Annotated Checklist of the Amphipod Crustaceans of Oklahoma, with Emphasis on Groundwater Habitats

G. O. Graening[1]
Oklahoma Biological Survey, University of Oklahoma, Norman, OK 73019

John R. Holsinger
Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529

Danté B. Fenolio
Department of Biology, University of Miami, Coral Gables, FL 33124

Elizabeth A. Bergey and Caryn C. Vaughn
Oklahoma Biological Survey, University of Oklahoma, Norman, OK 73019

Summarized here for the first time are all known records of amphipod crustaceans in Oklahoma. Data sources consisted of a thorough literature review as well as unpublished state, county, and site records by the authors and contributors to regional databases. Fourteen species in four families are currently recognized: Allocrangonyctidae (*Allocrangonyx pellucidus*); Crangonyctidae (*Bactrurus hubrichti*, three species of *Crangonyx*, and five species of *Stygobromus*); Gammaridae (three species of *Gammarus*); and Hyalellidae (*Hyalella azteca*). This list includes two species endemic to the Arbuckle Mountains and another species endemic to Mayes County. The majority of Oklahoman amphipods are closely associated with groundwater or cave habitats and seven species are found only in these habitats. Current global distributions and conservation statuses are summarized, and new rarity rankings are suggested.

INTRODUCTION

In this note we summarize all available records of amphipod crustaceans (Order Amphipoda) in Oklahoma, including new state, county, and site records. Most of the species recorded from the state are closely associated with groundwater habitats and half of them are stygobites; these species are typically troglomorphic (i.e., eyeless, unpigmented) and obligate inhabitants of subterranean waters. The principal aquatic subterranean habitats investigated in Oklahoma include streams and drip pools in caves, water wells, and the outflows of springs and seeps.

METHODS

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 (NMNH) (previously United States National Museum). Taxonomic identifications were performed by Holsinger utilizing taxonomic keys in Holsinger (1967, 1972) and in unpublished manuscripts. Records of amphipods from all available literature sources were also reviewed, summarized, and cited, as well as unpublished sources including the following: Oklahoma Department of Wild-

[1] Corresponding Author: graening@razorbackroad.com; current address - Department of Biological Sciences, California State University Sacramento, Sacramento CA 95819

life Conservation grant reports by Vaughn and Certain (1992), Vaughn (1996), and Bergey et al (2003); field reports of The Nature Conservancy Oklahoma Field Office and the United States Fish and Wildlife Service (USFWS) Ecological Services Office; the Natural Heritage Database maintained by the Oklahoma Biological Survey (University of Oklahoma, Norman); the Ozark Subterranean Biodiversity Database (maintained by Graening at The Nature Conservancy Oklahoma Field Office); and the Subterranean Amphipod Database (maintained by Holsinger at Old Dominion University, Norfolk, Virginia), accessible on the Internet at 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 OKLAHOMA

Family Allocrangonyctidae Holsinger 1989

Allocrangonyx pellucidus (Mackin 1935)(stygobite)

Johnston County: "springs upstream of Tishomingo National Fish Hatchery." 5 Aug 2005, two collected by Graening and Fenolio; Martin Spring, 31 Mar 2006, four collected by Graening, Fenolio, and A. Harris. Murray County: Bitter Ender's Cave, 24 Jun 1964, Holsinger and R. Norton (Holsinger 1971); Mystic Cave, Aug 1995, three collected by A. Harris and B. and B. Howard, and 18 Dec 2004, two collected by Graening, Fenolio, A. Harris, and B. and B. Howard; "seep 482 meters NW of Turner Falls," 11 May 1940, L. Hubricht and J. Mackin (Holsinger 1971); "small spring 402 meters NW of Turner Falls," 23 Apr 1936, L. Hubricht, (Holsinger 1971); springs on Hickory Creek, 29 Mar 2006, collections by Graening, Fenolio, and A. Harris; "spring on Honey Creek south of Davis," 1 Apr 1973, W. Reisen (Holsinger 1989); Wild Woman Cave, 18 Jan 1959, "several collected," 7 Feb 1959, "one ovigerous female collected," and 28 Feb 1959, "one female bearing young collected" by R. Harrel (Harrel 1960), and 17 Aug 1995, "greater than 20 individuals" counted and one collected by A. Harris and B. and B. Howard. Pontotoc County: Byrds Mill Spring, 12 Nov 1930, 15 deposited (NMNH #137144) by J. Mackin (Mackin 1935, Holsinger 1971); Coal Creek Cave, 2 Jun 1965, R. Harrel collected "several ovigerous females" (Holsinger 1971), and 22 Sep 1995, 24 counted and three collected by A. Harris and B. and B. Howard, and 19 Dec 2004, six counted by Graening and Fenolio. *Allocrangonyx pellucidus* is endemic to the Arbuckle-Simpson hydrologic basin.

