

Research Note

A New Host Record for *Mesocestoides* sp. (Cestoidea: Cyclophyllidea: Mesocestoididae) from a Rough Green Snake *Ophedrys aestivus* (Ophidia: Colubridae) in Arkansas, U.S.A.

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ABSTRACT: Twenty-one adult rough green snakes *Ophedrys aestivus* (Ophidia: Colubridae) were collected during 2010 and 2012 from Montgomery ($n = 1$) and White ($n = 20$) counties, Arkansas, U.S.A., and examined for helminths. A single *O. aestivus* (5%) harbored a massive infection of *Mesocestoides* sp. This represents a new host record for *Mesocestoides* sp., and 1 of the rare instances that *O. aestivus* has been reported to harbor any parasite.

KEY WORDS: *Ophedrys aestivus*, rough green snake, *Mesocestoides* sp., Mesocestoididae, Cestoidea, Arkansas, Ophidia, Colubridae.

The rough green snake *Ophedrys aestivus* (Ophidia: Colubridae) is a slender, medium-sized colubrid that ranges from southern New Jersey to the Florida Keys and west to southeastern Kansas and Texas, U.S.A., southward to Tampico and Coahuila, Mexico (Conant and Collins, 1998). It is mostly an arboreal species that forages in trees and shrubs but sometimes enters shallow aquatic habitat. Although *O. aestivus* is 1 of the best known ecologically of all North American snakes (see Trauth et al., 2004), very little information is available on its helminth parasites. The first report of parasites in *O. aestivus* was by Stiles and Hassall (1894) who reported larval trematodes, *Distomum* sp. Diesing, 1850; however, this identification is uncertain (see Ernst and Ernst, 2006). The only other previously published papers on parasites of rough green snakes (a single trematode species) was by Nicoll (1914) who provided a description of *Brachycoelium obesum* (= *B. salamandrae*) from an *O. aestivus* (as *Contra aestiva*) housed at the London Zoological Gardens; Harwood (1932) who reported a *Brachycoelium* sp. from Texas *O. aestivus*; and Rabalais (1969) who reported *B. salamandrae* from specimens collected from Louisiana. Herein, we document the first report of a cestode in *O. aestivus* from specimens collected in Arkansas.

Between April and September 2010, 20 adult male (mean \pm 1 SD snout–vent length [SVL], range = 384.4 ± 45.3 , 282–462 mm) *O. aestivus* were collected from Bald Knob Lake ($n = 4$) or at Searcy ($n = 16$), White County, Arkansas; a single adult male (SVL = 291 mm) was collected in April 2012 from Black Springs, Montgomery County, Arkansas. Snakes were taken to the laboratory and overdosed with an intraperitoneal injection of sodium pentobarbital (Nembutal®). A midventral incision was made, and the viscera were examined for parasites. Suspected encapsulated cestodes were observed in the coelomic cavity and reproductive organs of a single snake. For light microscopy of plastic-embedded tissues, we followed the methods of Bozzola and Russell (1999). After fixation, tissues were dehydrated in a graded series of increasing ethanol solutions (70–100%), placed in a 50%:50% acetone/plastic mixture for overnight infiltration, and then embedded in Mollenhauer's Epon-Araldite #2 (Dawes, 1988). For thick sectioning (approximately 1 μ m in thickness) and staining, we used glass knives on an LKB Ultratome (Type 4801A) with Ladd® multiple stain, respectively. Photomicrographs were taken using an Eclipse 600 epifluorescent light microscope with a DXM 1200C digital camera (Nikon Instruments Inc., Melville, New York). A Konica Minolta Maxxum 7D digital single lens reflex camera fitted with a ProMaster AF Macro lens also was used to photograph macroscopic images. Voucher specimens of *O. aestivus* were deposited in the Arkansas State University Herpetological Museum (ASUMZ), State University, Arkansas, U.S.A., as ASUMZ 31444–31447, 31519–31522, 31533–31536, 31539–31542, and 31551–31554. A voucher of *Mesocestoides* sp. was deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland, U.S.A.

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A single snake was found to be infected with many encapsulated plerocercoid metacestodes (tetrathyridia) identified as *Mesocestoides* sp.

Cestoidea

Cyclophyllidea: Mesocestoididae *Mesocestoides* sp. Vaillant, 1863 (Figs. 1–4)

Host and locality: Rough green snake, *Opheodrys aestivus* (Linnaeus, 1766) (ASUMZ 31539, adult male, SVL = 291 mm) collected on 17 July 2010 from Bald Knob Lake, White County, Arkansas, U.S.A. (35°20'21"N; 91°35'24"W).

