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Annotated Checklist of the Amphipoda of Arkansas with Emphasis upon Groundwater Habitats

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Abstract

Based on recent collections and review of the literature, 20 species of freshwater amphipod crustaceans are listed from the state of Arkansas. Included are species from the families Allocrangonyctidae, Crangonyctidae, Gammaridae and Hyaellidae and the genera *Allocrangonyx*, *Bactrurus*, *Crangonyx*, *Stygobromus*, *Gammarus*, and *Hyaella*. Ten of the species are restricted to subterranean groundwaters, 2 are closely associated with groundwater but also occur in surface waters, and 8 are known primarily from surface waters. Two of the species are in the process of being described in the literature, whereas 2 remain only provisionally recognized to date. On the basis of this new list, some revisions to the current rarity rankings are recommended.

Introduction

All records of Amphipoda in Arkansas are summarized, including new state, county, and site records. More than one-half of all species recorded from the state are closely associated with groundwater habitats and the majority of them are stygobites. These species are typically troglomorphic (i.e., eyeless, unpigmented) and obligatory to subterranean groundwaters. The principal groundwater habitats investigated in Arkansas include streams and pools in caves, water wells and the outflows of springs and seeps. Collections were made by hand using pipettes, dip nets, aspirators, and occasionally bait traps consisting of mesh bags filled with leaves. Specimens collected during this study were preserved in 70-90% ethanol, and most are in the research collection of Holsinger. All of this material will eventually be deposited in the Smithsonian Institution's National Museum of Natural History (USNM). Taxonomic identifications were performed by Holsinger, with assistance from Slay and S. Longing (University of Arkansas). Taxonomic keys used included those in Holsinger (1967, 1972) and in unpublished manuscripts. Records of amphipoda from all available literature sources were also reviewed, summarized, and cited, as well as those from unpublished sources including the Natural Heritage Database maintained by the Arkansas Natural Heritage Commission (ANHC, C. Osborne, data manager) and the Subterranean Amphipod database (in progress) at Old Dominion University, Norfolk, Virginia (searchable

on the Internet at the following address, (URL = <http://web.odu.edu/sci/biology/amphipod/>). Amphipod records published by others are cited after each occurrence; all other records are unpublished data of the authors and colleagues.

List of All Amphipod Taxa Recorded at Present from the State of Arkansas

Family Allocrangonyctidae Holsinger, 1989

Allocrangonyx hubrichti Holsinger, 1971

White County: M. Longley's well in the town of Romance, 6 Nov. 1996, 1 male (Robison and Holsinger, 2000). *Allocrangonyx hubrichti* is also reported from caves and the hyporheic habitat (subterranean underflow) of surface streams in 14 counties in Missouri (Holsinger, 1989; Sarver and Lister, 2004).

Family Crangonyctidae Bousfield, 1973

Bactrurus pseudomucronatus Koenemann and Holsinger, 2001

Lawrence County: "deep cistern, 5 miles south of Imboden" 16 Sept. 1940, 1 male collected by B. Marshall in USNM (Koenemann and Holsinger, 2001). **Randolph County:** Mansell Cave (Koenemann and Holsinger, 2001). *Bactrurus pseudomucronatus* is also reported from Missouri but

it is restricted to the Salem Plateau subcoregion of both states (Koenemann and Holsinger, 2001). Dunivan et al. (1982) mistakenly referred to the Mansell Cave population of this species as *Batrurus mucronatus* (Forbes, 1876) but this record was for the closely similar *B. pseudomucronatus*. *Batrurus mucronatus* is recorded from subterranean groundwaters, primarily from drain tile outlets, in glacial drift areas in Illinois, Indiana, Iowa, Michigan, and Ohio (Koenemann and Holsinger, 2001).

Batrurus speleopolis Holsinger et al., 2006

Marion County: Marble Falls Cave, 7 Sep. 2001, 3 counted in subterranean stream and 1 collected by Graening and Slay. **Sharp County:** Cave City Cave, 13 Dec. 2001, 20 counted and 6 collected by Graening, D. Fenolio, and J. Stark; 23 Nov. 2002, 25 counted by Graening and D. Fenolio; 11 Dec. 2004, 8 counted by S. Wallace.

