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

G. O. Graening
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 Data sources consisted of a thorough literature review as well as unpublished state, county, and site records by the authors and contributors to regional databases.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. © 2006 Oklahoma Academy of Science.

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-
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 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 Allocragononyctidae Holsinger 1989

Allocragononyx pellucidus (Mackin 1935)(stygobite)


Allocragononyx 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. Seams ter (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-
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 Eurangonyx shoemakeri, and Zhang and Holsinger (2003) referred it to C. minor. Crangonyx minor is also reported from Arkansas, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, and West Virginia (Zhang and Holsinger 2003).

Crangonyx pseudogracilis Bousfield 1958


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)


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 Hubbricht (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 Hubbricht (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)


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. Hubbricht; “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. 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 re-examined 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)


Family Undetermined

**Amphipoda - stygobitic**


**Amphipoda - stygophilic**

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.

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

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

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.

REFERENCES


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