Allocrangonyx sp. (unidentified)

Johnston County: Desperado Spring (Gaskin and Bass 2000); Dotson Spring, 1995, sighted by A. Harris.

Family Crangonyctidae Bousfield 1973

Bactrurus hubrichti Shoemaker 1945 (stygobite)

Muskogee County: "well near the Connors State College campus, Warner," 6 Jan 1939, one female collected by A. Seamster (Hubricht and Mackin 1940). Rogers County: "unnamed spring approximately 3.5 miles south of Oolagah," 1 Jun 1981, two collected by J. Hoover and W. Milstead (Koenemann and Holsinger 2001). *Bactrurus hubrichti* occurs in caves, springs, seeps, and wells of eastern Kansas, northeastern Oklahoma, and central Missouri (Koenemann and Holsinger 2001).

Crangonyx forbesi (Hubricht and Mackin 1940)(stygophile)

Cherokee County: Cave Spring, 20 Jan 2006, *ca.* 20 collected by Fenolio and J. Stout; Dressler Cave, 26 Sep 1991, collected by Vaughn, D. Certain, D. Fong, E. Grigsby, and D. Smith; "Lucky Spring about 4.0 km E of Peggs," 13 collected in 1981 and 1982 by J. Hoover and W. Milstead (Zhang and Hols-

inger 2003) and 20 Jan 2006, 17 collected by Fenolio and J. Stout. Mayes County: "spring at roadside park, one mile east of Locust Grove," 24 May 1940, 21 collected by Hubricht (1943), and 21 Jan 2006, ca. 25 collected by Fenolio and J. Stout; "spring at Girl Scout Camp, 4.8 km S of Locust Grove," 22 May 1940, 16 collected by L. Hubricht (Zhang and Holsinger 2003); "spring on E side of Locust Grove," 3 Aug 1970, nine collected by J. Black (Zhang and Holsinger 2003); "spring 5.9 km W of Locust Grove," 21 May 1942, 50 collected by L. Hubricht (Zhang and Holsinger 2003). Ottawa County: "Cave spring ca. 8.8 km E of Fairland," 48 collected on 2 Jun 1981 and 2 Jun 1982, by J. Hover and W. Milstead (Zhang and Holsinger 2003); "unnamed cave spring ca. four miles east of Wyandotte," 2 Jun 1981, one collected by J. Hoover and W. Milstead (identified as *Crangonyx* near *forbesi* by Zhang and Holsinger 2003). *Crangonyx forbesi* is also found in cave streams and springs in Arkansas, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, and West Virginia (Zhang and Holsinger 2003).

Crangonyx minor Bousfield 1958

Pontotoc County: "temporary stream, one mile east of Ada," 1937, 25 collected by J. Mackin, who stated it was "found in nearly all small temporary streams in this county"; Hubricht and Mackin (1940) erroneously reported it as *Eucrangonyx shoemakeri*, and Zhang and Holsinger (2003) referred it to *C. minor*. *Crangonyx minor* is also reported from Arkansas, Illinois, Iowa, Kentucky, Ohio, Tennessee, and southern Ontario and inhabits a variety of aquatic habitats including small streams, sloughs, ditches, drains, springs, and ponds (Zhang and Holsinger 2003).

