



## Four new species of the subterranean amphipod genus *Stygobromus* (Amphipoda: Crangonyctidae) from shallow groundwater habitats on the Coastal Plain and eastern margin of the Piedmont in Maryland and Virginia, USA

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### Abstract

Four new species of the subterranean amphipod genus *Stygobromus* are described from groundwater habitats in Maryland and Virginia. All four of the species occur in Maryland, and one of them also occurs in Virginia. Three of these species are found in groundwater seeps or seepage springs in the Piedmont of northeastern Maryland, whereas the fourth occurs in similar habitats on the Coastal Plain of southern Maryland west of the Chesapeake Bay and on the opposite side of the Potomac River in seeps on the Coastal Plain in southeastern Virginia. Descriptions of the new species bring the total number of described species in the genus to 139, all but five of which are recorded from North America. Recognition of the four new species suggests that species diversity in *Stygobromus* is greater in shallow groundwater habitats east of the Appalachian cave and karst region than originally believed.

**Key words:** Amphipoda, Crangonyctidae, *Stygobromus*, troglomorphic, subterranean groundwater, hypotelminorheos, seep, seepage spring, Coastal Plain, Piedmont, Blue Ridge

### Introduction

Species of the large, exclusively troglomorphic (characterized by absence of eyes and pigment and elongated appendages) amphipod crustacean genus *Stygobromus* are recorded from a wide variety of aquatic subterranean groundwater habitats, including drip pools, streams, and phreatic water in caves, waterwells, seeps and/or seepage springs (hypotelminorheos), and the underflow of surface streams (hyporheic). More details on the variety, structure and ecology of subterranean groundwater habitats are given in Culver & Pipan (2009). In North America, the genus *Stygobromus* is presently represented by 130 described species (e.g. Holsinger 1974, 1978, 2009; Wang & Holsinger 2001; Taylor & Holsinger 2010). However, numerous new species have been discovered and are either in the process of being described (22 in manuscript prepared by JRH), or are provisionally recognized but remain undescribed (ca. 50). Outside North America five species are recorded from groundwater habitats in Eurasia (Sidorov *et al.* 2010).

### Methods and material

The four new species described below inhabit shallow groundwater habitats on the Coastal Plain and eastern part of the Piedmont physiographic provinces in eastern Maryland and Virginia (Fig. 1). The majority of specimens utilized in this study were collected directly from the substrate or from vegetation associated with groundwater seeps or small spring-like outlets. These unique groundwater habitats and appropriate collecting techniques were clearly defined recently by Culver *et al.* (2006) and Culver & Pipan (2009). Following collection, specimens were preserved in 70% 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