

# ***BRACKENRIDGIA ASHLEYI* (ISOPODA: TRICHONISCIDAE): RANGE EXTENSION WITH NOTES ON ECOLOGY**

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**Abstract:** We collected *Brackenridgia ashleyi* from ten caves in Arkansas and Missouri. From the type locality at Tumbling Creek Cave, Taney County, Missouri, we extended the range of the species 138 km north-northeast into Pulaski County, Missouri, 67 km south-southwest into Newton County, Arkansas, and 96 km southeast into IZARD County, Arkansas. The new records reported here, in combination with detection of this species at previously inventoried sites, suggest that this species is widely distributed in the Ozarks. However, the relatively intensive sampling efforts required indicate the *B. ashleyi* is rare and easily overlooked.

## INTRODUCTION

The genus *Brackenridgia* (Isopoda: Trichoniscidae) includes ten species, nearly all described from subterranean habitats, mostly in the western United States and Mexico (Lewis, 2004). With the exception of *B. heroldi* in California, all of the species are troglolobionts (Sket, 2008) and occur in widely separated karst areas. *Brackenridgia cavernarum* has the widest distribution, known from two areas in Texas and one location in New Mexico (Lewis, 2004). Three species are known from individual caves: *B. sphinxensis* (Arizona; Shultz, 1984), *B. palmitensis* (Mexico; Reddell, 1981, p. 95), and *B. ashleyi* described on the basis of specimens from Tumbling Creek Cave, Taney County, Missouri, by Lewis (2004).

In Missouri, trichoniscid isopods were reported from Tumbling Creek Cave, Missouri (Craig, 1975; Gardner, 1986), and these specimens ultimately were included in the description of *B. ashleyi* by Lewis (2004). In addition to *B. ashleyi*, other trichoniscids have been recorded from caves in the Ozark ecoregion of Arkansas, Missouri, and Oklahoma. Gardner (1986) reported, from several caves in Carter, Crawford, Howell, and Taney counties in the Missouri Ozarks, *Miktoniscus* and *Amerigoniscus* (as *Caucasonethes*; North American *Caucasonethes* were placed in *Amerigoniscus* by Vandel (1950, 1977)). In Arkansas, *Miktoniscus* has been reported from Clay Cave, IZARD County (McDaniel and Smith, 1976), and from Foushee Cave, Independence County (Youngsteadt and Youngsteadt, 1978). Recent records of trichoniscids in Arkansas (Graening et al., 2007) include *Brackenridgia* from a cave in Marion County, *Haplothalmus danicus* from a cave in Benton County, and *Miktoniscus* (determined by G. Schultz) from single caves in Newton and Searcy counties. We report new records from caves in Missouri and Arkansas, broadening the range of *B. ashleyi* to include much of the central Ozarks and changing its global conservation status, an assessment of extinction risk as defined by NatureServe (2011), through addition of new localities.

## MATERIALS AND METHODS

During 2003–2009, we collected *B. ashleyi* from caves in Missouri and Arkansas. Usually, we discovered individuals by visually inspecting woody debris, animal feces, or other organic material. In several caves, we recorded soil temperature (2 cm below the surface), air temperature (10 cm above the surface), and relative humidity to further define the habitats that yielded trichoniscid isopods. We preserved specimens in 70 to 80% ethanol and sent them to J. J. Lewis for identification. Specimens from Arkansas were deposited in the University of Arkansas Arthropod Museum, Fayetteville. Specimens from Missouri were deposited in the Crustacean Collection at the Illinois Natural History Survey, Champaign.

## RESULTS

New localities and records for *Brackenridgia ashleyi*—Arkansas: IZARD County, Clay Cave, 10 July 2008, M. Slay and M. Kottmyer, 1 individual (Dark 2). Marion County, Forest Trail Ridge Cave, 8 June 2004, M. Slay and C. Bitting, 1 individual (087 Hand); 12 June 2008, M. Slay, D. Fong, and M. Kottmyer, 11 individuals; Forest Trail Pit, 11 June 2008, M. Slay, D. Fong, and M. Kottmyer, 2 individuals; Overlook(ed) Cave, 11 June 2008, M. Slay, D. Fong, and M. Kottmyer, 2 individuals. Newton County, Toney Barnes Cave, 16 September 2004, M. Slay and C. Bitting, 1 individual. Stone County, Blanchard Springs Caverns, 11 March 2009, M. Slay and M. Kottmyer, 3 individuals (Dripstone Tour behind first set of bleachers); Rowland Cave, 14 August 2008, M. Slay, C. Slay, and M. Kottmyer, 6 individuals (start of Breakdown passage), 1 ovigerous female (between station

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D and station E); Upper Shelter Cave, 11 July 2008, M. Slay and M. Kottmyer, 12 individuals. Missouri: Pulaski County, Andy's Cave #2, 11 April 2004, S. Taylor, M. Slay, and JoAnn Jacoby, 6 individuals (335 Hand); Martin Cave, 23 March 2003, S. Taylor and V. Block, 1 individual (MAR-002 Hand), 29 March 2003, S. Taylor and V. Block, 1 individual (362 Hand), 1 individual (316 Hand).

