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Geographic Range Expansion and Feeding Response by the Leech *Macrobdella diplotertia* (Annelida: Hirudinea) to Wood Frog and Spotted Salamander Egg Masses

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The hirudinid leech *Macrobdella diplotertia* is the latest of four species of sanguivorus leeches within the North American genus *Macrobdella* (i.e., *M. decora*, Say, 1824; *M. sestertia*, Whitman, 1886; *M. ditetra*, Moore, 1936) to be described (Meyer, 1975). Following this species' description (Meyer, 1975) from specimens collected in Missouri (Osage County), the only additional locality records for *M. diplotertia* have come from three counties in Kansas (Klemm et al., 1979) and two counties in Arkansas (Turbeville and Briggler, 2003). In addition, the only information on any aspect of the biology of this leech is found in Turbeville and Briggler (2003) who observed feeding behavior in this species in several artificial ponds from Benton and Madison counties of northwestern Arkansas. These authors confirmed that *M. diplotertia* was a sanguivore (through human contact with the leech). They also witnessed *M. diplotertia* feeding on eggs of the green frog (*Rana clamitans*) and the southern leopard frog (*Rana sphenocephala*), although the actual feeding process was inconclusively documented. Herein, we report on an additional locality record for this species in Missouri, provide photographic details of the feeding response by *M. diplotertia* on wood frog (*Rana sylvatica*) and spotted salamander (*Ambystoma maculatum*) eggs, and introduce a common name for this leech.

The discovery of a population of *Macrobdella diplotertia* occurred on 12 March 2003 during a two-year herpetofaunal inventory of the Ozark National Scenic Riverways (OZAR), a riverine national park (Current and Jacks Fork rivers) located in south-central Missouri. A large population of this leech was observed by a six-member Arkansas State University research team in a single fishless pond during nocturnal aquatic sampling of several wildlife ponds in the Owls Bend Recreational Area (Shannon County) of OZAR. Most of the leeches were collected by dip netting as they routinely surfaced in a nearly vertical approach to the surface of the pond. They then quickly dove downward in a manner typical of the swimming activity of the central newt (*Notophthalmus viridescens louisianensis*), a syntopic salamander species observed at the pond. One major difference between the swimming styles of these two organisms is that *M. diplopteria* typically swims with an up-to-down motion (dorsal/ventral undulations), whereas *N. viridescens* swims with side-to-side (lateral undulations) movements. Only one additional sighting of this leech occurred during the survey and that was in a backwater area of the Current River in the Owls Bend area.

Sixteen leeches and 25 newts were collected and returned to the laboratory at Arkansas State University. Five adult leeches, however, were retained unfed in a 45 L water-filled aquarium in the laboratory for nearly six months.

On 24 February 2004, egg masses of the wood frog and the spotted salamander were collected from Stout Pond, a wildlife research pond located in the Sylamore Ranger District of the Ozark National Forest in Stone County, Arkansas (see Trauth et al., 2000). Egg masses were returned to the laboratory and kept cold for two days prior to leech feeding trials.

A staged leech feeding experiment occurred on 26 February 2004. All five leeches were placed in a plastic shoe box half filled with aquarium water. Then, a wood frog egg mass was lowered into the box. We used a digital camera to record predatory activity by the leeches (Figs. 1 and 2).

Leeches had an immediate feeding response to the wood frog egg cluster (Fig. 1A). One leech extended its body and began probing eggs with its head. As the leech became elongated, the posterior sucker was used to retain a secure attachment on the gelatinous surface of a single egg (Fig. 1B). The egg cluster was then rotated clockwise to provide a better visualization of the leech (Fig. 1C). Upon penetrating an individual egg jelly envelope, the leech encircled the developing embryo with the anterior 10 mm of its body. At this point, the mouth opened, and an entire embryo was consumed. Soon, all five leeches became intertwined within the egg cluster (Fig. 1D). We watched as several embryos were ingested. In one instance, an embryo was bitten in half with the remaining half being left behind by the leech. The leeches continued to forage within the egg cluster for several minutes.

We then placed a spotted salamander egg mass into the plastic box. Soon the leeches began forays away from the

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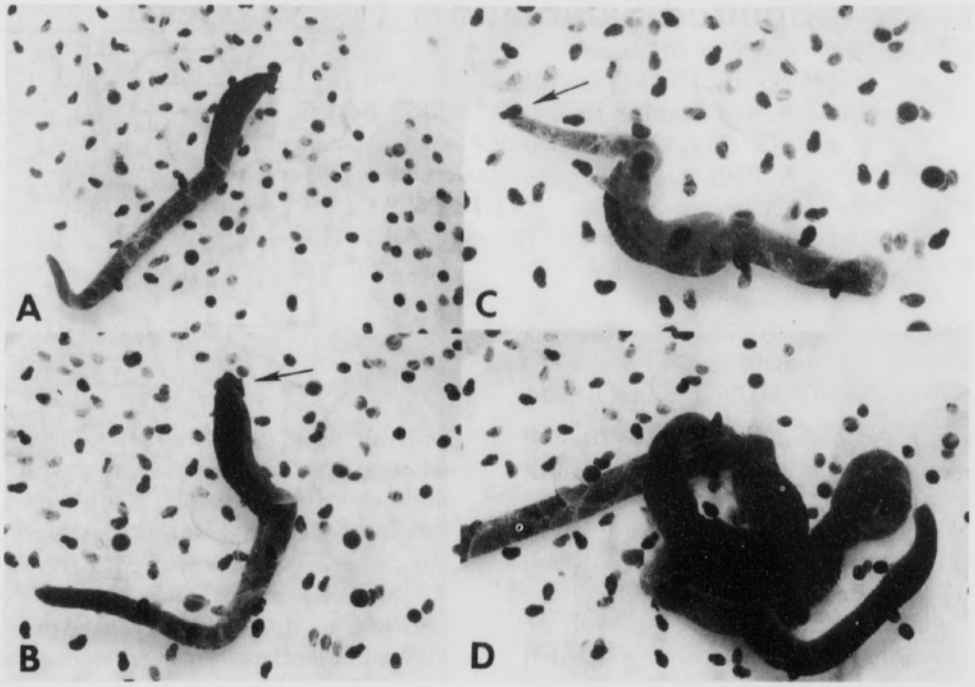

