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Arthropod and Helminth Parasites from the Plains Pocket Gopher, *Geomys bursarius bursarius* from the Hosts' Northern Boundary Range in Minnesota

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ABSTRACT: As part of a continuing and more general study of the diversity of parasites from subterranean mammals in central North America, individuals of the Plains Pocket Gopher, *Geomys bursarius bursarius*, were collected from 7 localities in northwestern Minnesota from September 1991 through October 1996. Arthropods collected included the fleas, *Opisocrostis bruneri* (4 of 124, 3.2%), *Foxella ignota ignota* (85 of 124, 68.5%); the chewing louse, *Geomydoecus geomydis geomydis* from 98 of 124 (79%), and larvae of the tick, *Dermacentor variabilis* (1 of 124, 0.8%). Nematodes found included *Physaloptera limbata* (2 of 118 gophers, 1.7%), *Capillaria americana* (4 of 118, 3.4%), and *Ransomus rodentorum* (31 of 118, 26.3%). Cestodes recovered included *Anoplocephaloides infrequens* (12 of 136 gophers, 8.8%), *Anoplocephaloides variabilis* (19 of 136, 14%), *Andrya macrocephala* (20 of 136, 14.7%), and *Hymenolepis weldensis* from 12 of 136, 8.8%. The acanthocephalan, *Moniliformis clarki* was found in 1 of 118 gophers (0.8%). No parasites were found in the cheek pouches, thoracic, or peritoneal cavities.

Pocket gophers (Geomyidae), primarily southern Nearctic and extreme northern Neotropical in distribution, are subterranean mammals that only infrequently leave their burrows (Hall, 1981). The Plains Pocket Gopher, *Geomys bursarius* (Shaw) complex, which consists of about 21 subspecies, occurs in the midwestern and southern United States from Texas to southern Manitoba (Canada), and from Illinois to Wyoming and New Mexico (Hall, 1981).

Few data exist concerning the parasites of the subspecies, *Geomys bursarius bursarius*, which occupies Minnesota near the northern limit of its range (records also being from southern Manitoba), but searching in marginal localities for this species by R. L. Rausch (pers. comm. to S.L.G.) revealed possible local extirpation of this species. From collections made in Minnesota, Douthitt (1915) described the cestodes, *Andrya macrocephala*, *Anoplocephaloides infrequens*, and *Anoplocephaloides variabilis*, and Timm and Price (1980) collected *Geomydoecus geomydis*.

Studies of the arthropods and helminths of other subspecies

of *G. bursarius* report cestodes and nematodes from Oklahoma (Burnham, 1953); *Hymenolepis* from the midwestern states (Douthitt, 1915); *Hymenolepis* spp. from Colorado (Gardner and Schmidt, 1988); *Foxella* from North Dakota (Larson, 1997); *Geomydoecus*, *Foxella*, and Acari from Colorado (Miller and Ward, 1960); *Geomydoecus* and *Foxella* from South Dakota (Rissky, 1962); *Geomydoecus* and Acari from Illinois and Missouri (Spicka, 1981); *Geomydoecus* from throughout the host's range (Timm and Price, 1980); *Geomydoecus*, *Foxella*, and Acari from Indiana (Tuszynski and Whitaker, 1971); and *Andrya*, *Anoplocephaloides*, and Nemata from Kansas (Ubelaker and Downhower, 1965).

We examined 144 individuals of *G. b. bursarius* for the presence of both endo- and ectometazoan parasites collected from 7 localities in Minnesota. We found 2 species of fleas, 1 species of lice, 1 species of tick, 3 species of nematodes, 4 species of cestodes, and 1 species of Acanthocephala. Seven new host and 6 new locality records are reported (Table I).

Gophers were trapped using Victor Macabee gopher traps, placed in plastic bags, cooled on ice, and taken to the laboratory. Traps were checked every few minutes and gophers removed as soon as they were captured. Ectoparasites were brushed from the fur with a fine brass brush into an enamel-coated tray and preserved in 70% ethanol. Cheek pouches and cavities of the thorax and abdomen were examined for parasites. The contents of the stomachs, small intestines, large intestines, and cecae were separately washed over a 100-mesh screen, the screenings of which were examined for helminths in a petri dish using a dissecting microscope.

Cestodes found were relaxed in ice water and, after death, were immediately fixed in hot buffered formalin. Other helminths were fixed directly in buffered formalin. Standard techniques of dehydrating, clearing, staining, and mounting of parasites were used (Dailey, 1996). Voucher specimens have been

TABLE I. Prevalence (%) and mean intensity (range) of parasites found in the plains pocket gopher from 7 localities in Minnesota.

