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Parasites of Four Species of Endemic *Plethodon* from Arkansas and Oklahoma

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The Caddo Mountain salamander, *Plethodon caddoensis* Pope and Pope, 1951, is restricted to the Caddo and Ouachita Mountains of Howard, Montgomery, Pike, and Polk Counties of western Arkansas; the Kiamichi slimy salamander, *P. kiamichi* Highton, 1989, is known only from the Kiamichi and Round Mountain outcroppings of Polk County of western Arkansas; the Rich Mountain salamander, *P. ouachitae* Dunn and Heinze, 1933, occurs on Rich Mountain and adjacent ridges of the Ouachita Mountains of Polk County, Arkansas, and eastern Oklahoma; the southern redback salamander, *P. serratus* Grobman, 1944, exists in four isolated populations, west-central Arkansas and southeastern Oklahoma, central Louisiana, central and southeastern Missouri, and the Piedmont and Blue Ridge provinces of northeastern Georgia, adjacent Alabama, eastern Tennessee and western North Carolina (Highton et al., 1989; Conant and Collins, 1998; Trauth et al., 2003). To our knowledge, there is only one report (Winter et al., 1986) of parasites from *P. caddoensis* and *P. ouachitae,* and Arkansas populations of *P. serratus.* The purpose of this note is to report additional parasites from *P. caddoensis, P. ouachitae, and P. serratus,* and for the first time, parasites from *P. kiamichi.*

Between December 1988 and February 2002, 72 plethodontid salamanders were collected by hand from several counties within the Ouachita National Forest of Arkansas and Oklahoma: *P. caddoensis* from springs or abandoned mines and *P. kiamichi, P. ouachitae,* and *P. serratus* from beneath decaying logs and leaf litter in seepage areas of deciduous forest habitat. Salamanders were placed in individual bags and transported on ice to the laboratory where they were killed within 48 hr of capture by prolonged immersion in a dilute chloretone® solution. Methods for salamander necropsy, coccidial isolation, and preparation and staining of blood smears and helminths follow McAllister and Upton (1987) and Upton et al. (1993); preparation of mites follows McAllister et al. (1995d).

Collection sites, sample size, mean ± 1 SD snout-vent length (SVL) in mm, and host accession numbers for voucher specimens deposited in the Arkansas State University Museum of Zoology (ASUMZ) for each species are listed in Appendix 1. Selected voucher specimens of parasites were deposited in the U.S. National Parasite Collection (UNSPC) and their accession numbers are listed in Table 1.

Of the 72 salamanders collected, 32 (44%) harbored parasites 11 (39%) *P. caddoensis,* four (25%) *P. kiamichi,* seven (88%) *P. ouachitae,* and 10 (50%) *P. serratus* Blood smears were negative for intraerythrocytic hematozoa and viral and/or rickettsial inclusions. Parasites found in this study with their intensity of infection are listed in Table 1.

Cepedietta michiganensis (Woodhead, 1928) Corliss, de Puytorac, and Lom, 1965, was originally described as *Haptophyra michiganensis* by Woodhead (1928). Joy and Tucker (2001) have summarized hosts and localities. In Arkansas, it has been reported from the western slimy salamander (*P. albagula*), Fourche Mountain salamander (*P. fourchensis*), and *P. ouachitae* (Winter et al., 1986; McAllister et al., 1993). *Plethodon serratus* represents a new host record for *C. michiganensis* and Oklahoma a new locale for the parasite.

One of the *P. kiamichi* (ASUMZ 18982, male, 65 mm SVL, collected on 23 April 1993) was found to be passing eimerian oocysts in the feces. Unfortunately, only a few oocysts were present and not enough completed sporulation to allow for specific identification; however, oocysts of this isolate clearly contained four sporocysts, a taxonomic characteristic of the genus *Eimeria. Plethodon kiamichi* represents a new host record for *Eimeria* sp. This is only the fourth time a coccidian has ever been reported from plethodontid salamanders (Saxe, 1955; McAllister et al., 1993; Upton et al., 1993).

Cylindrotaenia idahoensis (Waitz and Mehra, 1961) Jones, 1987 was originally described from the Coeur d'Alene salamander, *Plethodon idahoensis* from Kootenai County, Idaho (Waitz and Mehra, 1961). It has been reported from Jordan's redcheek salamander, *P. jordani* from North Carolina (Dyer, 1983; Jones, 1987) and the western redback salamander, *P. vehiculum* from Oregon (Panitz, 1969). *Plethodon caddoensis, P. ouachitae* and *P. serratus* represent new host records for *C. idahoensis.* The Ouachita National Forest of Arkansas and Oklahoma are new locality records for *C. idahoensis.*

Batracholandros magnavulvaris (Schad, 1960) Petter and Quentin, 1976 was originally described as *Oxyuris magnavulvaris* by Rankin (1937) from the red-spotted newt (*Notopthalmus viridescens*) and several species of plethodontid salamanders from Buncombe County, North Carolina. It

Table 1. Parasites of endemic *Plethodon* spp. from Arkansas and Oklahoma.