Batrurus sp. (unidentified)

Independence County: Cave Spring Cave, 5 Oct. 2002, 2 collected by Graening, S. McGinnis, H. Bryant, and C. Blevins.

Crangonyx aka Zhang and Holsinger, 2003

Crangonyx aka is known only from central Arkansas and from only 4 collections: 1 stream in Pope County; 2 streams in Van Buren County; and 1 seep in Saline County—"seep 0.8 km S of Hector on state rd. 27" (Zhang and Holsinger, 2003).

Crangonyx forbesi (Hubricht and Mackin, 1940)

Fulton County: Mammoth Spring; "small spring near Mammoth Spring" (Zhang and Holsinger, 2003). **Independence County:** Cave Spring Cave, 5 Oct. 2002, 32 counted and 2 collected by Graening, S. McGinnis, H. Bryant, and C. Blevins. **Lawrence County:** "spring 3.7 miles south of Imboden" (Hubricht, 1943). **Sharp County:** Eckel Cave, 22 Nov. 2002, 1 collected by Graening and D. Fenolio. Although not a stygobite, *C. forbesi* is commonly found in cave streams and springs in Kansas, Kentucky, Illinois, Indiana, Missouri, Ohio, and Oklahoma. It is also reported from a number of surface streams and occasionally ponds. Many of the cave populations show some degree of morphological modification for a subterranean existence (Hubricht, 1943; Zhang and Holsinger, 2003).

Crangonyx minor Bousfield, 1958

Greene County: "seep 8.0 km N of Brookland" (Zhang and Holsinger, 2003). *Crangonyx minor* is also reported from

Illinois, Iowa, Kentucky, Ohio, Oklahoma, Tennessee, and southern Ontario and inhabits a variety of aquatic habitats including small streams, sloughs, ditches, drains, springs, and ponds (Bousfield, 1958; Zhang and Holsinger, 2003).

Crangonyx obliquus (Hubricht and Mackin, 1940)

Crangonyx obliquus is recorded from surface waters in the following Arkansas counties: Faulkner, Jefferson, Johnson, Monroe, Perry, Phillips, and Yell (Hubricht and Mackin, 1940; Hubricht, 1943; Zhang and Holsinger, 2003). This species is largely restricted to the Coastal Plain of the south-central United States (Zhang and Holsinger, 2003). It was incorrectly listed as a troglophile [stygophile] in the cave fauna of Arkansas by McDaniel and Smith (1976).

Crangonyx pseudogracilis Bousfield, 1958

Boone County: "large spring near Willcockson", 8 April 1939 (Zhang and Holsinger, 2003). *Crangonyx pseudogracilis* is recorded from surface waters in the following Arkansas counties: Arkansas, Ashley, Calhoun, Conway, Cross, Dallas, Faulkner, Garland, Grant, Jackson, Jefferson, Johnson, Lawrence, Monroe, Nevada, Ouachita, Perry, Phillips, Pulaski, Union, and Yell (Zhang and Holsinger, 2003). *Crangonyx pseudogracilis* is widely distributed in southern Canada and east-central United States (Bousfield, 1958; Zhang and Holsinger, 2003). Earlier Arkansas records for *Eucrangonyx gracilis* by Hubricht and Mackin (1940) and *C. gracilis gracilis* by Hubricht (1943) refer to *C. pseudogracilis* as presently understood.

Stygobromus alabamensis sensu latu (Stout, 1911)

