2014

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Recommended Citation

Davison, P. G.; Robison, H. W.; and McAllister, C. T. (2014) "First Record of Ribbon Worms (Nemertea: Tetrastemmatidae: Prostoma) from Arkansas," *Journal of the Arkansas Academy of Science*: Vol. 68 , Article 25.

DOI: <https://doi.org/10.54119/jaas.2014.6820>

Available at: <https://scholarworks.uark.edu/jaas/vol68/iss1/25>

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First Record of Ribbon Worms (Nemertea: Tetrastemmatidae: *Prostoma*) from Arkansas

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Running Title: Nemertea from Arkansas

Ribbon worms (Phylum Nemertea) are well known coelomate marine organisms; however, few biologists are aware of the presence of freshwater forms in North America (Gibson and Moore 1976, Sundberg and Gibson 2008). Members of this phylum are unique in having an eversible muscular proboscis that lies free inside of a rhynchocoel above the alimentary canal and is used for grasping prey (Hickman et al. 2011). Freshwater nemerteans are hermaphroditic and often protandric (Kolasa 1991). Ribbon worms have been previously reported from adjacent Louisiana (Harman 1962), Oklahoma (Harrell 1969) and Texas (Ziser 2011); however, to date, this phylum has not been documented from Arkansas despite numerous intensive aquatic macroinvertebrate surveys in the state by Cather and Harp (1975), Harp and Harp (1980), Farris and Harp (1982), Guntharp and Harp (1982), Huggins and Harp (1983), Cochran and Harp (1990), Chordas et al. (1996), and Harp and Robison (2006).

On 10 July 2011, 15 specimens of an unknown species of ribbon worm were collected from the Ouachita River at Little Hope Road, 0.4 km S of St. Hwy. 88 in Pine Ridge, Montgomery County (34.581364°N, 93.883678°W) (Fig. 1). Ribbon worms were collected in the main river from a shallow riffle where submerged plants of hornleaf riverweed, *Podostemum ceratophyllum* Michx., occurred abundantly. At the collecting site the water was 25 to 38 cm deep, the water temperature was 23.5°C, and the air temperature was 34°C. At this locale, the Ouachita River is characterized physicochemically by water temperatures ranging from near 0°C in winter months to 25°C in summer, dissolved oxygen of 9.5-11.4 mg/l, pH 6.9-7.1, alkalinity (total) 25.2- 36.8 mg/l, chloride 11.2-26.0 mg/l, total dissolved solids 14-53, turbidity (NTU) 2.0-4.2, hardness, Ca++, Mg++ of 28.2-36.9 mg/l, sulfates 3.7-56 mg/l, total phosphorus 0.029-2.033, and total suspended solids 3.0-5.1 (J Wise, *pers. comm*). While these data are not intended to be

Figure 1. The Ouachita River study site where *Podostemum ceratophyllum* (submerged and not visible) occurred abundantly.

indicative of physicochemical limits of this nemertean worm, they are suggestive of the general type of water quality found at this upland locality.

In our search for Arkansas ribbon worms we purposefully sought out *Podostemum* vegetation as this had been shown to be a reliable microhabitat for collecting nemerteans. The senior author (PGD) had previously collected nemerteans from the sediment attached to *Podostemum* in western North Carolina (Chattooga River) and northwestern Alabama (Cypress Creek, Lauderdale County and Gin Creek, Marion County). *Podostemum* has long been known as an important habitat for macroinvertebrates (Hutchens et al. 2004, Nelson and Scott 1962) but we know of no previous published reports linking ribbon worms to *Podostemum*. At the Ouachita River site, *Podostemum* was removed by hand from its attachment to rock in the flowing stream. Care was taken to acquire the sediment bound by *Podostemum* at the rock surface. Samples were placed in plastic bags, stored in a cooler, and processed in a motel room within several hours of collecting. Processing followed the procedure known

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as the oxygen depletion method (Schockaert 1996) described in some detail by Young (2001). Materials collected from the Ouachita River were placed in the bottom halves of six clear glass jars ranging in size from 0.96 to 7.6 l (1 qt to 2 gal). Stone weights (rocks of golf ball size and larger) were added to hold the vegetation in the lower half of the jars and the jars were then filled with habitat water. The stone weights prevent vegetation from rising and obscuring one's view. Within 5 hrs, 4 stagnant jars yielded a total of 10 nemerteans made visible with the aid of a strong light aimed through the backs and sides of the jars. The worms clung to the inner glass walls as they glided towards the water's surface. By the next morning, a total of 15 pinkish ribbon worms measuring 4 to 8 mm in length were collected by pipet and preserved in 70% v/v ethanol.

Figure 2. Ribbon worm collected from *Podostemum*. Scale bar = 1.5 mm.

Our collection of ribbon worms represents the first documentation of the Phylum Nemertea in Arkansas. Unfortunately, we were unable to determine the exact identity of ribbon worm (Fig. 2). Eight specimens were sent to C. Laumer for identification using DNA sequencing. Mr. Laumer reported (*pers. comm.*) that preliminary DNA analysis of the haplotypes from the Arkansas *Prostoma* specimens were identical to a particular haplotype seen elsewhere in the USA and Australia. He suggested that we use the name currently being listed in GenBank as *Prostoma* cf. *eilhardi* for the form we report herein.

Acknowledgments

We thank B. Crump, USDA Forest Service biologist, Ouachita National Forest, for her assistance in our quest to find *Podostemum* localities and ribbon worms in the Ouachita Mountains. Her professionalism, wide knowledge of the area, and enthusiasm for the project aided our effort immensely. In addition, we also thank G. Leeds, retired USDA Forest Service biologist, Ozark National Forest (ONF), L. Leeds, retired USDA Forest Service engineer (ONF), and J. Kremers, Clarksville, for assisting us in the Ozark Mountains. These knowledgeable individuals kindly showed us localities in the Ozarks, chauffeured us to the various sites, and ably assisted us in our collecting efforts. In addition, L. and S. Leeds graciously provided us food, shelter, and use of their home as our laboratory while in their company. Appreciation is also expressed to J. Wise (ADEQ) for supplying water quality data for the Ouachita River. Lastly, we wish to acknowledge two ribbon worm experts, C. Laumer (Harvard University), who conducted the DNA analyses and provided a name to use for this manuscript, and N. Van Steenkiste (Hasselt University, Belgium), who showed PGD his first freshwater nemertean and how to use the oxygen depletion method.

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