

Nematode Parasites of the Many-Ribbed Salamander, *Eurycea multiplicata* (Caudata: Plethodontidae), from Arkansas and Oklahoma

Chris T. McAllister

Science and Mathematics Division, Eastern Oklahoma State College, 2805 NE Lincoln Road, Idabel, OK 74745

Charles R. Bursey

Department of Biology, Pennsylvania State University-Shenango Campus, 147 Shenango Avenue, Sharon, PA 16146-1537

Michael A. Steffen

Department of Biological Sciences, University of Tulsa, Tulsa, OK 74104

Sixty-six many-ribbed salamanders (*Eurycea multiplicata*) were collected from 11 localities in seven counties of Arkansas and four sites in three counties of Oklahoma and examined for helminth parasites. Seven (10.6%) were infected with nematodes, including three (4.5%) with *Desmognathinema nantahalaensis*, one (1.5%) with *Omeia papillocauda*, and three (4.5%) with *Cosmocercoides* sp. This is the first time helminths have been reported from *Eurycea multiplicata*. We report three new host and a new geographic locality for endoparasites of *Eurycea multiplicata*. © 2010 Oklahoma Academy of Science.

INTRODUCTION

The many-ribbed salamander (*Eurycea multiplicata*) is a small plethodontid that ranges south of the Arkansas River and throughout the Ouachita Mountains of west-central Arkansas and adjacent southeastern Oklahoma (Trauth et al., 2004). It is a metamorphic surface-dwelling species that frequents aquatic sites including abandoned mine shafts and spring seeps and can also be found under damp rocks and logs in deciduous forest. Although much has been published on the ecology of *Eurycea multiplicata* (Dundee, 1967; Trauth and Dundee, 2005), nothing is known about its helminth parasites. In an unpublished dissertation, Bouchard (1953) examined 15 *Eurycea multiplicata* from Oklahoma but did not recover any parasites. Rosen and Manis (1976) examined a single *Eurycea multiplicata* from an unknown location in Arkansas and found no helminths. Fogle (1960), Saltarelli (1977), Buckner and

Nickol (1978), and McAllister et al. (1995b) reported on parasites of related gray-belly salamanders, *Eurycea multiplicata griseogaster* collected from various counties north of the Arkansas River; however, *Eurycea multiplicata griseogaster* is conspecific and a junior synonym of the Oklahoma salamander, *Eurycea tynerensis* (Bonett and Chippindale, 2004). In addition, Malewitz (1956) reported the acanthocephalan, *Fessisentis vancleavei* from *Eurycea multiplicata* from Cherokee County, Oklahoma. However, that site is also north of the Arkansas River so his host would also be referred to as *Eurycea tynerensis*. Bonett and Chippindale (2004) found high mtDNA divergence within the Ouachitas (south of the Arkansas River) likely indicating cryptic species of *Eurycea multiplicata*; however, further work remains to be done. Herein, we provide the first report of helminth parasites in large sample of *Eurycea multiplicata* from Arkansas and Oklahoma.

MATERIALS AND METHODS

Between December 1987 and March 1995 and again between March 2002 and April 2010, 66 larval and adult *Eurycea multiplicata* (mean \pm snout-vent length [SVL] = 34.9 ± 1.2 , 23–44 mm) were collected by hand or aquatic dip-net from (sample sizes in parentheses) Conway (1), Garland (2), Montgomery (1), Pulaski (1), Polk (2), Saline (21), and Scott (33) counties, Arkansas, and LeFlore (2), McCurtain (2), and Pushmataha (1) counties, Oklahoma (Appendix). Eight of the 21 Saline County salamanders had also been used in a previous study of myxozoa by Upton et al. (1995). Specimens were placed in zip-lock bags with habitat water on ice and returned to the laboratory for necropsy. Salamanders were killed by prolonged immersion in a dilute chloretone (chlorobutanol) solution. A mid-ventral incision was made to expose the viscera and the entire gastrointestinal tract, liver, gall bladder, spleen, and gonads were examined for helminths. The skull and endolymphatic sac was not examined. Nematodes were placed in a drop of glycerol on microscopic slides and identifications were made from these temporary mounts. Nematode voucher specimens were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland. Host voucher specimens were deposited in the Arkansas State University Museum of Zoology, Herpetological Collection (ASUMZ) or the Henderson State University Herpetological Collection (HSU), Arkadelphia, Arkansas.