Host species	*P. caddoensis*	*P. kiamichi*	*P. ouachitae*	*P. serratus*	
Number examined	(28)	(16)	(8)	(20)	
Parasite	Number of infected hosts and intensities (mean ± 1SD, range)				USNPC Accession No.
Protista					
*Cepedietta michiganensis***	—	—	4 (50%)	1 (5%)*	84342,92564,92565
Eimeria sp.	—	1 (6%)*	—	—	—
Cestoidea					
*Cylindrotaenia idahoensis***	9 (32%)* 2.8 ± 1.6 (2-5)	—	2 (25%)* 2.5 ± 0.7 (2-3)	3 (16%)* 2.3 ± 0.6 (2-3)	84300, 84339, 84340
Nematoda					
*Batracholandros magnavulvaris***	—	—	3 (38%) 1.0 ± - (1)	8 (40%) 1.6 ± 0.7 (1-3)	92042
Cosmocercoides variabilis	1 (4%)* 2.0 ± - (2)	—	3 (38%)* 1.3 ± 0.6 (1-2)	—	84256
Oswaldocruzia euryceae	—	2 (13%)* 3.5 ± 2.1 (2-5)	3 (38%) 4.6 ± 3.8 (2-9)	—	84254
Arthropoda					
Hannemania sp.	2 (7%)	1 (6%)*	6 (75%)	—	84341

*New host records.
**New locality record (Ouachita National Forest, Arkansas and/or Oklahoma).

has been reported from the Ouachita dusky salamander, *Desmognathus brimleyorum, P. caddoensis, P. fourchensis, P. ouachitae,* and *P. serratus* from Arkansas (Winter et al., 1986; McAllister et al., 1995d), and many species of salamanders from other North American locations (hosts and localities summarized by Joy and Tucker, 2001). The Ouachita National Forest of Oklahoma is a new locality record for *B. magnavulvaris.*

Cosmocercoides variabilis (Harwood, 1930) Travassos, 1931 was originally described from Woodhouse's toad, *Bufo woodhousii* collected in Texas (Harwood, 1930). It has been reported from the ringed salamander, *Ambystoma annulatum* from Arkansas (McAllister et al., 1995b) and various other hosts (see Baker, 1987). It should be noted that a similar species, *Cosmocercoides dukae*, a parasite of gastropods, has been reported from numerous amphibians (Baker, 1987). The major difference between the two species is the number of caudal papillae: *C. dukae* with 12 pairs of plectenes (Holl, 1928); *C. variabilis* with 14-20 pairs of plectenes (Harwood, 1930). Because our specimens had 16 pairs of plectenes, we have assigned them to *C. variabilis. Plethodon caddoensis* and *P. ouachitae* represent new host records for *C. variabilis.*

Oswaldocruzia euryceae Reiber, Byrd, and Parker, 1940 was originally described from the three-lined salamander, *Eurycea longicauda guttolineata* collected in Georgia (Reiber et al., 1940). It has been reported from *P. caddoensis, P. ouachitae,* and *P. serratus* (Winter et al., 1986). *Plethodon kiamichi* represents a new host record for *O. euryceae.*

Larval intradermal mites, *Hannemania* sp. was found encapsulated in three species *P. caddoensis, P. ouachitae,* and *P. kiamichi.* Because only larvae were found, specific identity was not possible. *Hannemania* sp. has also been reported in Arkansas on *D. brimleyorum* (Loomis, 1956; Winter et al., 1986; McAllister et al., 1995d), graybelly salamanders, *E. multiplicata griseogaster* (McAllister et al., 1995c), and pickerel frogs, *Rana palustris* (McAllister et al., 1995a). *Plethodon kiamichi* represents a new host record for larva of *Hannemania* sp.

In summary, nine new host records and three new locality records are reported for parasites of four endemic species of *Plethodon* from the Ouachita Province of Arkansas and Oklahoma. Our survey supports Aho's (1990) suggestion of a depauperate noninteractive community structure observed in helminth communities of most amphibians and reptiles.

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Appendix 1. Voucher specimens of host salamanders (ASUMZ accession numbers) and collection localities in Arkansas and Oklahoma.

Species	SVL ± 1 SD mm (range)	ASUMZ	Localities and sample sizes (parentheses) counties; Township, Range, Section
P. caddoensis	42 ± 4 (32-47)	18519-18520	Montgomery Co., AR; T3S, R27W, S26 (n = 2) Polk Co., AR; T4S, R29W, S6 (n = 23) T3S, R29W, S26 (n=3)
P. kiamichi	57 ± 16 (27-73)	17575-17585; 17661-17663	Polk Co., AR; T1S, R32W, S31 (n = 16)
P. ouachitae	49 ± 9 (29-59)	19492	Polk Co., AR; T1S, R31W, S7 (n = 8)
P. serratus	40 ± 6 (27-49)	19491; 26396-26402	Hot Spring Co., AR; T5S, R20W, S31 (n = 7) Perry Co., AR; T3N, R20W, S27 (n = 1) Pike Co., AR; T6S, R25W, S14 (n = 3) Polk Co., AR; T1S, R32W, S10 (n = 3) LeFlore Co., OK; T1S, R32W, S7 (n = 2) McCurtain Co., OK; T5S, R25E, S10 (n = 4)

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