be a widespread helminth as it has been reported from six species of *Spermophilus* as well as *Tamiasciurus hudsonicus* by the above two authors.

*Syphacia citelli* Tiner & Rausch, 1950 (U.S. Helminthol. Coll. No. 79049). This caecal nematode was found in 77 of 419 squirrels (18%) collected in the irrigated habitat. As with the previous species, no squirrels were found to be infected with *S. citelli* in the desert. This species was found in 2 of 209 *S. richardsoni* (1%) examined by McGee in Saskatchewan but was found in large numbers of *S. variegatus*, *S. armatus*, and *S. beldingi* (66%, 63%, 8% respectively) in Utah (Jenkins and Grundmann 1973).

### CONCLUSIONS

The presence of both adult cestodes and nematodes in the irrigated habitat and the absence of the same species from hosts collected in the more xeric habitat indicate that moisture may be a factor in furthering the life cycle of helminths of ground squirrels as it is for other helminths (Soulsby 1977). However, Jenkins and Grundmann (1973) found various species of ground squirrels from arid or xeric habitats infected with the same species of helminths that we found only in the mesic habitat.

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