Baxter County: Norfork Bat Cave, 13 Sep. 2000, 20 counted by Graening and B. Wagner (Graening et al., 2004). **Benton County:** Cold Cave, 10 April 2000, 50 counted by Graening and Slay; "seep near Big Spring, Bella Vista" (Holsinger, 1967). **Boone County:** "seep 9 miles southwest of Harrison" (Holsinger, 1967). **Carroll County:** cave on North Boundary Trail, 12 Aug. 2000, 11 counted in drip pool by Graening; Huckleberry Point Cave, 18 Sep. 2002, 1 collected by B. Wagner; sampling site on Kings River, 6 March 2002, several collected by Slay and A. Brown. **Crawford County:** US Forest Service cave # 230109, 9 April 2000, 4 collected in drip pool by Slay and J. Briggler; US Forest Service cave #23040, 9 April 2000, 2 collected by Slay and J. Briggler. **Independence County:** (Holsinger, 1967). **Izard County:** Bergren Cave, 16 Aug. 2002, 1 collected by Graening and R. Schroeder; Donovan Cave, 1976, reported as *Stygobromus* sp. in McDaniel and Smith (1976); Needles Cave, 7 June 1975 (Smith, 1977), and 1 Feb. 2003, 10 counted and 5 collected by Graening, Slay, and E. Corfe. **Jackson County:** Mason's Cave (McDaniel et al.,

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1979; this study); "spring 1.5 miles southwest of Olyphant" (Holsinger, 1967). **Logan County:** "seep 0.6 miles east of Magazine Mt. Lodge" (Holsinger, 1967). **Madison County:** Simpson's Cave, 9 July 2000, 100 counted by Graening and S. McGinnis; Wounded Knee Cave, 27 May 2001, 2 collected by Graening and C. Brickey. **Marion County:** Coon Cave, 14 Sep. 1979 (Welbourn and Lindsley, 1979); Elm Cave, 16 Nov. 2001, 1 collected by Graening and B. Sasse; Middle Creek Spring Cave, 15 July 1977 (Lindsley and Welbourn, 1977). **Montgomery County:** Brier Springs and Rattlesnake Springs, collected by H. Robison. **Newton County:** Cave Mountain Cave, 29 June 2001, 4 collected by C. Bitting; Chilly Bowl Cave, 4 Aug. 2001, 1 collected by Slay, C. Brickey, and M. Covington; Copperhead Cave, 14 Nov. 1999, 1 collected by Slay; Corkscrew Cave (Youngsteadt and Youngsteadt, 1978); Friday the 13th Cave, 15 April 2000, 10 counted by Slay and S. Allen; Lewis Spring Cave, 1976 (Youngsteadt and Youngsteadt, 1978); Mr. Clean Cave, 6 July 2001, 2 counted in drip pools, 1 collected by Slay and C. Bitting; Saltpeter Cave, 17 March 2002, 50 counted and 2 collected by Slay and M. Covington; Stillhouse Hollow Cave, 23 June 2001, 10 counted and 2 collected by Graening, Slay, and C. Bitting; Tom Watson's Bear Cave, 26 Jan. 2002, 4 collected by Slay, C. Brickey, and M. Ross; "seep 9.6 miles south of Boxley" (Holsinger, 1967); "seeps 4 miles south of Boxley" (Holsinger, 1967); "seeps below Lookout Point, 7 miles south of Jasper" (Holsinger, 1967); Wolf Creek Cave, 14 Jan. 2000, 1 collected by Graening and R. Redman. **Searcy County:** Big Creek Cave, 16 March 2002, 13 counted by Graening and C. Brickey (Graening et al., 2004); "seeps 3.0 miles east of Harriet" (Holsinger, 1967); "small seep 4.1 miles west of Marshall" (Holsinger, 1967); Wood's Hollow Cave #1, 16 March 2002, 10 counted and 1 collected by Graening and C. Brickey (Graening et al., 2004). **Stone County:** Bald Scrappy Cave (McDaniel and Smith, 1976); Biology Cave, 23 May 1981 (Welbourn, 1983), and 17 Sep. 2000, 2 counted by D. Fenolio, C. Brickey, and S. Longing (Graening et al., 2004); Blanchard Springs Caverns, 1976 (McDaniel and Smith, 1976); Breakdown Cave, 17 May 1980, R. Schroeder (Welbourn, 1980); Gunner Cave, 17 May 1980 (Welbourn, 1980); Hammer Springs Cave, 26 April 1980, Jagnow, Welbourn, and Blore (Welbourn, 1980); Martin Hollow Cave, 14 Oct. 2000, 3 collected by Graening, Slay, M. Covington, C. Brickey, and J. Gunter; Saltpeter Cave, 31 March 2002, 1 collected by Graening, D. Fenolio and C. Brickey (Graening et al., 2004); "seep near Blanchard Falls" (Holsinger, 1967). **Van Buren County:** "seep 5.5 miles north of Winslow" (Holsinger, 1967). **Washington County:** seep on M. Evan's property, 1 March 2002, 3 collected by Graening and Slay; spring at Bradley Shelter, 2 April 2000, 30 counted and 2 collected by Graening and Slay; storm sewer under University of Arkansas Physics Building, 17 Feb. 2003, 2 collected by Graening and D.