Parasite	n* (%)	x (range)	County locality†	Location in host
Siphonaptera				
<i>Opisocrostitis bruneri</i> ‡	4/124 (3.2)	2 (0–3)	5, 6	Fur
<i>Foxella ignota ignota</i> §	85/124 (68.5)	4.5 (0–18)	2, 3, 4, 5, 6, 7	Fur
Mallophaga				
<i>Geomydoecus geomydis geomydis</i>	98/124 (79.0)	31.4 (0–504)	1, 2, 3, 4, 5, 6, 7	Fur
Ixodida				
<i>Dermacentor variabilis</i> ‡	1/124 (0.8)	1 (0–1)	1	Fur
Nemata				
<i>Physaloptera limbata</i> ‡§	2/118 (1.7)	4 (0–7)	1	Stomach
<i>Capillaria americana</i> ‡§	4/118 (3.4)	2.5 (0–4)	6	Small intestine
<i>Ransomus rodentorum</i> ‡§	31/118 (26.3)	4.8 (0–17)	1, 3, 4, 5, 6, 7	Large intestine, cecum
Cestoda				
<i>Anoplocephaloides infrequens</i>	12/136 (8.8)	1.4 (0–3)	2, 3, 5	Small intestine
<i>Anoplocephaloides variabilis</i>	19/136 (14.0)	3.7 (0–20)	1, 2, 3, 5	Small intestine
<i>Andrya macrocephala</i>	20/136 (14.7)	1.3 (0–3)	1, 2, 3, 5, 6	Small intestine
<i>Hymenolepis weldensis</i> ‡§	12/136 (8.8)	3.3 (0–13)	1, 4, 5, 6, 7	Small intestine
Acanthocephala				
<i>Moniliformis clarki</i> ‡§	1/118 (0.8)	1 (0–1)	1	Small intestine

* Number infected/number examined.

† 1 = Kittson, 2 = Roseau, 3 = Polk, 4 = Beltrami, 5 = Clay, 6 = Becker, 7 = Big Stone.

‡ New host record.

§ New state or geographic record.

deposited in the Harold W. Manter Laboratory of Parasitology (HWML), University of Nebraska–Lincoln: *Opisocrostitis bruneri* (HWML14802–14803), *Foxella ignota ignota* (HWML14804–14812), *Geomydoecus geomydis geomydis* (HWML14813–14824), *Physaloptera limbata* (HWML14931), *Capillaria americana* (HWML14930), *Ransomus rodentorum* (HWML14922–14929), *Anoplocephaloides infrequens* (HWML14789–14792), *A. variabilis* (HWML14787–14788), *Andrya macrocephala* (HWML14798–14801), *Hymenolepis weldensis* (HWML14793–14795), and *Moniliformis clarki* (HWML14948). Specimens of *Dermacentor variabilis* (26.1X.1966) have been deposited with the Institute of Arthropodology and Parasitology, Statesboro, Georgia.

Siphonaptera (fleas) were represented by the genera *Opisocrostitis* and *Foxella*. Species of *Opisocrostitis* (syn. *Oropsylla*) are common on ground squirrels (*Spermophilus* spp.) and prairie dogs (*Cynomys* spp.) (Hubbard, 1968). The species *Oropsylla bruneri*, occurring from Michigan and Indiana westward into eastern Montana, is found on species of *Spermophilus* and its ecological associates and inquilines including the Northern Pocket Gopher, *Thomomys talpoides* (Larson, 1997). This is the first record of *O. bruneri* from gophers, with this species infesting 4 (3.2%) of the gophers examined (Table I).

The Pocket Gopher Flea, *F. ignota*, currently with 11 subspecies, is widespread in northern North America, where it occurs on various rodents (Hubbard, 1968; Larson, 1997). *Foxella i. ignota* has been reported to occur on *G. b. bursarius* from the Rocky Mountains east to the Mississippi River. This flea has also been reported from *T. talpoides* in eastern North Dakota (Larson, 1997). Rissky (1962) recovered it from 50 (26%) of *G. bursarius* examined in in South Dakota. *Foxella i. ignota*

occurred on 85 (68.5%) of the gophers we collected and represents a new state record.

Timm and Price (1980), in their extensive study of chewing lice of the order Mallophaga from the 23 described subspecies of *G. bursarius*, list 15 species and subspecies of *Geomydoecus* exclusively from this host. *Geomydoecus g. geomydis* is the only subspecies of chewing louse occurring on *G. b. bursarius* from Kansas northward (Price and Emerson, 1971). Ninety-eight (79%) of the gophers examined were infested with this louse (Table I), representing a new host record.

The tick, *D. variabilis* is abundant in eastern North America, westward to the Mississippi basin, with several disjunct populations occurring in southern Canada and the midwestern and western United States including limited records from the western and eastern borders of Minnesota (Sonenshine, 1979). Larva feed predominantly on *Peromyscus*, *Clethrionomys*, and *Microtus* (Atwood and Sonenshine, 1967; Burachynsky and Galloway, 1985). Miller and Ward (1960) reported 1 larva from *Thomomys bottae* (Southern Pocket Gopher) in Colorado. In our study, 1 larva was collected from 1 gopher (0.8%) (Table I). These low levels of infestation suggest that larval *D. variabilis* are rare ecological associates of gophers.

Nematodes of the genera *Physaloptera*, *Capillaria*, and *Ransomus* were found in this study (Table I). *Physaloptera limbata* occurred in 2 (1.7%) of the gophers collected, a new host and state record. This nematode was reported by Leidy (1856) from the stomach of *Scalops canadensis* (syn. *Scalopus aquaticus*) in Pennsylvania; from *S. aquaticus* in Wisconsin, Missouri, Indiana, Ohio, Kansas, and Iowa; from *Parascalops breweri* in Maryland, Vermont, and New Hampshire; and from *Blarina brevicauda* in Illinois and Wisconsin (Morgan, 1946).