New localities and records for *Brackenridgia* sp.—Arkansas: Marion County, Morning Star Mine #6, 26 May 2004, M. Slay and C. Bitting, 1 individual (034 Hand); Toney Bend Mine #3, 23 July 2004, M. Slay and C. Bitting, 4 individuals (122 Hand), 3 individuals (120 Hand). Missouri: Pulaski County, Wilson Cave, 5 January 2004, S. Taylor and M. Slay, 1 individual (093 Hand), 8 January 2004, S. Taylor and M. Slay, 2 individuals (159 Hand).

In Rowland Cave, we collected *B. ashleyi* on moist soil mixed with old bones of bats, organic debris, and rocks. In Clay Cave, we collected specimens on clay floors from old, blackened, damp wood full of casings and feces. Similarly, in Blanchard Springs Caverns, we collected individuals from damp pieces of decayed wood; however, the pieces of wood were on top of rocks in a large pile of breakdown blocks. In Pulaski County, Missouri, we always collected the species on clay floors, sometimes with scattered bat guano present. All of our collections and observations of this isopod occurred in sections of caves characterized by complete darkness. In four caves (Clay Cave, Forest Trail Ridge Cave, Martin Cave, and Rowland Cave), we recorded temperature and relative humidity at locations where *B. ashleyi* was present. Average temperature of the soil ( $n = 14$ ) was  $13.6\text{ }^{\circ}\text{C}$  ( $\text{SE} \pm 0.3\text{ }^{\circ}\text{C}$ ) with a range of  $12.1\text{--}16.6\text{ }^{\circ}\text{C}$ . Average temperature of the air ( $n = 13$ ) was  $14.3\text{ }^{\circ}\text{C}$  ( $\text{SE} \pm 0.3\text{ }^{\circ}\text{C}$ ) with a range of  $13.1\text{--}17.1\text{ }^{\circ}\text{C}$ . Average relative humidity ( $n = 13$ ) was  $94.6\%$  ( $\text{SE} \pm 1\%$ ) with a range of  $85.5\text{--}98.2\%$ .

Collectively, we observed the species during all seasons and in eight (January, March, April, May, June, July, August, and September) of the twelve calendar months. In Martin Cave, we consistently observed the species during four visits over a period of nineteen months (documenting it in March 2003 and January, May, and September 2004). In Blanchard Springs Caverns, we observed it twice over a five-month period (March and July 2009). At a smaller time scale, daily visits to several caves in Arkansas over a period of five days in June 2008 yielded some consecutive observations of *B. ashleyi*. In Forest Trail Pit, we observed individuals the first four days, but not the final day. In Overlook(ed) Cave, we observed individuals the first three days, but not the last two days.

Overall, when any individuals were found, the number was low, with fewer than five individuals observed 87% of the time. Of 30 observations, 17 detected a single individual, 9 detected two to four individuals, and 4 yielded

more than five individuals. We observed the greatest numbers of individuals in Rowland Cave, Forest Trail Ridge Cave, and Upper Shelter Cave, where ten, eleven, and twelve individuals of *B. ashleyi* were observed, respectively.

Bioinventories in Pulaski County, Missouri, included fifty-seven caves, thirty-three of which were visited on more than one occasion for bioinventory using timed-area searches, pitfall trapping, or quadrat sampling. Qualitative sampling was conducted at the remaining caves, but this isopod was only detected in three of the caves in Pulaski County.

## DISCUSSION

*Brackenridgia ashleyi* is now confirmed from ten additional sites in Arkansas and Missouri, and these new locations extend the range of the species 138 km north-northeast into Pulaski County, Missouri, 67 km south-southwest into Newton County, Arkansas, and 96 km southeast into IZard County, Arkansas, from the type locality at Tumbling Creek Cave, Taney County, Missouri (Fig. 1). Specimens of *Brackenridgia* were collected from three other caves, but these individuals could not be identified to species. It is possible that these three caves also are locations for *B. ashleyi*, but additional specimens are needed for confirmation. Earlier records attributed to other genera may, in part, be misidentifications of *B. ashleyi* (such as records of *Miktoniscus* in Arkansas and Missouri; Lewis, 2004). Several caves where we recorded this species had been sampled previously for macroinvertebrates, notably Blanchard Springs Caverns and Rowland Cave, which were inventoried by Graening et al. (2003). The new records reported here, in combination with detection of this species at previously inventoried sites, suggest that this species is widely distributed in the Ozarks. However, the relatively intensive sampling efforts required indicate the *B. ashleyi* is rare and easily overlooked.

