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Research Note

Hymenolepis horrida (Cestoda: Hymenolepididae) and *Catenotaenia peromysci* (Cestoda: Anoplocephalidae) in Voles from the Canadian Rockies

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ABSTRACT: Cestodes from *Clethrionomys gapperi* (n = 34) and *Microtus longicaudus* (n = 8) from Kootenay National Park, British Columbia, Canada are reported. Two species of cestodes, *Hymenolepis horrida (sensu lato)* and *Catenotaenia peromysci*, were found in *Clethrionomys gapperi*, and 1 species of cestode, *H. horrida*, was found in *Microtus longicaudus*. *Clethrionomys gapperi* represents a new host record for *C. peromysci*. The Canadian Rockies is a new locality record for both cestode species.

KEY WORDS: *Clethrionomys gapperi*, *Microtus longicaudus*, *Hymenolepis horrida*, *Catenotaenia peromysci*, red-backed vole, long-tailed vole, cestodes, boreal forest, biodiversity.

The red-backed vole (*Clethrionomys gapperi*) occurs transcontinentally through Canada, and its northwestern distribution overlaps with that of *Clethrionomys rutilus*. It also occurs in western North America from the Rocky Mountains south to southwestern Arizona and New Mexico, and in the east from the Appalachian Mountains south into northern Georgia. *Clethrionomys gapperi* is an omnivorous, opportunistic feeder inhabiting mesic environments in coniferous, deciduous, and mixed forests (Merritt, 1981). The long-tailed vole (*Microtus longicaudus*) occurs throughout most of the western United States and Canada, with its geographic range extending from New Mexico and Arizona to as far north as southeastern Alaska. *Microtus longicaudus* is primarily herbivorous and occurs in a wide variety of habitats, including coniferous and hardwood forests, meadows, and riparian areas (Smolen and Keller, 1987). Both species occur in suitable habitat in the Canadian Rockies.

Thirty-four specimens of *C. gapperi* and 8 specimens of *M. longicaudus* were collected from July 20 to August 23, 2005, at Kootenay National Park, British Columbia, Canada (50°68′N, 115°93′W). They were live-trapped with Longworth traps baited with sunflower seeds. Captured animals were transported alive to the laboratory at the Kananaskis Field Station (University of Calgary) where they were euthanized by CO_2 inhalation less than 4 hr after capture and examined for parasites. The lungs, liver, stomach, small intestine, cecum, large intestine, and bladder were examined for cestodes. Cestodes were relaxed in fresh water and fixed in 70% ethanol. For identification, cestodes were stained with Semichon's acetic-carmine solution, dehydrated in ethanol, cleared in terpineol or xylene, and mounted in Damar Gum.

Seventeen specimens of *Hymenolepis horrida (sensu lato)* and 2 specimens of *Catenotaenia peromysci* were found in *C. gapperi*. Fourteen specimens of *H. horrida* were found in *M. longicaudus*. Voucher specimens of parasites were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), Lincoln, Nebraska.

Clethrionomys gapperi

Thirty-four red-backed voles (21 males, 13 females; mean body mass = 21.4 g) were collected from July 20 to August 23, 2005, at Kootenay National Park, British Columbia, Canada (Nearctic biogeographic region).

Hymenolepis horrida (Linstow, 1901) Lühe, 1910

Prevalence, mean intensity, and range: Hosts infected, 9 of 34 (26%, 1.9 ± 0.51; 1–5).

Site of infection: Small intestine.