Prevalence and intensity: 1/21 (5%) overall; 1/4 (25%) Bald Knob Lake, 0/16 (0%) Searcy, 0/1 (0%) Black Springs; too numerous to count.

Site of infection: Cysts in coelomic cavity.

Additional Arkansas records: Caudata: Ouachita dusky salamander *Desmognathus brimleyorum* (McAllister, Bursey, Upton et al., 1995); spotted dusky salamander *Desmognathus conanti* (McAllister et al., 2013). Anura: pickerel frog *Lithobates palustris* (as *Rana palustris*, McAllister, Trauth, Bursey, 1995); wood frog *Lithobates sylvaticus* (as *Rana sylvatica*, McAllister, Upton, Trauth et al., 1995). Sauria: eastern collared lizard *Crotaphytus collaris* (McAllister and Trauth, 1985); and prairie lizard *Sceloporus consobrinus* (as *Sceloporus undulatus hyacinthinus*, McAllister et al., 1992).

Additional reports, Nearctic colubrid snakes: Eastern glossy snake *Arizona elegans* (Goldberg and Bursey, 2001); eastern indigo snake *Drymarchon couperi* (as *D. corais couperi*, Foster et al., 2000); common kingsnake *Lampropeltis getula* (Goldberg and Bursey, 2004); western coachwhip *Masticophis flagellum testaceus* (Conn and McAllister, 1990); striped racer *Masticophis lateralis* (Goldberg and Bursey, 2001); long-nosed snake *Rhinochelius lecontei* (Goldberg and Bursey, 2001); and western terrestrial garter snake *Thamnophis elegans* (Voge, 1953). In addition, at least 8 Nearctic viperid snakes (*Crotalus* spp.) have been reported previously as hosts (see Bursey et al., 2012).

Other reported herpetile hosts: See recent summary by Bursey et al. (2012). It includes many hosts, including amphibians and reptiles from the Asian, Australo-Papuan, Ethiopian, Nearctic, Neotropical, and Palearctic regions.

Geographic range: The genus is cosmopolitan (Schmidt, 1986).

Type species, type host, and type locality: *Mesocestoides ambiguous* (Mammalia: Carnivora), small-spotted genet, *Viverra genetta*, Africa (Vaillant, 1863).

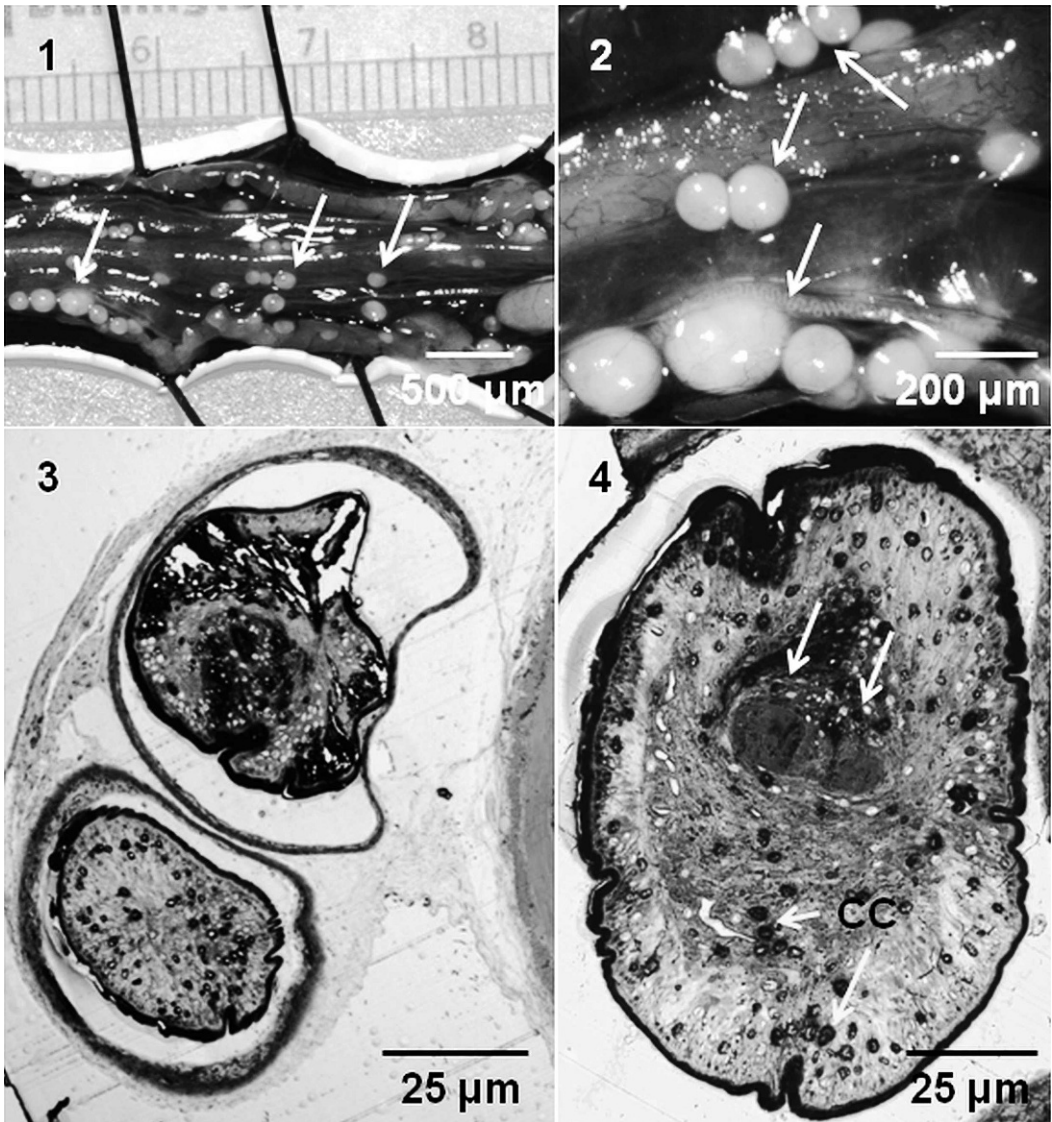
Specimens deposited: USNPC 105790 (slide).