Fenolio. *Stygobromus alabamensis* is also reported from numerous groundwater habitats in Alabama, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and Texas, and it is the most widely distributed stygobitic species in North America (Holsinger, 1967).

Stygobromus elatus (Holsinger, 1967)

Stygobromus elatus is known only from a single site in Logan County: "seep 0.2 miles east of Magazine Mt. Lodge," 4 May 1940, 4 deposited in USNM by L. Hubricht (Holsinger 1967), and 1 April 1980, K. Smith (ANHC 2001). There is a strong possibility that this species is synonymous with *Stygobromus alabamensis* (see above) (Holsinger, in manuscript).

Stygobromus montanus (Holsinger, 1967)

Stygobromus montanus is known only from Polk County in 2 springs at Queen Wilhelmina State Park on Rich Mountain, 26 April 1936, 20 collected by L. Hubricht (Holsinger, 1967), and 22 April 1981, 9 collected by K. Smith and J. Rettig (ANHC, 2001).

Stygobromus onondagaensis (Hubricht and Mackin, 1940)

Benton County: Arkansas Archaeological Survey Site #3BE532, 9 Nov. 1999, 1 collected by Graening and M. Evans; Big Spring, 7 July 2000, 1 collected by Graening and Slay; Cave Springs Cave, 1968, T. Poulson, M. Cooper, and R. Norton; Tanyard Creek Nature Trail Cave, 5 Jan. 2003, 5 counted and 1 collected by Graening and S. McGinnis. *Stygobromus onondagaensis* is relatively common in caves in Missouri and is also recorded from caves in the adjacent states of Kansas and Oklahoma (Hubricht, 1943; Holsinger, in manuscript).

Stygobromus ozarkensis (Holsinger, 1967)

Benton County: Bear Hollow Cave, 7 Dec. 2000, 8 counted and 1 collected by Slay and Graening; Blowing Springs Cave, 27 Sep. 2001, 1 collected by Slay, L. Moritz, and M. Covington; Cave Springs Cave, 30 Oct. 1972, J. Holsinger (Holsinger, 1972), and 30 Nov. 2000, 1 counted by Graening; Civil War Cave, 23 Nov. 1999, 200 counted and 2 collected by Graening, A. Brown and Slay, and 29 Oct. 2000, 14 counted by Slay, Graening, and A. Brown; Dickerson Cave, 19 April 1980, A. Brown and M. Schram (Schram, 1980), and 8 Oct. 1999, 1 counted by Slay; Logan Cave, K. Herbert (Herbert, 1994), and 15 Dec. 1999, 1 counted by Graening, and 21 Nov. 2000, 2 counted by Graening and Slay; Old Pendergrass Cave, 10 Dec. 1999, 2 collected by Graening and Slay, and 24 April 2000, 1 counted by Graening and B. Wagner; Spavinaw Creek