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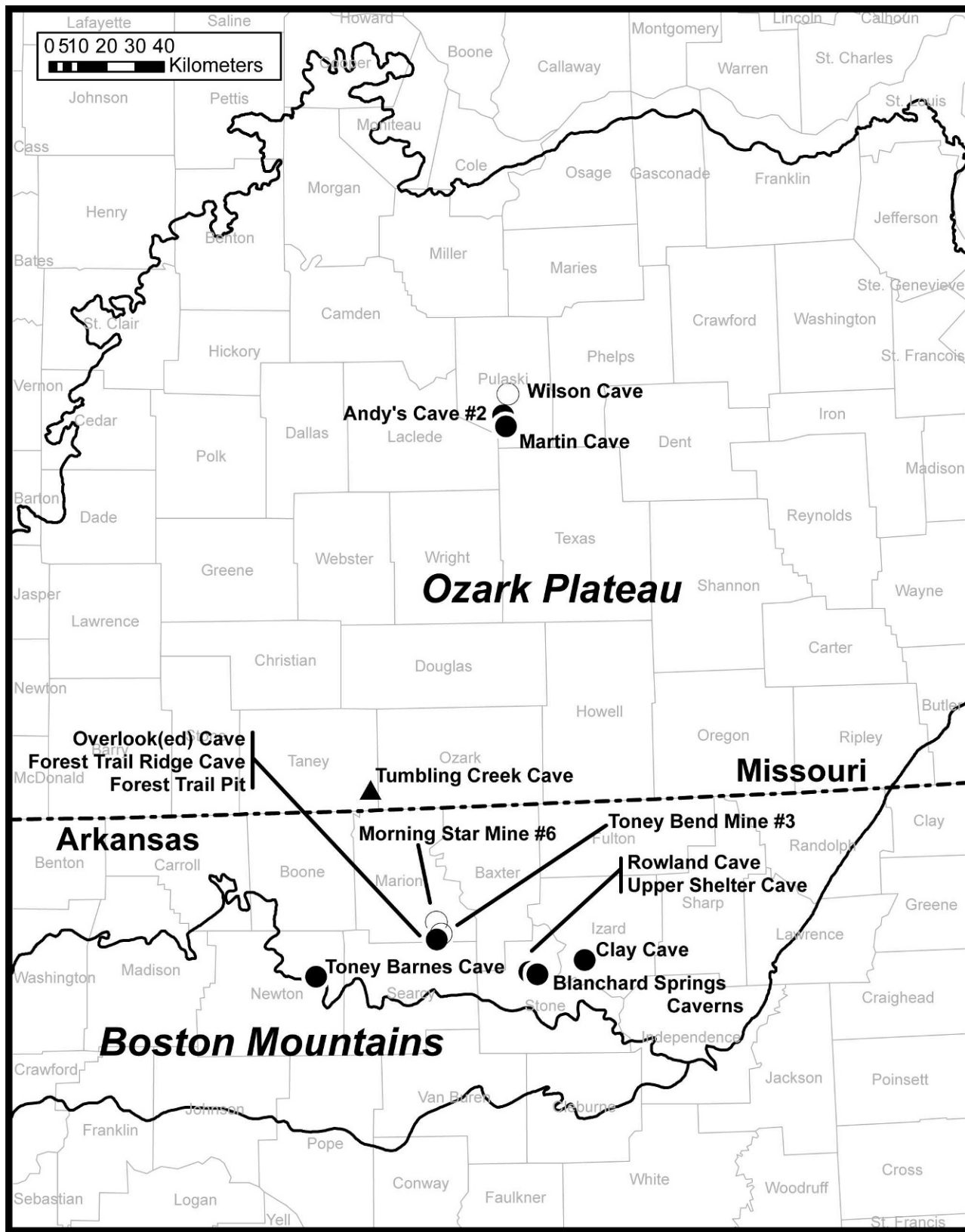


Figure 1. Known distribution of *Brackenridgia ashleyi* (closed circles, triangle) showing type locality (triangle) and *Brackenridgia* sp. (open circles, material probably attributable to this species).

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