Other reported hosts: Apodemus agrarius (Shimalov, 2002), *Arvicola terrestris* (Feliu et al., 1997), *Chionomys nivalis* (Feliu et al., 1997), *Clethrionomys bedfordiae* (Asakawa, 1993; Sakata et al., 2001), *C. gapperi* (Schiller, 1952a, b; Kinsella, 1967), *C. glareolus* (Feliu et al., 1997), *C. rutilus* (Rausch, 1952; Schiller, 1952a; Asakawa, 1993), *C. wrangeli* (Rausch,

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1952; Schiller, 1952b), *Dicrostonyx groenlandicus* (Rausch, 1950; Kuns and Rausch, 1950; Rausch, 1952), *Eothenomys smithii* (Asakawa et al., 1992), *Lemmus amurensis* (Revin, 1983), *L. bungei* (Haukisalmi and Henttonen, 2001), *L. sibiricus* (Luzhkov, 1964; Gubanov and Fedorov, 1970; Shahmatova and Yudina, 1989; Yushkov, 1995; Haukisalmi and Henttonen, 2001), *L. trimucronatus* (Rausch, 1950, 1952; Schiller, 1952b; Haukisalmi and Henttonen, 2001), *Meriones tristrami* (Schmidt and Wertheim, 1988), *Microtus arvalis* (Feliu et al., 1997), *Microtus chrotorrhinus* (Schiller, 1952b), *Microtus longicaudus* (Rausch, 1952; Schiller, 1952b; Kinsella 1967), *Microtus miurus* (Rausch, 1952; Schiller, 1952b; Haukisalmi et al., 1995), *Microtus montanus* (Kuns and Rausch, 1950), *Microtus ochrogaster* (Rausch, 1951), *Microtus oeconomus* (Rausch, 1952; Haukisalmi et al., 1995), *Microtus pennsylvanicus* (Rausch, 1952; Schiller, 1952b), *Microtus richardsoni* (Kuns and Rausch, 1950; Schiller, 1952b), *Perognathus californicus* (Voge, 1952), *Peromyscus boylei* (Voge, 1952, 1955), *P. californicus* (Voge, 1952, 1955), *P. truei* (Voge, 1952, 1955), *Pitymys* (syn. *Microtus*) *duodecimcostatus* (Feliu et al., 1997), *P. pyrenaicus* (Feliu et al., 1997), *Sciurus vulgaris* (Shimalov and Shimalov, 2002), *Tamiasciurus hudsonicus* (Schiller, 1952b), *Thomomys bottae* (Voge, 1952), *T. bulbivorus* (Gardner, 1985), *T. monticola* (Howard and Childs, 1959), *T. talpoides* (Frandsen and Grundmann, 1961), *T. umbrinus* (Frandsen and Grundmann, 1961), and *Zapus princeps* (Kinsella, 1968).

Geographic range: Asia: Japan (Asakawa et al. 1992; Asakawa, 1993; Sakata et al., 2001); Africa: Sinai (Egypt—Schmidt and Wertheim, 1988); Europe: Belarus (Shimalov, 2002; Shimalov and Shimalov, 2002), Russia (Luzhkov, 1964; Gubanov and Fedorov, 1970; Revin, 1983; Shahmatova and Yudina, 1989; Yushkov, 1995; Haukisalmi and Henttonen, 2001), Spain (Feliu et al., 1997); North America: Alaska (U.S.A.—Rausch, 1950, 1952; Schiller, 1952b; Haukisalmi et al., 1995), California (U.S.A.—Voge, 1952, 1954; Howard and Childs, 1959), Montana (U.S.A.—Schiller, 1952b; Kinsella, 1968), Oregon (U.S.A.—Gardner, 1985), Quebec (Canada—Schiller, 1952b), Tennessee (U.S.A.—Rausch, 1951), Utah (U.S.A.—Frandsen and Grundmann, 1961), Washington (U.S.A.—Schiller, 1952a), Wyoming (U.S.A.—Kuns and Rausch, 1950).

Specimens deposited: HWML# 48382, 48387, 48388, 48389, 48390, 48391, 48392, 48393.

Remarks: Hymenolepis horrida (*sensu lato*) is a widespread parasite of arvicoline rodents (i.e., voles and lemmings) in the northern hemisphere, with a Holarctic distribution (Doran, 1954; Rausch, 1957). Recent DNA analyses have concluded that *H. horrida* may not be a single species but may consist of multiple species (cf. the "*Arostrilepis horrida* complex") with similar morphologies (Hoberg et al., 2003). Kootenay National Park, British Columbia, Canada, is a new locality record for the species in Canada.