RESULTS AND DISCUSSION

Seven (10.6%) were infected with nematodes, including three (4.5%) with the seuratoid, *Desmognathinema nantahalaensis* Baker, Goater, and Esch, 1987, one (1.5%) with the seuratoid, *Omeia papillocauda* Rankin, 1937, and three (4.5%) with an ascaroid, *Cosmocercoides* sp.

Nine *D. nantahalaensis* (seven males, two females; USNPC 103428) were removed

from the intestinal tract of three *E. multiplicata* (29, 31, 36 mm SVL) collected on 28 February and 13 March 2010 from LeFlore and Pushmataha counties, Oklahoma (see Appendix). The species was originally described from *D. quadramaculatus* (type host) and *D. monticola* from North Carolina (Baker et al., 1987). Other hosts include *E. lucifuga* and *E. tynerensis* (= *E. m. griseogaster*) from Arkansas (McAllister et al., 1995b). *Eurycea multiplicata* is a new host and Oklahoma a new locality for *D. nantahalaensis*.

Two *O. papillocauda* (USNPC 84239) were recovered from the small intestine of a single *E. multiplicata* (SVL = 23 mm, ASUMZ 19489) collected on 18 March 1994 from Crystal Springs off US 270, Garland County, Arkansas. This nematode was originally described from *Desmognathus* spp. and Blue Ridge spring salamanders, *Gyrinophilus porphyriticus danieli* in North Carolina (Rankin, 1937a). It has also previously been reported from numerous plethodontid salamanders from North America, including the northern two-lined salamander, *Eurycea bislineata*, cave salamander, *Eurycea lucifuga*, northern dusky salamander, *Desmognathus fuscus*, common blackbelly salamander, *Desmognathus quadramaculatus*, Allegheny dusky salamander, *Desmognathus ochrophaeus*, seal salamander, *Desmognathus monticola*, spring salamander, *G. porphyriticus* and *Desmognathus* (= *Leurognathus*) *marmorata* from Alabama, North Carolina, Ohio, and Tennessee (Rankin, 1937b; Walton, 1940; Dyer and Peck, 1975; Dunbar and Moore, 1979; Catalano et al., 1982; Baker et al., 1987). More importantly, this nematode has also been reported from Ouachita dusky salamanders, *Desmognathus brimleyorum* from Polk County, Arkansas (McAllister et al., 1995d). We document a new host record for *O. papillocauda*.

The ascaroid *Cosmocercoides* sp. (all females, USNPC 84238) was found in the rectum of three *E. multiplicata* (31, 34, and 36 mm SVL; ASUMZ 20149, 19785, 20156) collected on 9 April 1994 and 15 March 1995 from 3.2 km W of Shannon Hills, Saline

County, Arkansas. Since only females were found it is not possible to assign our specimens to species. Nematodes of this genus/species (= *C. variabilis*) are common in both amphibians and reptiles of the United States and Canada (summarized by McAllister and Bursey, 2004). In addition, this genus (as *Oxysomatium* sp.) has been reported from bullfrogs, *Lithobates* (= *Rana*) *catesbeianus*, southern leopard frogs, *Lithobates* (= *R.*) *sphenocephalus utricularius*, northern cricket frogs, *Acris crepitans*, Great Plains narrow-mouth toads, *Gastrophryne olivacea*, Texas toads, *Anaxyrus* (= *Bufo*) *speciosus*, Woodhouse's toad, *Anaxyrus* (= *B.*) *woodhousii*, and Couch's spadefoot, *Scaphiopus couchii* in Oklahoma (Trowbridge and Hefley, 1934; Kuntz, 1940, 1941). It has also been reported as *C. variabilis* from ringed salamanders, *Ambystoma annulatum*, Caddo Mountain salamanders, *Plethodon caddoensis*, Rich Mountain salamanders, *Plethodon ouachitae*, dark-sided salamanders, *Eurycea longicauda melanopleura*, *E. lucifuga* and pickerel frogs, *Lithobates* (= *R.*) *palustris* in Arkansas (McAllister et al., 1995a, 1995c, 2002; McAllister and Bursey, 2004).