Crangonyx pseudogracilis Bousfield 1958

Cherokee County: "unnamed spring, ca. 13.6 km S of Tahlequah," two collected on 22 May 1981 and on 4 Jun 1982, by J. Hoover and W. Milstead (Zhang and Holsinger 2003). Johnston County. "Cummins Spring, ca. 0.8 km N of Connerville," 14 Jun 1982, 13 collected by J. Hoover and W. Milstead (Zhang and Holsinger 2003). Mayes County: "unnamed spring, ca. 0.3 km N of Locust Grove," seven collected on 20 May 1981 and 20 on 3 Jun 1982, by J. Hoover and W. Milstead (Zhang and Holsinger 2003). McCurtain County: Spring No. SPR02-306, 2002, three collected by Bergey et al, prob. *C. pseudogracilis*. McIntosh County: "slough of Canadian River S of Eufauala," 10 May 1940, three collected by Hubricht (1943) who erroneously reported it as *C. gracilis*; Zhang and Holsinger (2003) referred it to *C. pseudogracilis*. Osage County: "Doddy Miller Spring, ca. 12.0 km NE of Barnsdall," three collected on 1 Jun 1981 and two on 1 Jun 1982 by J. Hoover and W. Milstead (Zhang and Holsinger 2003). Pushmataha County: "Lily Lake, two miles north of Antlers," 2 May 1935, nine collected and erroneously reported by Hubricht and Mackin (1940) as *Eucrangonyx gracilis*; Zhang and Holsinger (2003) referred it to *C. pseudogracilis*. *Crangonyx pseudogracilis* is widely distributed in southern Canada and east-central United States (Zhang and Holsinger 2003). All records for *C. gracilis* in Oklahoma have been reassigned to *C. pseudogracilis*; *C. gracilis* is currently known primarily from the Great Lakes region (Zhang and Holsinger 2003).

Crangonyx sp. (unidentified)

Cherokee County: "Spring Nos. 11 and 18, collections by Mathews et al (1983); "Teresita Bridge, Spring Creek," 21 May 1996, one collected by R. Heth. Delaware County: "Spring No. 12," collection by Mathews et al (1983); "Coppage Farm, Spring Creek," 21 May 1996, two collected by R. Heth. Ottawa County: Schifleff Cave, 6 Dec 2003, three collected by Graening, Fenolio, and S. Hensley.

Stygobromus alabamensis sensu latu (Stout 1911)(stygobite)

Adair County: Cave #AD-54, 16 Nov 2006, one collected by Graening, S. Hensley, and R. Stark; Charlie Owl Cave, 1987, collector unknown, and 16 Dec 2004, 60 counted