Capillaria americana was reported from the intestine of *Glaucomys volans* (type host), *Sciurus carolinensis*, *Peromyscus maniculatus*, and *Peromyscus leucopus* from Illinois (type locality), Ohio, and Wisconsin; from 5 (22%) of *Dipodomys ordii* in Utah (Frandsen and Grundman, 1961); and from *Tamiasciurus hudsonicus*, *Neotoma magister*, *P. leucopus*, and *Clethrionomys gapperi* in Maryland (Lichtenfels and Haley, 1968). Four (3.4%) of the gophers examined were infected (Table I), representing new host and locality records.

The rodent hookworm, *Ransomus rodentorum* was found in the cecae and large intestines of 31 (26.3%) of the gophers examined (Table I), representing a new host and distribution record. This gopher-specific nematode was reported by Hall (1916) from *T. talpoides* (type host) in Colorado; Frandsen and Grundman (1961) from both *T. talpoides* (46%) and *Thomomys umbrinus* (0.04%) in Utah; Todd et al. (1971) from 78% of *T. talpoides* examined in Wyoming; Jasmer (1980) from *T. bottae* in northern California; and by Gardner (1985) from *Thomomys bulbivorus* (11%) in the Willamette Valley of Oregon (Gardner, 1985).

Four species of cestodes representing the genera *Anoplocephaloides*, *Andrya*, and *Hymenolepis* occurred in the intestines of 63 (46.3%) of the gophers. *Anoplocephaloides infrequens* Douthitt, 1915 was recovered from the intestine of 12 (8.8%) of the animals examined (Table I). This cestode was reported by Douthitt (1915) from *G. b. bursarius* (type host) in Minnesota and Manitoba, Canada; Rausch (1976) from *G. b. bursarius* in Minnesota; Ubelaker and Downhower (1965) from 6 (50%) of *G. b. bursarius* in Kansas; Todd et al. (1971) from 7 (15%) of *T. talpoides* in Wyoming; Frandsen and Grundmann (1961) from *T. talpoides* in Wyoming; and Hansen (1950) from 9 (17%) of *Microtus ochrogaster* in Nebraska. Nineteen (14%) of the gophers examined harbored *A. variabilis* (Table I). This cestode was reported by Douthitt (1915) from the intestine of *G. b. bursarius* (type host) from Minnesota, North Dakota, Manitoba, and Illinois; Rausch (1976) from 5 (31%) of *T. talpoides* in Saskatchewan and 1 (17%) in Manitoba; Frandsen and Grundmann (1961) from *T. talpoides* in Utah; Todd et al. (1971) from 18 (38%) in *T. talpoides* from Wyoming; and Lubinsky (1957) from *T. talpoides* from Alberta. *Andrya macrocephala* Douthitt, 1915 was found in 20 (14.7%) of the gophers examined (Table I). Douthitt (1915) reported this cestode from *G. b. bursarius* (type host) from Minnesota; Rausch and Schiller (1949) from *Thomomys talpoides tenellus* in Wyoming, from *Sigmodon hispidus* in North Carolina, from *Microtus* sp. from Ohio, Michigan, Wisconsin, Manitoba, Wyoming, Illinois, Nebraska, Washington, and in *Ondatra* from Ohio; Hansen (1950) from 5 (100%) of *G. bursarius* from Nebraska; and Lubinsky (1957) in *Microtus*, *Pedomys*, and *Clethrionomys* from Alberta. The cestode, *H. weldensis* Gardner and Schmidt, 1988 was recovered from 12 (8.8%) of the gophers examined (Table I), a new host subspecies and state geographic record. This cestode was reported by Gardner and Schmidt (1988) from 3% of *Geomys bursarius lutescens* (type host) from Colorado.

Moniliformis clarki (phylum Acanthocephala) was recovered from the small intestine of 1 (0.8%) of the animals examined (Table I). This species was first described by Ward (1917) from squirrels. Van Cleave (1953) lists records of various mammalian host species including *Geomys bursarius illionensis* from Illinois; Erickson (1938) recovered *Moniliformis* sp. (consid-

ered *Moniliformis clarki* by VanCleave, 1953) from *P. maniculatus* in Minnesota; Rausch and Tiner (1948) (*M. clarki*?) from *Eutamias* in Minnesota; McLeod (1933) from *Citellus* in Manitoba; Fish (1972) from *Microtus* (19%) in Indiana; Chandler (1947) from *Sciurus* and *Glaucomys* in Florida; Pfaffenberger et al. (1985) from *Onychomys* in New Mexico; and Frandsen and Grundmann (1961) from 1 (0.03%) of *Thomomys umbrinus stansburyi* and 4 (0.01%) of *Peromyscus* in Utah.

No parasites were noted or recovered from the cheek pouches, thoracic, pleural, or abdominal cavities of the gophers that were examined.

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