Cave, 1 Sept. 1999, 2 collected by Slay; Tom Danforth Cave, 14 Oct. 1963, 1 collected by D. Martin (Holsinger, 1967); War Eagle Cavern, 11 Feb. 2000, 1 collected by Graening and S. McGinnis, and 11 May 2001, 2 counted by A. and C. Brown. **Carroll County:** cave above Black Bass Lake, 11 Oct. 2002, 1 collected by Graening and D. Renko; "White River below Beaver Dam" (Schram, 1982). **Izard County:** Clay Cave (McDaniel et al. 1979); Needles Cave, 1 Feb. 2003, 1 collected by Graening, Slay, and E. Corfey. **Madison County:** Hunter's Cave, 28 April 2001, 1 collected by Graening and J. Gunter; War Eagle Cave, 6 Aug. 1978, M. Schram (Schram, 1983); Withrow Springs Cave, 2 collected by M. Schram (Schram, 1983). **Marion County:** Boat Creek Mine, 5 Aug. 2002, 2 collected by Slay, C. Bitting and M. Taylor; Reed Cave, 9 March 2002, 1 collected by Graening and S. McGinnis. **Newton County:** Fitton Cave, 1982, L. Willis, and 15 Jan. 2000, 1 collected by Graening and R. Redman, and 13 May 2001, 3 counted by Graening and C. and C. Bitting; Fitton Spring Cave, 5 Oct. 2000, 6 counted and 3 collected by Slay and C. and C. Bitting; John Eddings Cave, 21 Sep. 2000, 1 counted by Graening, Slay, and C. Bitting; Pretty Clean Cave, 7 July 2001, 1 collected by Slay and C. Bitting; Sherfield Cave, 10 June 2000, 2 collected by Graening; Walker Mountain Overflow Cave, 19 March 1983, 1 collected by A. Grubbs. **Stone County:** Flitterin' Pit, 24 Nov. 2002, 1 collected by Graening, D. Fenolio, and C. Brickey. **Washington County:** Copperhead Spring, 28 Nov. 2000, 4 counted by Slay and J. Gunter. *Stygobromus ozarkensis* is also reported from Missouri and Oklahoma but it is restricted to the Ozark Plateaus ecoregion of all three states (Holsinger, 1967). Earlier Arkansas records for *S. clantoni* from Clay Cave by McDaniel et al. (1979), from Fitton Spring Cave by Lindsley (1977), and from John Eddings Cave by Welbourn and Lindsley (1979) are erroneous and refer to *Stygobromus ozarkensis* as presently understood (Holsinger, in manuscript). *Stygobromus clantoni* (Creaser, 1934) was previously reported in Arkansas by Mackin and Hubricht (1940) and Hubricht (1943), but all of these records have since been attributed to other species of *Stygobromus*. However, *S. clantoni* is authentically recorded from caves and water wells in nearby Kansas and Missouri (Holsinger, 1967; in manuscript).

Stygobromus sp. nov. Holsinger, in manuscript

Carroll County: Blowing Springs Cave, 28 April 2001, 20 counted by Graening, J. Gunter, R. Honebrink, and B. Wagner (Graening et al., 2004). **Independence County:** Cave Spring Cave, 5 Oct. 2002, 1 collected by Graening, S. McGinnis, H. Bryant, and C. Blevins; Chinn Springs Cave, 10 Nov. 2000, 5 counted and 1 collected by Graening, E. Corfey, and B. Wagner; Blowing (Dozen's Den) Cave, 12 Dec. 2000, 6 counted by Graening, Slay, and B. Wagner.

Marion County: Reed Cave, 15 Nov. 2001, 3 counted and 1 collected by Graening, T. Snell, and P. Shurgar. **Sharp County:** Cave City Cave, 23 Nov. 2002, Graening and D. Fenolio, 1 collected; Eckel Cave, 22 Nov. 2002, 1 collected by Graening and D. Fenolio. **Stone County:** Nesbitt Spring Cave, 30 March 2002, 1 collected by Graening, Slay, B. Wagner, and C. Brickey; Rowland Cave, 5 Oct. 2001, 2 collected by Graening, Slay, D. Taylor, and W. Meurer (Graening et al., 2004). This new species of *Stygobromus* is also recorded from many caves in Missouri but is restricted to the Ozark Plateaus ecoregion in both states (Holsinger, in manuscript).

Stygobromus sp. nov.

Montgomery County: Boxx Springs, 19 June 1996, 6 specimens collected by H. Robison. This is a provisionally recognized undescribed new stygobitic species distinguished by a sexually dimorphic male gnathopod 2 and the absence of a ramus from uropod 3 (Holsinger, unpublished data).

