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Gastrointestinal Parasites of the Northern River Otter, *Lontra canadensis* (Carnivora: Mustelidae), from Arkansas

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Running Title: Helminths of River Otter from Arkansas

The northern river otter, *Lontra canadensis* (Schreber) ranges from Alaska and most of Canada south to northern California and northern Utah in the west and from Newfoundland southward to Florida in the east (Reid 2006). In Arkansas, *L. canadensis* is found statewide in rivers, creeks, bayous, and lakes bordered by timber (Sealander and Heidt 1990). The river otter primarily feeds on fish, but will also consume aquatic invertebrates, amphibians, reptiles, birds, and other mammals (Tumlison et al. 1986, Larivière and Walton 1998, Melquist et al. 2003, Ligon and Reasor 2007).

The river otter has been a common subject of several surveys on its helminth parasites. These previous studies were conducted on specimens from 15 US states, including Alabama, Alaska, Arkansas, Florida, Georgia, Louisiana, Maryland, Massachusetts, Michigan, Montana, New York, North Carolina, Oklahoma, Oregon, and Tennessee, and Newfoundland and Ontario, Canada (summarized by Fleming et al. 1977, Stuht 1978, Shoop and Corkum 1981, Tumlison et al. 1984, Addison et al. 1988, Snyder et al. 1989, Forrester 1992, Hoberg et al. 1997, Kollars et al. 1997, Kimber and Kollias 2000, Feldhamer et al. 2003, Dronen 2009, Crait et al. 2015, McAllister and Fayton 2015). Although it appears the helminth fauna of *L. canadensis* is fairly well known, there are obvious gaps in our knowledge, particularly for populations in Arkansas. Indeed, only a single nematode parasite has been reported from river otters from Arkansas (Tumlison et al. 1986). Here, we report more detailed information on a survey of gastrointestinal helminth parasites of *L. canadensis* from the state.

During the 2013–2015 fur trapping seasons, 38 adult river otter carcasses (21 males, 17 females) were obtained from licensed fur buyers in Arkansas (n = 2), Clark (n = 1), Crawford (n = 5) , Franklin (n = 2), Lonoke (n = 1), Pike (n = 4), Polk (n = 5), Perry (n = 1), Prairie (n = 9), Pulaski (n = 1), Scott (n = 1), St. Francis (n = 1), Sebastian (n = 2), Union (n = 1), White (n = 1) and Yell (n = 1) counties (Fig. 1). Most of the carcasses were obtained frozen, but many had remained at ambient temperatures for 24 hrs or more before being frozen. These conditions may have limited the diversity of parasites we were able to locate. After thawing, a mid-ventral incision was made to expose the gastrointestinal tract, which was split lengthwise from the esophagus to anus and its contents rinsed into a sieve then examined for helminths. Several 15 cm segments of tissue were cut and placed in Petri dishes and their contents rinsed in 0.9% w/v saline. Trematodes were removed from the stomach and upper small intestine, transferred to 70% v/v ethanol, stained in acetocarmine or Ehrlich's hematoxylin, cleared in methyl salicylate and mounted in Canada balsam. Nematodes and acanthocephalans originally fixed in 70% v/v ethanol were examined as temporary mounts in glycerol. Host voucher specimens (skulls only) were deposited in the Henderson State University Collection, Arkadelphia, as HSU 719, 763, 784, 809, 867, 870; parasite vouchers were deposited in the Harold W. Manter Laboratory of

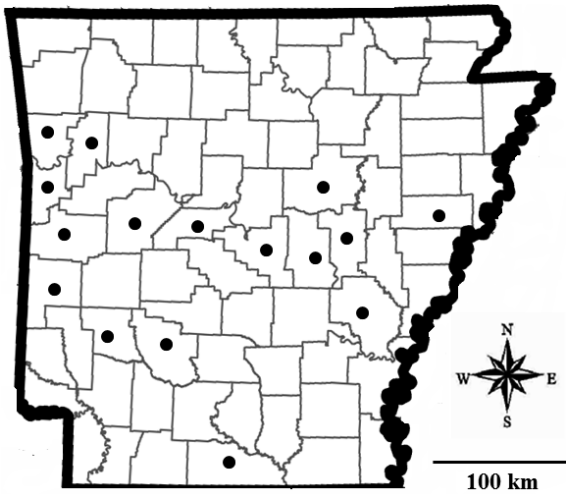

Fig. 1. Sixteen counties in Arkansas where river otters were collected.