and three collected by Graening, Fenolio, S. Hensley, M. Slay, and C. Russell; Duncan Field Cave, reported in "Sam's Pit" by Black (1971), and one collected on 7 Dec 1991, by W. Puckette and D. Certain, and one collected on 12 Oct 1996, by B. Howard; Three Forks Cave (Black 1971). Bryan County: Spring No. 5, 1982, collection by Matthews et al (1983). Cherokee County: "Teresita Bridge, Spring Creek," 21 May 1996, collected by R. Heth; "Teresita Ford, Spring Creek," 12 Dec 1996, collected by R. Heth. Choctaw County: "Cistern fed by spring, NW of Hugo," 5 Aug 1981 and 14 Jul 1982, collections by J. Hoover and W. Milstead. Delaware County: January-Stansbury Cave, 9 Oct 2001, one collected by Bergey, Fenolio, and S. Hensley; "unnamed spring at West Siloam Springs," 3 Jun 1982, collection by J. Hoover and W. Milstead. Latimer County: "seeps in San Bois Mountains near Wilburton" (Black 1971); "small rivulets emerging from crevices of rocks near summits of some of the hills of the San Bois Mountains, near Wilburton, Oklahoma," collected and erroneously reported by Mackin (1935) as *Boruta americana*. Major County: Nescatunga Cave, 10 Aug 2005, three counted and one collected in the subterranean pool "Tiger Tank" by Fenolio and J. Stout. Mayes County: "seeps 4.6 miles west of Locust Grove" (Black 1971); "intermittent south tributary to Snake Creek," 7 Dec 1996, collected by R. Heth. Murray County: Antelope Spring (Black 1973). Ottawa County: "5 Mile Creek (in Slick Rock Park)," 9 Nov 1968, collected by R. Craven; "unnamed spring, ca. four miles E of Wyandotte," 21 Jun 1981, one collected by J. Hoover and W. Milstead. Pontotoc County: "seeps 2.3 miles south of Fittstown," as *Stygonectes alabamensis occidentalis* in Holsinger (1967); Sheep Creek Spring, collected and erroneously reported by Hubricht and Mackin (1940) as *Synpleonia clantoni* (Holsinger, unpub. data); "springs issuing from Frank's fault on tributary to Sheep Creek," 1936, collector unknown (Holsinger 1967). Tulsa County: "seeps at Lost City, one mile south of Sand Springs" (Black 1971). The following records probably are *S. alabamensis sensu latu*. Comanche County: Baker's Spring, 28 Mar 2006, five collected by Fenolio and W. Musterman; CCC Cistern on Panther Creek, 28 Mar 2006, five collected by Graening and S. Hodge. Woodward County: Alphabet Cave, 29 Jun 1994, two collected by D. Hubbard Jr.; "Horseshoe Cave (2.25 miles SE of Quinlan," one collected by J. Black on 17 Jan 1974, and 10 collected by D. Hubbard Jr. on 29 Jun 1994. *Stygobromus alabamensis sensu latu* is widely distributed in the southeastern United States.

Stygobromus bowmani (Holsinger 1967)(stygobite)

Mayes County: "seep, Girl Scout Camp, 3.2 miles south of Locust Grove," 22 May 1940, 22 specimens collected and erroneously reported by Hubricht (1943) as *Synpleonia clantoni*. Holsinger (1967) referred 17 of these specimens to *S. bowmani* and five to *S. ozarkensis* (reported later in this text). *Stygobromus bowmani* is apparently closely related to *S. ozarkensis* and this is the only known occurrence to date of this species.

Stygobromus onondagaensis (Hubricht and Mackin 1940)(stygobite)

Adair County: Duncan Field Cave, 1969, collected by J. Black in "Sam's Pit." Cherokee County: Dressler Cave, 21 March 1971, two collected by J. Black. Delaware County: Bolton Cave, 5 Oct 1991, two collected by Vaughn, and 27 Jul 2005, collection by Graening, M. Slay, and W. Puckette; January-Stansbury Cave, 1971, one collected by J. Black; Marion Duncan Cave, 9 Nov 1991, two collected by Vaughn. Mayes County: "seep, Girl Scout Camp, 3.2 miles south of Locust Grove" 11 collected by Hubricht (1943). Ottawa County: small cave/spring complex (# SPR01-37), 28 Jun 2001, two counted and one collected by J. Waterbury. Rogers County: "spring 3.5 miles S of Oolagah," 1 Jun 1981, one collected by J. Hoover and W. Milstead. *Stygobromus onondagaensis* is also reported from northwestern Arkansas, southeastern

Kansas, and southern Missouri (Holsinger, unpub. data).