Stygobromus sp. (unidentified)

Benton County: Congo Crawl, 1 May 2001, 1 counted by Slay and A. Brown. **Madison County:** Pine Creek Cave, 11 Feb. 2000, 1 counted by Graening and Slay; Womack Spring Cave, 6 Dec. 2000, 1 collected by Graening and C. Brickey. **Marion County:** Rush Landing Spring Cave, 26 March 1977 (Lindsley and Welbourn, 1977). **Newton County:** Stockman Cave, 11 Dec. 2004, 3 collected from drip pools by Graening and D. Fenolio; Walnut Cave, 13 July 1977 (Lindsley and Welbourn, 1977). **Searcy County:** Back o' Beyond Cave, 31 March 2001, 1 counted by Slay and C. Bitting. **Stone County:** Herald Hollow Cave, 23 March 2001, 3 counted by Graening and Slay (Graening et al., 2004). Most of these specimens could not be positively determined because they were sexually immature or damaged.

Synurella bifurca (Hay, 1882)

Jackson County: "spring 1.5 miles southwest of Olyphant" (Hubricht and Mackin, 1940). *Synurella bifurca* is also reported from surface water habitats in the following Arkansas counties: Calhoun, Craighead, Cross, Dallas, Jefferson, Lawrence, Monroe, Phillips, and Pulaski. *Synurella bifurca* is a widespread epigeal species in the southern United States and commonly occurs throughout much of Louisiana and Mississippi (Hubricht and Mackin, 1940; Hubricht, 1943; Holsinger, 1972).

Family Gammaridae Latreille, 1802

Gammarus minus sensu lato Say, 1818

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Benton County: Big Spring, Bella Vista (Hubricht, 1943); Cave Springs Cave and spring run, 1 Dec. 1996 and 4 Nov. 1999, 1 to 100 individuals per square meter in cave stream resurgence counted by Graening; Logan Cave and spring run, 7 Nov. 1982, 407 counted by L. Willis (Brussock et al., 1988), and 24 May 2002, 4 counted by Graening; "spring, 2 miles south of Gentry" (Hubricht, 1943); "rocky creek and spring 1 mile south of Missouri-Arkansas state line on U.S. Hwy. 59" (Reimer, 1969). **Boone County:** "large spring near Willcockson" (Hubricht and Mackin, 1940). **Fulton County:** Mammoth Spring (Hubricht and Mackin, 1940). **Independence County:** Cushman Cave, 26 Jan. 2001, 1,000 counted by Graening, C. Brickey, and E. Corfey. **Izard County:** cave on Mr. Griffin's property, 25 June 2002, 8 collected by B. Wagner; Needles Cave, 7 June 1975 (Smith, 1977), and 1 Feb. 2003, 500 counted and 6 collected by Graening, Slay, and E. Corfey. **Marion County:** Cold Spring, 1 Oct. 1979 (Welbourn and Lindsley, 1979); Rush Spring (Welbourn and Lindsley, 1979); Wishbone Spring, 23 March 1977 (Lindsley and Welbourn, 1977). **Newton County:** Flowstone Facade Cave, 5 Oct. 2000, 50 counted and 1 collected by Slay and C. Bitting; John Eddings Cave, 31 Oct. 1979 (Welbourn and Lindsley, 1979); Sprite Cave, 16 March 2002, 30 counted and 18 collected by Slay and M. Covington. **Searcy County:** Blowing Spring Cave, 12 Dec. 2001, 100 counted and 7 collected by Graening and D. Fenolio (Graening et al., 2004); resurgence of Hurricane River Cave (Hubricht, 1943). **Stone County:** Martin Hollow Cave, 14 Oct. 2000, 1,000 counted and 2 collected by Graening, Slay, M. Covington, C. Brickey, and J. Gunter. **Washington County:** Cave Spring, 31 March 2000, 100 counted by Graening and J. Gunter. *Gammarus minus* is probably a species complex and is reported from springs and cave streams throughout the Appalachian Mountains, Interior Low Plateaus, and Ozark Plateaus ecoregions (Hubricht, 1943; Holsinger, 1972). Populations of *G. minus* occurring in Arkansas, Missouri, and Oklahoma have been defined as a geographical type (Ozarkian) based on morphological variation (Cole, 1970). Previous records for *Gammarus propinquus* from "a large spring near Willcockson" in Boone County and from Mammoth Spring in Fulton County by Hubricht and Mackin (1940), and *Gammarus elki* from a "rocky creek and spring 1 mile south of the Missouri-Arkansas state line" in Benton County by Reimer (1969) refer to *G. minus* as presently understood and listed above. Both *G. propinquus* Hay and *G. elki* Reimer are now considered synonyms of *G. minus* (see Shoemaker, 1940; Holsinger, 1972).

