Larval *Porrocaecum* sp. (Nematoda: Ascaridida: Ascarididae: Toxocarinae) in Northern Cottonmouth, *Agkistrodon piscivorus* (Ophidia: Viperidae) and Plain-Bellied Watersnake, *Nerodia erythrogaster* (Colubridae) from Western Arkansas

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Abstract: During June 2024, a northern cottonmouth, *Agkistrodon piscivorus* and plain-bellied watersnake, *Nerodia erythrogaster* were collected from Polk County, Arkansas, and examined for helminth parasites. Both snakes harbored larval *Porrocaecum* nematodes encapsulated in the dermis of their coelomic cavity and on organ surfaces. This is the first time this nematode genus has been reported to infect these semi-aquatic snakes. A summary of the larval *Porrocaecum* sp. in snakes is provided.

Introduction

Recently, helminth parasites were reported from the western cottonmouth, *Agkistrodon piscivorus* (Lacépède) from Arkansas (McAllister et al. 2023; see citations therein). There are several reports of helminth parasites from the plain-bellied watersnake, *Nerodia erythrogaster* (Forster) (see citations in Ernst and Ernst 2006). However, no report has documented larval *Porrocaecum* sp. from these snakes.

Normally, *Porrocaecum* nematodes belonging to the family Ascarididae Baird, 1853 occur as intestinal helminths of birds (Moravec

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and Kaiser 1995; Atkinson et al. 2009). The type species is *Porrocaecum crassum* Deslongchamps, 1824 which was reported from ducks (Deslongchamps 1824). In the life cycle, ova are eaten by earthworms in which they hatch in the intestine and migrate into blood vessels where they undergo molting and become infective third-stage larvae (Anderson 2000). When consumed by worm-eating avian (vermivore), the larvae are liberated and enter the submucosa of the bird's gizzard and then pass to the small intestine; however, when ingested by other vermivores, they can encyst in body tissues (Anderson 2000).

Larval *Porrocaecum* have been previously reported from fishes, often in the swim bladder (Moravec 1994), and from the dermis, organs, and coelomic cavities of numerous amphibians (salamanders, frogs, and toads) and reptiles (lizards and snakes but no turtles or crocodilians) (see summaries in Bursey and Brooks [2011] and McAllister et al. [2013]). The presence of larvae in any snake suggests that any vermivore could serve as a paratenic or accidental host. Here, we report, for the first time, *Porrocaecum* larvae in two species of semi-aquatic snakes from Arkansas.

Methods

Host collection and processing

On 20 June 2024, a 402 mm snout-vent length (SVL) *A. piscivorous* was collected with snake tong from the Ouachita Mountains Biological Station Pond, Polk County (34°27'43.4484''N, -93°59'54.3264''W). On 22 June 2024, a 475 mm SVL *N. erythrogaster* was collected by hand from the same locale. Both snakes were killed by an intraperitoneal injection of concentrated tricaine-methanesulfonate and a mid-ventral incision was made from the throat to vent. All major organs were removed and placed in Petri dishes containing 0.9% (v/v) saline and examined under a stereomicroscope. Encapsulated nematodes were observed in both hosts in the dermis of the coelomic cavity and on organ surfaces (mainly liver) and preserved in 10% neutral-buffered formalin. Specimens were further examined by placing them on microscopic slides and examined as temporary mounts in glycerol.

Parasites were deposited in the Harold W. Manter Laboratory (HWML), University of Nebraska, Lincoln, Nebraska. Host voucher specimens were deposited in the vertebrate collection of Northeast Texas Community College, Mt. Pleasant, TX.

Results

Larval ascaridid nematodes with characters of the genus *Porrocaecum* Railliet and Henry, 1912 was found in both snakes. A basic generic character of the genus includes the presence of an intestinal cecum but without an oesophageal appendix. The northern cottonmouth harbored five larval *Porrocaecum* sp. (HWML 118838) while the plain-bellied watersnake possessed 19 larval *Porrocaecum* sp. (HWML 118839).

Discussion

McAllister et al. (2013) reported larval *Porrocaecum* sp. from a single adult Ouachita dusky salamander, *Desmognathus brimleyorum* Stejneger from Ouachita County, Arkansas. It represented the first report of *Porrocaecum* from a caudate host as well as from any herptile host in the USA. A summary of the 19 snake hosts of larval *Porrocaecum* sp. is provided in Table 1. The majority of hosts are reported from Costa Rica (n = 15) with single hosts from México and Turkmenistan, including our two new hosts from the USA (Table 1). In terms of snake families, the majority of hosts (n = 17) belong to the family Colubridae with single hosts in the families Elapidae and Viperidae (Table 1).

Table 1. Larval *Porrocaecum* sp. from snakes.

Host Family/Species	Locality	Reference
Colubridae		
Amastridium veliferum	Costa Rica	Goldberg and Bursey (2004a)
Chironius carinatus	Costa Rica	Goldberg and Bursey (2004a)
Coniophanes fissidens	Costa Rica	Goldberg and Bursey (2007)
Dendrophidion pericarinatum	Costa Rica	Goldberg and Bursey (2004a); Bursey and Brooks (2011)
D. vinitor	Costa Rica	Goldberg and Bursey (2004a)
Drymobius margartiferus	Costa Rica	Goldberg and Bursey (2005)
Erytrolampus bizona	Costa Rica	Goldberg and Bursey (2004a)
Imantodes inornatus	Costa Rica	Goldberg and Bursey (2009)
Leptodeira septentrionalis	Costa Rica	Goldberg and Bursey (2009)
Liophis epinephalis	Costa Rica	Goldberg and Bursey (2004a)
Mastigodryas melanolomus	Costa Rica	Goldberg and Bursey (2006)
Natrix tesselata	Turkmenistan	Velikanov (1982)
Nerodia erythrogaster	Arkansas, USA	This report
Oxybelis brevirostris	Costa Rica	Goldberg and Bursey (2004a); Bursey and Brooks (2011)
Pliocercus euryzonus	Costa Rica	Goldberg and Bursey (2007)
Rhadinea decorata	Costa Rica	Goldberg and Bursey (2007)
Thamnophis valida	México (Sinaloa, Sonora)	Goldberg and Bursey (2004b)
Elapidae		
Micrurus nigrocinctus	Costa Rica	Goldberg and Bursey (2004a)
Viperidae		
Agkistrodon piscivorus	Arkansas, USA	This report

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