Stygobromus ozarkensis Holsinger 1967 (stygobite)

Adair County: Cave Spring, 4 Jun 1982, one collected by J. Hoover and W. Milstead; Shirley's Spring Cave, 17 Nov 2006, one collected by Graening and S. Hensley; Three Forks Cave (Black 1973). Cherokee County: Dressler Cave, 26 Sep 1991, one collected by Vaughn, D. Certain, D. Fong, E. Grigsby, and D. Smith. Delaware County: January-Stansbury Cave, 26 Oct 1991, two collected by Vaughn, and 9 Oct 2001, one collected by Fenolio, Bergey and S. Hensley; Marion Duncan Cave, 9 Nov 1991, one collected by Vaughn; Nickel Preserve Cave # 4, 1 Nov 2001, one collected by S. Hensley; Rodman Cave, 23 Nov 1991, one collected by Vaughn; Spavinaw Bat Cave, 9 Nov 1991, one collected by Vaughn, W. Puckette, D. Certain, and W. Drummond, and 18 Jan 2006, four collected by Fenolio and J. Stout. Mayes County: "seep, Girl Scout Camp, 3.2 miles south of Locust Grove," collected and erroneously reported by Hubricht (1943) as *S. clantoni* and referred to *S. ozarkensis* by Holsinger (1967); Locust Grove Spring Cave, collected and erroneously reported by Black (1971) as *S. clantoni*; reassigned to *S. ozarkensis* by Holsinger (unpub. data); "seeps, 4.6 miles west of Locust Grove," collected and erroneously reported by Hubricht (1943) as *Synpleonia americana*. *Stygobromus ozarkensis* is also reported from Arkansas and Missouri, but is restricted to the Ozark Plateaus ecoregion of all three states (Holsinger 1967).

Stygobromus sp. nov (Holsinger, unpub. data)(stygobite)

Murray County: Dip Cave, same as "small cave near Bitter Enders Cave," in Black (1973), 24 Jun 1964, one collected (to be designated holotype and deposited in NMNH) by Holsinger and R. Norton.

Stygobromus sp. (unidentified)

Adair County: Christian School Cave, 1 Jun 1981, single specimen of a probable new species, collected by J. Lewis and T. Lewis; Linda Bear Paw Cave, 16 Dec 2004, 10 counted and one collected by Graening, Fenolio, M. Slay, S. Hensley, and C. Russell; "Spring and cave five miles south of Kansas," erroneously reported as *S. clantoni* by Black (1971). Cherokee County: Single Barrel Cave, 28 Jul 2005, one collected by Graening, M. Slay, and W. Puckette; hyporheic site in the Illinois River, 11 Jul 1995, single specimen of a possible new species, collected by Vaughn. Delaware County: Bell's Bluff Cave, 27 Jul 2005, Graening, M. Slay, and W. Puckette; Engelbrecht Cave, 8 Dec 2003, one collected by Graening and Fenolio; Junkyard Cave, 26 Jul 2005, one collected by Graening and M. Slay; Long's Cave, 26 Jul 2005, one collected by Graening, M. Slay, S. Hensley, and J. Pruett; Spider Cave, 3 March 2004, one counted by Graening and Fenolio; Star Cave, 1 Aug 2005, one collected by Graening, Fenolio, S. Hensley, and R. Stark; Surprise Cave, 27 Jul 2005, 37 counted by Graening, Fenolio, and W. Puckette. Mayes County: Locust Grove Spring Cave, erroneously reported as *S. clantoni* by Black (1971). Most of these specimens could not be positively determined because they were sexually immature or damaged.

It should be noted that collections reported as *Stygobromus clantoni* (Creaser 1934) in Oklahoma by previous workers have been referred to other species of *Stygobromus*. To date, *S. clantoni* is known only from eastern Kansas and western Missouri (Holsinger, unpub. data).

Family Gammaridae Latreille 1802

Gammarus lacustris sensu latu Sars 1863

Johnston County: Cummins Spring, 15 Jul 1995, collection by G. Carpenter and D. Deblanc; "spring, Blue River, 2.5 miles south of Pontotoc," 22 May 1940, 67+ specimens collected by L. Hubricht; "Blue River

springs," 7 August 1930, 30+ specimens collected by J. Mackin; "springs near Connorville," erroneously reported as *G. limnaeus* by Hubricht and Mackin (1940). Pontotoc County: Byrds Mill Spring, erroneously reported as *G. limnaeus* by Hubricht and Mackin (1940). Woods County: "Bat Cave spring, four miles northeast of Freedom," 19 May 1942, ca. 20 specimens collected and erroneously reported as *G. limnaeus* by Hubricht (1943). *Gammarus lacustris sensu latu* is primarily a cold lake species distributed throughout Canada, northern USA, and Alaska (Holsinger 1972). Records from Oklahoma are either erroneous or represent disjunct or relict populations. Specimens from Cummins Spring, "springs near Connorville," and Byrds Mills Spring reported above are probably *G. lacustris sensu latu* but need careful re-examination.

