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## **A new species of the subterranean amphipod genus *Stygobromus* (Amphipoda: Crangonyctidae) from two caves and a spring in western Maryland, USA with additional records of undescribed species from groundwater habitats in central Maryland**

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### **Abstract**

A new species of the subterranean amphipod genus *Stygobromus* is described from two caves and a small spring on the Appalachian Plateau in Garrett County in western Maryland, USA. The description of this species brings to six the total number of species in the genus *Stygobromus* from the state of Maryland. The other five species are recorded from shallow groundwater habitats (e.g., seeps and springs) in the eastern and southeastern parts of the state. In addition, at least four new species of *Stygobromus* from central Maryland are recognized but remain undescribed to date.

**Key words:** Amphipoda, Crangonyctidae, *Stygobromus*, stygomorphic, cave, spring, seep, subterranean groundwater, karst, Appalachian Plateau

### **Introduction**

Species of the large, exclusively stygomorphic (aquatic species typically characterized by absence of eyes and pigment) amphipod crustacean genus *Stygobromus* are recorded from a wide variety of aquatic subterranean groundwater habitats, including drip pools, streams, and phreatic water in caves, water wells, seeps and/or seepage springs (hypotelminorheic) and the underflow of surface streams (hyporheic) (Holsinger 1978). In North America, the genus *Stygobromus* is presently represented by 134 described species (e. g. Holsinger *et al.* 2011). Description of the new species herein brings this total to 135. However, numerous new species primarily from east-central North America have been discovered and are either in the process of being described in a manuscript in preparation by JRH, or are provisionally recognized but remain undescribed. Outside North America five species are recorded from groundwater habitats in Eurasia (Sidorov *et al.* 2010).

### **Methods and material**

The new species described below is recorded from two caves and one spring on the Appalachian Plateau in Garrett County, western Maryland (Fig. 1). Although a majority of specimens examined in this study were collected from drip pools in John Friend Cave, a few specimens were collected from a stream in this cave. In addition several other specimens tentatively assigned to this species were collected from a small, mud-bottom stream in Crabtree Cave and High Rock Wildland Spring No. 2, both sites located approximately 25 km east-southeast of John Friend Cave. Following collection, specimens were preserved in 70 – 75% ethanol and brought to the laboratory for observation and dissection. Slide preparations were made by mounting dissected appendages and other body parts in glycerin. Slide mounts were then examined with a Leica DMLS compound microscope and drawings of pertinent structures were prepared utilizing the associated drawing attachment. As indicated below, types of the species described herein are deposited in the U. S. National Museum of Natural History of the Smithsonian Institution, Washington D.C. Additional material is retained in the JRH collection at Old Dominion University.

John Friend Cave, *S. emarginatus* and *S. allegheniensis*, are significantly larger and less commonly found in drip pools than *S. amicus*. Most specimens of these two species have been collected from the cave stream.

Collections of amphipods from John Friend Cave have been carried out by a number of workers for approximately 63 years dating back to an early visit to the cave by Jerry Hardy in August 1950, but the first recorded collection of amphipods from this cave belonging to *Stygobromus amicus* did not occur until 2 specimens were collected by Dan Feller in August 1992. Prior to that time, only specimens of *Stygobromus emarginatus* and *Stygobromus allegheniensis* had been collected and described from John Friend Cave as well as from numerous other predominately cave localities both to the north and northeast in Pennsylvania and New York state for *S. allegheniensis* and south-southwest to southern West Virginia for *S. emarginatus* (see Holsinger 1967, 1978). In addition there is a single, heretofore unpublished record for *S. emarginatus* from Early Tract Field Spring in the TNC Cransville Swamp Preserve in Garrett County on the Maryland/West Virginia boundary approximately 5 km WSW of John Friend Cave. This material is in the collection of J. R. Holsinger at Old Dominion University.

### **A summary of collections from John Friend Cave follows:**

*S. emarginatus*: 12 specimens collected over a span of 58 years (1950–2008) by J. D. Hardy, J. Gillespie, J. R. Holsinger, G. and B. Marland, A. Norden, and D. Culver *et al.*

*S. allegheniensis*: 38 specimens collected over a span of 58 years (1950–2008) by J. D. Hardy; J. R. Holsinger, G. and B. Marland, R. Franz, A. Norden, and D. Culver *et al.*

*S. amicus* n. sp.: 21 specimens collected over a span of 17 years (1992–2009) by D. Feller, B. Hutchins, D. Culver *et al.* The majority of specimens (ca. 10 specimens) were collected from drip pools, whereas the other collections (ca. 2 or 3 specimens) were from the cave stream.

### **Undescribed species**

It is important to call attention to several undescribed new species of *Stygobromus* from groundwater habitats in central Maryland to the east of Garrett County. Detailed descriptions of these species are planned for an additional paper and include material from Dead Fly Cave and 2 or 3 groundwater seeps in Allegany County, 5 or 6 springs and/or groundwater seeps in Frederick and Montgomery counties, and deep flooded areas in Roundtop limestone mine No. 5 in Washington County.

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