Gammarus pseudolimnaeus Bousfield, 1958

Lawrence County: "Wautuga Springs, 2.9 miles southeast of Ravenden" (Hubricht, 1943). This species is recorded

from streams and cave springs in northern Arkansas, where it may occur syntopically in springs with *G. minus* (Holsinger, 1972). *Gammarus pseudolimnaeus* is widespread and reported from a number of states, including Illinois, Missouri, Oklahoma, Kentucky, Michigan, Wisconsin, and Quebec and Ontario in Canada (Holsinger, 1972). The record for *G. limnaeus* from Wautuga Springs in Lawrence County by Hubricht (1943) is referable to *G. pseudolimnaeus* as presently understood. Many of the earlier records for *Gammarus limnaeus* Smith became *G. pseudolimnaeus* when Bousfield (1958) described the latter as a new species and made *G. limnaeus* a subspecies of *Gammarus lacustris* (see Bousfield, 1958; Holsinger, 1972). *Gammarus* sp. nov. (awaiting description)

Stone County: Martin Hollow Cave, 14 Oct. 2000, 20 counted and 7 collected by Graening, Slay, M. Covington, C. Brickey, and J. Gunter.

Gammarus sp.

Benton County: War Eagle Cavern, 4 Nov. 1978, M. Schram (Schram, 1980). **Carroll County:** White River below Beaver Dam, 1 July 1978, M. Schram (Schram, 1980). **Stone County:** Cave River Cave, 24 Nov. 2002, 10,000 counted by Graening, D. Fenolio, and C. Brickey. Hargis (1995) reported *Gammarus* from Crawford, Franklin, and Johnson counties.

It should be noted that *Gammarus fasciatus* (Say, 1818), was reported from Arkansas by Cather and Harp (1975) and listed in Johnson (1979). However, the established range of this species suggests that the Arkansas records are in error. As presently understood, *Gammarus fasciatus* is known authentically from the upper Mississippi River drainage eastward throughout the Great Lakes area and south along the Atlantic Coastal plain to southern North Carolina (Holsinger, 1972).

Family Hyalellidae Bulycheva, 1957

Hyalella azteca (Saussure, 1858)

Benton County: Big Spring, 7 July 2000, 100 counted and 5 collected by Graening and Slay. **Craighead County:** Big Creek, 1969 (Cather and Harp, 1975). **Garland County:** Meyers Springs, collected by H. Robison. **Montgomery County:** Boxx Springs, Rattlesnake Springs, Singing Springs, and Wehunt Springs, collected by H. Robison. **Randolph County:** James Creek, 1969 (Cather and Harp, 1975). Despite its widespread distribution throughout much of North America, (Hubricht and Mackin, 1940; Hubricht, 1943; Bousfield, 1958), *Hyalella azteca* apparently represents a complex of morphologically closely similar cryptic species

(Witt et al., 2000). It is probably more common in Arkansas than current records indicate.

Results and Discussion

The first state checklist of the Amphipoda of Arkansas was by Johnson (1979), who reported 13 taxa, 11 of which remain valid. Twenty species of amphipods are known at present, 18 of which have been found in groundwater habitats. The species are distributed among 4 families as follows: Allocrangonyctidae (1 species of *Allocrangonyx*); Crangonyctidae (2 species of *Baetrurus*, 5 species of *Crangonyx*, 7 species of *Stygobromus*, and 1 species of *Synurella*); Gammaridae (3 species of *Gammarus*); Hyalellidae (1 species - *Hyalella azteca*). Four of the 20 are provisionally recognized new species that belong to *Gammarus*, *Baetrurus*, and *Stygobromus* as indicated in the preceding list. A description of the new species of *Baetrurus* is in press and a description of one of the new species of *Stygobromus* is in manuscript. Previous studies suggest that more than one-half of North American freshwater amphipod species occur exclusively in subterranean waters (Holsinger, 1967), and this observation applies generally to Arkansas, where 10 of the 20 species recognized in this

report are stygobites and 2 others are stygophiles that are closely associated with cave waters.