Gammarus minus sensu latu Say 1818 (stygophile)

Delaware County: January-Stansbury Cave, 13 Nov 1971, J. Black, and 14 Aug 2002, two collected by Fenolio; "unnamed spring at West Siloam Springs," collections by J. Hoover and W. Milstead on 21 May 1981 and 3 Jun 1982; "unnamed spring ca. six miles SE of Jay," 2 Jun 1982, J. Hoover and W. Milstead. Mayes County: "Saline Court House spring, source of Snake Creek," 21 January 1997, collected by R. Heth. Ottawa County: "unnamed cave spring, ca. four miles east of Wyandotte," 32 collected on 21 Jun 1981 and 90 on 2 Jun 1982, by J. Hoover and W. Milstead. *Gammarus minus* is a species complex that is reported from springs and cave streams throughout the Appalachian Mountains, Interior Low Plateaus, and Ozark Plateaus ecoregions (Cole 1970, 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).

Gammarus pseudolimnaeus Bousfield 1958

Mayes County: "spring at roadside park, one mile east of Locust Grove," 24 May 1940, ca. 50 specimens collected and erroneously reported as *G. minus* by Hubricht (1943). These specimens were carefully reexamined and referred to *G. pseudolimnaeus*, which is the only state record for this species to date. *Gammarus pseudolimnaeus* is relatively widespread in springs and streams in east-central and northeastern United States and southeastern Canada (see Holsinger 1972).

Gammarus sp. (unidentified)

Atoka County: Sandy Springs, 1 Jul 1999 (Gaskin and Bass 2000). Cherokee County: Cave Spring, 20 Jan 2006, 20 collected by Fenolio and J. Stout. Osage County: Sand Creek and Wild Hog Creek (Bass 1994). Ottawa County: Schifleff Cave, 6 Dec 2003, 100 counted by Graening, Fenolio, and S. Hensley.

Family Hyalellidae Bulycheva 1957

Hyalella azteca sensu latu (Saussure 1858)

Atoka County: Sandy Springs, 1 Jul 1999 (Gaskin and Bass 2000). Blaine County: Big Spring, 1 Jul 1999 (Gaskin and Bass 2000) and 14 Jun 2002, collection by Bergey et al, and in 2002, 194 collected (Rudisill and Bass 2005); Little Spring, 1,555 collected in 2002 (Rudisill and Bass 2005); Middle Spring, 14 Jun 2002, collection by Bergey et al, and 2002, 785 collected (Rudisill and Bass 2005); Roman Nose State Park Cave (Black 1971). Bryan County: Banty Spring, 16 May 1981 (Matthews et al 1983) and 10 Jul 2001, collection by Bergey et al; and "oxbow lake, north of Armstrong" (Hubricht and Mackin 1940). Cherokee County: Seminary Spring, 17 Jul 2001, collection by Bergey et al. Choctaw County: Kiamichi River, near State Highway 109 bridge (Wilhm et al 1979). Cimarron County: "spring 6.5 km W of Castaneda," 28 May 1981 (Matthews et al 1983). Cleveland County: Lake Thunderbird (Wellborn et al 2005). Comanche County: Post Oak Creek and West Cache Creek, Wichita Mountains (Bass 1990). Craig County: "spring 11.5 km