Catenotaenia peromysci

Prevalence, mean intensity, and range: Hosts infected, 1 of 34 (3%, 2).

Site of infection: Small intestine.

Type host and type locality: Peromyscus maniculatus rufinus (Merriam), Rio Arriba Country, New Mexico (Smith, 1953).

Other reported hosts: Peromyscus maniculatus sonoriensis (Grundmann et al., 1976).

Geographic range: Colorado (U.S.A.—Smith, 1953), New Mexico (U.S.A.—Smith, 1953), Utah (U.S.A.—Grundmann et al., 1976), Wyoming (U.S.A.—Smith, 1953).

Specimens deposited: HWML# 48385.

Remarks: Catenotaenia peromysci appears to be closely related to *C. pusilla*. However, in general, many structures of *C. peromysci* are larger than those of *C. pusilla* (Smith, 1953). *Clethrionomys gapperi* is a new host record for *C. peromysci*. Rausch and Tiner (1948) reported *C. pusilla* infecting *C. gapperi*, but this was later corrected as *Catenotaenia dendritica* (Doran, 1954). *Catenotaenia dendritica* has been found rarely in *C. gapperi* (Kinsella, 1967). Our specimens do not conform to descriptions of *C. dendritica* and fit most closely the descriptions of *C. peromysci* (length: 62 to 67 mm; width: 0.82 mm; scolex: 0.28 mm; number of testes: 65; cirrus sac length to width: 0.15 to 0.07; primary uterine branches: 24). *Clethrionomys gapperi* represents a new host record for this species.

Microtus longicaudus

Eight long-tailed voles (6 males, 2 females; mean body mass = 27.5 g) were collected from July 20 to August 23, 2005, at Kootenay National Park, British Columbia, Canada (Nearctic biogeographic region).

Hymenolepis horrida (Linstow, 1901) Lühe, 1910

Prevalence, mean intensity, and range: Hosts infected, 4 of 8 (50%, 4.7 ± 1.2; 3–7).

Site of infection: Small intestine

Specimens deposited: HWML# 48381, 48383, 48384, 48386.

Remarks: Taxonomic summary, distributional summary, and other remarks are presented under *C. gapperi*.

We report the cestode community found in voles, *Clethrionomys gapperi* and *Microtus longicaudus*, in the Kootenay National Park of the Canadian Rockies. *Hymenolepis horrida* has a wide geographic distribution and broad host range (Rausch, 1957). Schiller (1952b) noted exceptional morphological variation and diversity in *H. horrida* infecting various arvicolid rodents in the Nearctic region. It was established as the type species for the genus *Arostrilepis* based on morphological evidence (Mas-Coma and Tenora, 1997). However, the type species was found in the Common Pine Vole, *Microtus subterraneus*, from Hungary (Mas-Coma and Tenora, 1997). However, recent molecular studies on *H. horrida* from different parts of its distribution have shown that it perhaps encompasses multiple species in the *Arostrilepis* complex (Hoberg et al., 2003). Therefore, we retain the name *H. horrida* until taxonomic revision of the species in the "complex" in both New and Old World rodents is published.

The prevalence and intensity of *H. horrida* were higher in *M. longicaudus* than in *C. gapperi*. Perhaps individuals of *M. longicaudus* have a greater probability of coming into contact with infected arthropod intermediate hosts than do individuals of *C. gapperi*. Another possibility is that *C. gapperi* may have greater resistance to infection by *H. horrida*. We examined other sympatric small mammals for the presence of parasites, including *Phenocomys intermedius*, *Peromyscus maniculatus*, *Tamias amoenus*, and *Spermophilus lateralis*, and found no *H. horrida*. Thus, both red-backed and long-tailed voles probably have at least a partial niche overlap in this part of the Rockies (Millar et al., 1985).

Although both species of mammals share the same *Hymenolepis* species, only *C. gapperi* was infected with *C. peromysci*. The significance of the observation that *C. peromysci* infected only *C. gapperi* cannot be determined in this study.

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