Two of the principal goals of this checklist are to update the range and conservation status of the species of freshwater amphipods reported from Arkansas. Contained in the checklist are the first state records for *S. onondagaensis*, and new county records for *S. alabamensis*, *S. ozarkensis*, *C. forbesi*, and *G. minus*. However, *S. montanus*, *S. elatus*, and *C. aka* remain single-site endemics. Therefore, based on the revised distribution of amphipods in Arkansas, new biodiversity rankings are recommended for the Natural Heritage Program and its scientific advisory group NatureServe. Of special concern are the locally-rare species *A. hubrichti*, *B. pseudomucronatus*, *C. aka*, *C. forbesi*, *S. elatus*, *S. montanus*, and *S. onondagaensis*. Conversely, *S. ozarkensis* and *S. alabamensis* are now known from enough sites to warrant their removal from the list of rare and imperiled fauna. Suggested revisions of rarity rankings for Arkansas amphipods are enumerated in Table 1.

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Table 1. Current rarity rankings and suggested revisions at the Global (G-rank) and Subnational /State (S-Rank) levels, where a rank of 1 indicates that the species is critically imperiled and a rank of 5 indicates that the species is demonstrably widespread and secure. The reader is referred to NatureServe (2005) for a complete explanation of the ranking system and access to the national database.

Species	Current Global Rank	Suggested Global Rank	Current State Rank	Suggested State Rank
<i>Allocrangonyx hubrichti</i>	G2G3	G2	not ranked	S1
<i>Baetrurus pseudomucronatus</i>	G2G3	G2	not ranked	S1
<i>Crangonyx aka</i>	not ranked	G1	not ranked	S1
<i>Crangonyx forbesi</i>	not ranked	G3	not ranked	S1
<i>Crangonyx minor</i>	not ranked	G5	not ranked	S4
<i>Crangonyx obliquus</i>	not ranked	G4	not ranked	S3
<i>Crangonyx pseudogracilis</i>	not ranked	G5	not ranked	S4
<i>Gammarus minus</i>	not ranked	G4	not ranked	S4
<i>Gammarus pseudolimnaeus</i>	G5	G4	not ranked	S3
<i>Hyalella azteca</i>	G5	no change	not ranked	S4
<i>Stygobromus alabamensis</i>	G5	no change	not ranked	S4
<i>Stygobromus elatus</i>	G1G2	G1	S1	no change
<i>Stygobromus montanus</i>	G1G2	G1	S1	no change
<i>Stygobromus onondagaensis</i>	G5	G4	not ranked	S1
<i>Stygobromus ozarkensis</i>	G4	no change	S1	S3
<i>Synurella bifurca</i>	not ranked	G4	not ranked	S3

Annotated Checklist of the Amphipoda of Arkansas with Emphasis upon Groundwater Habitats

Allen, C. and C. Bitting, C. Blevins, C. Brickey, J. Briggler, A. and C. Brown, H. Bryant, E. Corfey, M. Covington, M. Evans, D. Fenolio, R. Ginsburg, J. Gunter, S. Hensley, R. Honebrink, S. Longing, S. McGinnis, W. Meurer, L. Moritz, R. Nilius, M. Oliver, R. Redman, D. Renko, H. Robison, M. Ross, M. Schram, R. Schroeder, K. Shirley, T. Snell, D. Taylor, M. Taylor, K. Tinkle, S. Todd, B. and D. Wagner, S. Wallace, L. Willis, N. and J. Youngsteadt, and T. Zawislak Furthermore, two caving societies—Boston Mountain Grotto of the National Speleological Society and the Arkansas Association for Cave Studies—provided assistance in locating caves and conducting safe caving trips.

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