SE of Vinita," 6 Jun 1981 and 1 Jun 1982 (Matthews et al 1983), and 27 Jun 2001, collection by Bergey et al. Delaware County: Summerfield Creek Cave (Black 1971). Ellis County: Bowman Spring, Dugger Spring, McCorkle Spring, Reininger Spring, and Word Spring, 8 and 9 Jun 2005, collections by Bergey et al. Garfield County: "spring 5 km S of Drummond," 25 May 1981 (Matthews et al 1983). Greer County: "spring 6.5 km S of Magnum," 7 Jun 2002, collection by Bergey et al. Harper County: "spring 15 km NW of Alabaster State Park," 26 May 1981 and 27 May 1982 (Matthews et al 1983) and 21 Jul 2001, collection by Bergey et al. Johnston County: Big Spring, 14 Jun 2001 (Mathews et al 1983) and 10 August 2001, collection by Bergey et al; "Blue River, northern part of county" (Hubricht and Mackin 1940); Bricken Spring, 14 Jun 1982 (Matthews et al 1983); Cummins Spring, 18 May 1981 (Matthews et al 1983), 15 Jul 1995, collected by G. Carpenter and D. Deblanc, and 5 Jul 2001, collection by Bergey et al; Deadman Spring, 26 Jul 2003, collection by Bergey et al; Rutherford Spring, 24 Jul 2004, collection by Bergey et al, "springs at Connorville" (Hubricht and Mackin 1940); Three Springs, 22 Jul 2004, collection by Bergey et al; Viola Spring, 25 Jul 2004, collection by Bergey et al. LeFlore County: Cucumber Creek (Bass, 1995). Logan County: Deer Creek (Margraf and Plitt 1982). Marshall County: Briar Creek (Wellborn et al 2005); Cowan Creek (Wellborn et al 2005), Taylor Creek Spring, 1 August 1982 (Matthews et al 1983); UOBS Creek (Wellborn et al 2005). Mayes County: "Spring Creek, Locust Grove" (Hubricht and Mackin 1940). McClain County: Washington Pond (Wellborn et al 2005). McCurtain County: Glover Creek (Orth et al 1982); "spring 11.5 km SE of Broken Bow," collection by Bergey et al. Murray County: Antelope pond (Wellborn et al 2005); Antelope Spring, 10 Jun 1993, collection by G. Carpenter and D. Deblanc; Bridal Veil Falls, 3 Jun 1993, collection by G. Carpenter and D. Deblanc; Buckhorn Spring (Varza and Covich 1995); Buffalo Spring, 10 Jun 1993, collection by G. Carpenter and D. Deblanc; Lowrance Springs, 11 Jun 1993, collection by G. Carpenter and D. Deblanc, and 17 Jun 2004, collection by Bergey et al; "Honey Creek, Turner Falls Park," "small spring below Turner Falls," and "lake at Price's Falls," all three reported in Hubricht and Mackin (1940). Okfuskee County: Flat Rock Spring, 19 Jul 1981 (Matthews et al 1983). Oklahoma County: Ten Acre Lake (Wellborn et al 2005). Osage County: Sand Creek and Wild Hog Creek (Bass, 1994); Salt Creek (Bryant and Wilhm 1990). Pontotoc County: Byrds Mill Spring, "lake in Ada," and Sheep Creek Spring, all three reported in Hubricht and Mackin (1940); Wildcat Spring, 2 August 2004, collection by Bergey et al. Pushmataha County: "limestone sink lake, two miles north of Antlers," 2 May 1935, collected by J. Mackin (Hubricht and Mackin 1940). Roger Mills County: Broken Leg Creek Spring, collection by Bergey et al; Persimmon Spring, 30 Jun 2002, collection by Bergey et al. Woods County: "spring 12.5 km N of Fort Supply," 26 May 1981 (Matthews et al 1983), and 21 Jun 2001, collection by Bergey et al. Woodward County: Boiling Springs, 1 Jul 1999 (Gaskin and Bass 2000). *Hyalella azteca* is a species complex widely distributed in North America (Bousfield 1958, Wellborn et al 2005, NatureServe 2006).