Remarks: Adult *Mesocestoides* spp. are parasites of birds and placental mammals, and although rare, humans also can serve as hosts (Padgett et al., 2012); apparently the first mention of tetrathyridia as accidental or paratenic parasites was in a European green lizard, *Lacerta viridis*, collected in France (Valenciennes, 1844). Twenty-seven species of *Mesocestoides* are recognized by Schmidt (1986), and the number of these species is far from settled, but given their variability, synonymies most likely exist. There are no morphological characteristics that allow assignment of tetrathyridia to a given species, and 7 species have been identified within the U.S.A. The only species reported definitively from Arkansas in reptiles (via prairie lizard–hamster transmission) is *Mesocestoides lineatus* (McAllister et al., 1992).

The life cycle of *Mesocestoides* spp. is a continuing enigma; however, Rausch (1994) suggests it requires at least 3 hosts (i.e., a vertebrate definitive host, a vertebrate second intermediate host, and a supposed arthropod first intermediate host). Encapsulated and free tetrathyridia are often found in the body cavity and various organs of amphibians, reptiles, and rodents (Padgett and Boyce, 2004). Because *O. aestivus* feeds on a variety of arthropods, including spiders (mostly), odonates, orthopterans, and lepidopterans (Plummer, 1981; Trauth et al., 2004), opportunity exists for infection with *Mesocestoides* sp.

We document herein a new host record for *Mesocestoides*, the first report of a cestode parasite from rough green snakes, and 1 of the few reports of any helminth from *O. aestivus*. Although a trematode (*B. salamandrae*) has been reported commonly from this snake (Nicol 1914; Harwood, 1932; Rabalais, 1969), no nematodes or acanthocephalans, to our knowledge, have been reported previously from *O. aestivus*. Interestingly, a trematode and 2 species of nematodes have been reported from smooth green snakes, *Opheodrys vernalis* (Chu, 1936; Fantham and Porter, 1954; Kuzmin et al., 2003). Additional surveys of *O. aestivus* are certainly warranted, especially from other parts of its range.

We thank the Arkansas Game and Fish Commission for providing scientific collecting permits to



Figures 1–4. *Mesocoestoides* sp. from *Ophedrys aestivus*. **1.** Macroscopic view showing clusters of tetrathyridia in coelomic cavity (arrows). **2.** Close-up view of tetrathyridia (arrows). **3.** Microscopic view of 2 tetrathyridia in host-derived fibrotic capsule. **4.** Higher magnification of tetrathyridium showing holdfast (arrows) and calcareous corpuscles (CC) with solid hindbody.

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