This is the first report of helminth parasites of *E. multiplicata* and as such we document a new locality and three new host records for nematode parasites of this salamander. However, in our experience, the number of parasite species in this host will increase with additional study. For example, six previous studies have compiled eight species of generalist helminths in *E. longicauda* and seven studies have compiled 19 species of generalist helminths in *E. lucifuga* (see McAllister and Bursey, 2004). Seven studies have compiled five generalist helminths, including *D. nantahalaensis* for *E. tynerensis* (see McAllister et al., 1995b). Where comparisons are possible, similar prevalence rates have been found, i.e. infection by *D. nantahalaensis*, three of 63 (5%) *E. multiplicata*, three of 52 (6%) *E. tynerensis*; Chi square, $X^2 = 0.02$, 1 df, $p > 0.05$ (no significant difference). These studies lend support to Aho's (1990) contention that caudate species

are among the most depauperate hosts of all vertebrates.

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APPENDIX. Collecting localities of 66 specimens of *Eurycea multiplicata* from Arkansas and Oklahoma (locality, [latitude/longitude in decimal degrees when available], date of collection, collector, and number of specimens).

ARKANSAS (61 specimens)

CONWAY COUNTY (1 specimen):

1. Petit Jean State Park. 23 November 1990. C. T. McAllister.

GARLAND COUNTY (2 specimens):

1. Crystal Springs off US 270 [34.52203°N, 93.33602°W]. 18 March 1994. C. T. McAllister. 1.
2. Stokes Creek, Hot Springs, off US 270. 15 April 2010. C. T. McAllister. 1.

MONTGOMERY COUNTY (1 specimen):

1. Pine Ridge, off St. Hwy. 88. 18 March 1994. C. T. McAllister.

POLK COUNTY (2 specimens):

1. 4.8 km W of Queen Wilhelmina State Park. 18 March 1994. C. T. McAllister. 1.
2. Pioneer Cemetery Historic Site, 1.6 km W of Queen Wilhelmina State Park. 21 March 2002. C. T. McAllister. 1.

PULASKI COUNTY (1 specimen):

1. Rosedale Edition, 4200 Gilman St., Little Rock. 17 December 1987. C. T. McAllister.

SALINE COUNTY (21 specimens):

1. 3.2 km SW of Shannon Hills [34.60996°N, 92.43227°W]. 26 November 1993, 9 April 1994, 15 March 1995. C. T. McAllister. 6, 1, 14.

SCOTT COUNTY (33 specimens):

1. 3.2 km W of Needmore at Buffalo Creek. 6 January 2006. L. Scott. 2.
2. 1.3 km NE of Harvey at Sulphur Creek. 7 and 15 January 2006. S. Pickens. 8, 18.
3. Ross Creek. 7 January 2006. M. Goddard. 5.

OKLAHOMA (5 specimens)**LEFLORE COUNTY (2 specimens):**

1. Stream off Rt. 144, 8.0 km E of Ludlow at Honobia Creek [34.53194°N, 94.80383°W]. 28 February 2010. M. A. Steffen. 1.
2. Cucumber Creek off US 269, 8.0 km N of Octavia [34.56601°N, 94.70757°W]. 13 March 2010. M. A. Steffen. 1.

MCCURTAIN COUNTY (2 specimens):

1. Beaver's Bend State Park, Boren Trail. 7 February 2004. C. T. McAllister.

PUSHMATAHA COUNTY (1 specimen):

1. US 271 at Clayton Lake State Park [34.54421°N, 95.30507°W]. 28 February 2010. M. A. Steffen.

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