Family Undetermined

Amphipoda - stygobitic

Adair County: Belle Starr Cave, 4 Apr 2004, Fenolio, M. Slay, W. Baker, C. Melhart, and J. Stout; Gallcatcher Cave, 2 May 2004, six counted and two collected by Graening, Fenolio, and W. Puckette. Delaware County: "cave near Brush Creek Bridge," 15 Dec 2004, one collected by Fenolio, Graening, M. Slay, and J. Pruett; Groundhog Hollow Cave, 1 August 1975, reported by C. Rudolph and W. Puckette.

Amphipoda - stygophilic

Delaware County: "spring on Bob Kelley's land," 15 Dec 2004, one collected

by Graening, Fenolio, M. Slay, and J. Pruett. Johnston County: "spring on Easterling's land," 19 Dec 2004, five counted and one collected by Graening and Fenolio; "springs upstream of Tishomingo National Fish Hatchery," 5 August 2005, collected by Graening and Fenolio. Ottawa County: Cave Springs Ranch Cave, 14 Dec 2004, one collected by Graening, Fenolio, and M. Slay.

DISCUSSION

This first state checklist of the amphipods of Oklahoma recognizes 14 species in four families, including one new species of *Stygobromus* endemic to the Arbuckle Mountains (Holsinger, unpub. data). The majority of North American freshwater amphipod species occur exclusively in subterranean waters, and this observation applies generally to Oklahoma, where seven of the 14 species recognized herein are stygobites and two others are stygophiles that are often associated with subterranean habitats.

Based on the current understanding of the distribution of amphipods in Oklahoma, new rarity rankings are recommended for the Natural Heritage Program and its scientific advisory group NatureServe. Of special concern are the highly endemic species *A. pellucidus*, *S. bowmani*, and *Stygobromus* sp. nov. Conversely, species such as *S. ozarkensis* are now known from enough sites to warrant their upgrading to a less imperiled status. Suggested revisions of rarity rankings for Oklahoma amphipods are enumerated in Table 1.

ACKNOWLEDGMENTS

This study was funded primarily by the Oklahoma Department of Wildlife Conservation's state wildlife grant program and also by The Nature Conservancy. The authors would like to thank contributors to the Natural Heritage Database, the Ozark Subterranean Biodiversity Database, and the Subterranean Amphipod Database. Expert field assistance was provided by the following colleagues: A. Harris, S. Hensley, R. Heth, B. and B. Howard, S. Jones, M. Lersch, B. Phillips, W. Puckette, M. Slay, J. Stout, J.

Table 1. Current rarity rankings and suggested revisions at the Global (G-rank) and Subnational / State (S-Rank) levels of Oklahoman amphipods.[1]

Species	Current Global Rank	Suggested Global Rank	Current State Rank	Suggested State Rank
Allocrangonyx pellucidus	G2G3	G2	S2	no change
Bactrurus hubrichti	G4	no change	S1	no change
Crangonyx forbesi	not ranked	G3	not ranked	S2
C. minor	not ranked	G5	not ranked	S2
C. pseudogracilis	not ranked	G5	not ranked	S2
Gammarus minus	not ranked	G4	not ranked	S4
G. lacustris	not ranked	G4	S1	no change
G. pseudolimnaeus	G5	G4	not ranked	S1
Hyalella azteca	G5	no change	not ranked	S4
Stygobromus alabamensis	G5	G4	not ranked	S3
S. bowmani	G1G2	G1	S1	no change
S. onondagaensis	G5	G4	S2S3	S2
S. ozarkensis	G4	no change	S2	S3

[1] A rank of 1 indicates that the species is critically imperiled and a rank of 5 indicates that the species is demonstrably secure. The reader is referred to NatureServe (2006) for a complete explanation of the ranking system and access to the national database.

Waterbury, and J. Weaver. We also thank the Tulsa Regional Oklahoma Grotto (National Speleological Society) for providing assistance in locating caves and conducting safe caving trips.

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Received: August 2, 2006; Accepted January 5, 2007.