Parasitology (HWML), University of Nebraska, Lincoln, NE.

A total of 37 of 38 (97%) of the *L. canadensis* harbored at least 1 helminth; 1 (3%) of the river otters from Polk County harbored a multiple infection of 2 helminths. Two specimens positive for the nematode, *Dracunculus insignis* (Leidy, 1858) will be reported elsewhere by RT. An annotated list of the parasites found follows:

Trematoda: Digenea: Echinostomatidae, *Bashkirovitrema canadense* Dronen, 2009

Twenty-four of 38 (63%) of the river otters were found to be infected with *B. canadense* (HWML 94121) in the gastrointestinal tract; the mean intensity was 8.4 ± 18.2, range 1–61 worms. Dronen (2009) erected *B. canadense* to accommodate specimens of *Bashkirovitrema* Skrjabin, 1944 harvested from the intestine of mustelids, including *L. canadensis* and the American mink, *Neovison vision* (Schreber), from Florida, Georgia, Louisiana, New York, North Carolina, and Ontario, Canada (Dronen 2009) and found this species to be morphologically most similar to *Bashkirovitrema incrassatum* (Diesing, 1850), which parasitizes the Neotropical otter, *Lontra longicaudis* (Olfers, 1818), in Brazil, South America. Recently, McAllister et al. (2015) reported *B. canadensis* from Oklahoma; we report this species from Arkansas for the first time.

Strigeidida: Clinostomatidae, *Clinostomum* sp.

Seven *Clinostomum* sp. (HWML 94120) were found in the stomach of a single (3%) *L. canadensis* collected on 16 February 2015 from the Little Missouri River, Clark County. This parasite (yellow grub) is typically found in the metacercarial stage in fishes and amphibians with fish-eating birds (herons, egrets) serving as definitive hosts (McAllister et al. 2010). In the current case, this parasite is considered an incidental finding of a host which has a piscivorous diet. However, this is the first time *Clinostomum* sp. has been reported from a river otter.

Nematoda: Dioctophymatoidea: Dioctophymatidae, *Dioctophyma renale* (Goeze, 1782)

Twelve of 38 (32%) of *L. canadensis* from Crawford, Franklin, Pike, Polk, Prairie, Pulaski, Sebastian, St. Francis and Yell counties harbored larval and pre-adults of this nematode (HWML 94122) in the large intestine; the mean intensity was 3.8 ± 9.0, range 1–31 worms. This cosmopolitan nematode, often referred to as the giant kidney worm has been found encapsulated in fishes; larvae can be transmitted along the food chain of paratenic hosts (Karmanova 1961). It is possible that American bullfrogs (*Lithobates catesbeianus*) become infected with *D. renale* by eating infected frogs of different species (Mace and Anderson 1975). Definitive hosts are carnivorous mammals, notably mink, wolves, coyotes, foxes, dogs, raccoons, and weasels. *Dioctophyma renale* has been previously reported from Arkansas (Hallberg 1953) and from *L. canadensis* from unknown localities (Kimber et al. 2000). However, we report *D. renale* in river otters from Arkansas for the first time.

Acanthocephala gen sp. (unknown genus)

Three female acanthocephalans (HWML 94123) were found in the large intestine of 3 of 38 (8%) river otters collected in February 2014, 2 hosts from Prairie and 1 host from Scott counties. As with the *Clinostomum* sp. found herein, this is considered to be an incidental finding of river otter food habits. Other acanthocephalans, also considered incidental findings, have been previously reported in *L. canadensis* from Alabama, Alaska, Florida, Oregon, Tennessee, Wyoming and Newfoundland, Canada (Schmidt 1969, Smith and Threlfall 1973, Fleming et al. 1977, Forrester 1992, Hoberg et al. 1997, Kollars et al. 1997, Crait et al. 2015).

In summary, we document a low parasite species richness as well a new distributional record for a trematode parasite of *L. canadensis* in Arkansas. The parasite list for river otters is much more extensive (see Kimber and Kollias 2000 for summary). Therefore, in order to further increase our knowledge of its parasites in the state, we suggest future surveys to include examination of fresh material, their major visceral organs, and specimens from other counties of the state, particularly northern Arkansas.

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