Fig. 1. Photos of *Macrobdella diplotertia* attacking wood frog (*Rana sylvatica*) eggs. A. Individual leech penetrating egg mass. B. Same leech as in A extending anterior region of body as posterior sucker (arrow) secures leech position. C. Same leech as in A and B with mouth beginning to open to consume embryo (arrow). D. Aggregate of five leeches consuming eggs.

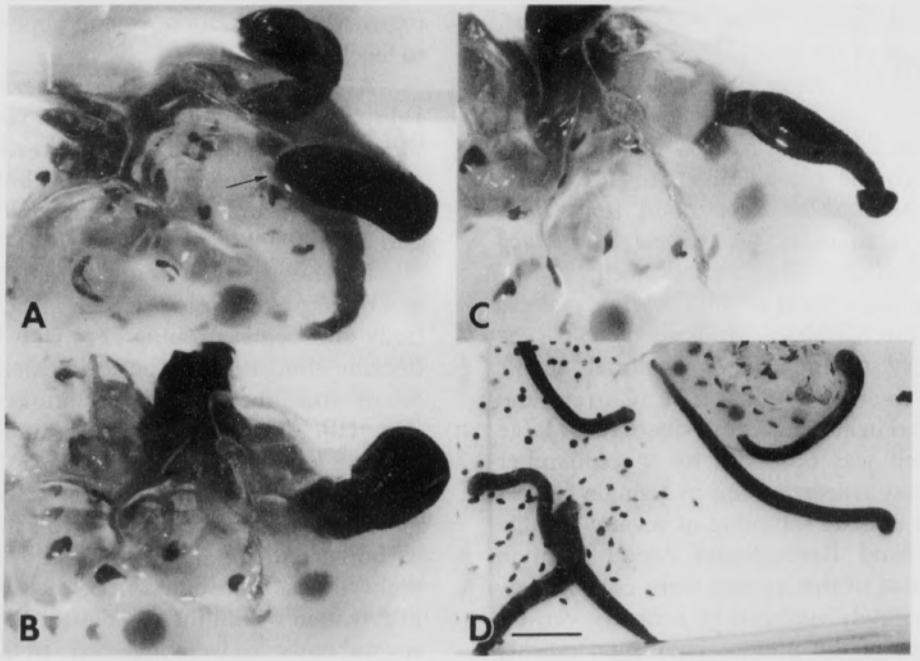

Fig. 2. Photos of *Macrobdella diplotertia* attacking spotted salamander (*Ambystoma maculatum*) egg mass. A. Leech on upper surface of egg mass begins entry into egg (arrow). B. Same leech as in A penetrates well into egg cluster. C. Same leech as in A and B with posterior sucker released from attachment to surface of egg cluster. D. Aggregate of five leeches with wood frog and spotted salamander egg masses. Line = 20 mm.

wood frog eggs and onto the spottted salamander egg mass. All but one of the leeches abandoned the wood frog mass attached themselves to the spotted salamander egg cluster. The more solid and durable gelatinous egg cluster of the spotted salamander proved to be more resistant to the probing activity of the leeches. Soon, however, all four leeches had secured an attachment or had penetrated the egg cluster. One leech near the upper surface of the egg mass (Fig. 2A) was examined closely as it penetrated the thick gelatinous egg envelope of this salamander (Fig. 2B and C). The leech eventually drew its entire body into the penetration hole created by its anterior end (Fig. 2C). We were unable to witness consumption of spotted salamander eggs due to the translucent nature of the egg cluster. Eventually, some of the leeches in the spotted salamander egg mass began forays back toward the wood frog egg cluster (Fig. 2D). The leeches were allowed to remain feeding on these amphibian eggs for several hours before finally being returned to their aquarium.

In summarizing the amphibian feeding preferences for the various species of *Macrobdella*, Meyer (1975) mentioned that *M. ditetra* and *M. decora* (according to Moore, 1923, 1953) will prey upon anurans and their eggs. Cargo (1960) also included spotted salamander eggs in the diet of *M. decora.* With the addition of our results to those of Turbeville and Briggler (2003), *Macrobdella diplotertia* is now known to consume the eggs of at least three ranid frogs (*R. clamitans, R. sphenocephala,* and *R. sylvatica*) and one ambystomatid salamander (*A. maculatum*). Because both amphibian species tested during the above feeding trial are sympatric with *M. diplotertia* within the Ozark Plateau ecoregion of Missouri and Arkansas, we suggest that "Ozark Highlands" leech be an acceptable common name for this hirudinid leech.

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