

## New records of stygobionts from the Edwards Aquifer of central Texas

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For several decades, the Edwards Aquifer of South-Central Texas has been recognized for its high stygobiont diversity (Holsinger and Longley 1980; Longley 1981). Biological investigations of the aquifer began in 1896 (Stejneger 1896) and have increased in the last several decades (Barr 1993; Gibson et al. 2008; Zara Environmental LLC 2010a,b) in part because of the listing of several endangered species by the U.S. Fish and Wildlife Service and because of a growing human demand on groundwater for domestic, agricultural, and industrial use. Despite considerable attention, stygobiont distributions are still incompletely known because of low detection probabilities (Culver et al. 2004; Schneider and Culver 2004; Krejca and Weckerly 2007), habitat inaccessibility (Notenboom et al. 1996), and the large number of potential sampling locations. For example, the Texas Water Development Board Groundwater Database included more than 10,000 Edwards Aquifer wells (accessed December 2012). Although undocumented stygobiont localities are common (see references above), documentation of previously unreported occurrences is important, even for common species or within previously established species ranges. A lack of documentation on the distribution of most stygobionts precludes an understanding of basic attributes of their natural history. Moreover, occurrence data are integral to biodiversity, ecology, and biogeography studies and are essential for prioritization of sites and species for conservation management. We present new occurrence records, including a minor range extension for four stygobitic invertebrates from the Edwards Aquifer in addition to a brief synopsis of those species' known distribution or relevant literature.

Occurrences are documented from four sites. Three of these sites, Diversion Spring, Deep Hole Spring, and Ruiz Well were sampled as part of an ongoing characterization of organic matter in the Edwards Aquifer. Ruiz well was sampled on 9 March 2012 using 5 bottle traps (1 liter plastic soda bottles with top cut off and inverted into the bottle with small holes drilled in the top half of the trap) baited with combinations of avocado, potato, Magic Bait® Hog Wild catfish dip bait, assorted nuts, and goat cheese. Traps were set and left in the well overnight for 18 hrs at depths between 1 and 7 m below water level. Diversion and Deep Hole Springs were sampled 6 times between 13 July 2010 and 11 October 2012. The springs are at depths of 6.1 and 7.9 meters, respectively, in a dammed lake that requires SCUBA to sample. A 250 µm mesh net with aperture of approximately 306 cm<sup>2</sup> was placed over a small orifice of each spring to exclude fish and other potential epigeal predators. Nets were checked every 6 to 12 hrs for between 48 and 60 hrs each. The fourth site, Sessom Creek Spring was sampled on 9 May 2012 to 6 June 2012 with a similar sized net checked every two days. With the exception of an undetermined species of flatworm (*Sphalloplana sp.*) that was destructively sampled for stable isotope analysis, all samples have been sent to the Texas Natural History Collections, the University of Texas at Austin for curation.

### New Occurrence Records

***Seborgia relict*** Holsinger & Longley, 1980 (Amphipoda, Sebiidae). TEXAS: Hays County: San Marcos: Spring Lake: Diversion Spring (Zone 14N, 603100.00 mE, 3307341.00 mN, datum: WGS 1984). Collected 8 October 2012. One individual collected and identified by Benjamin T. Hutchins.

*Seborgia relict* is a very small (<2mm) amphipod originally described from an artesian well on the campus of Texas State University<sup>1</sup>. During 6 sampling events, a single individual was collected from Diversion Spring, which additionally yielded the isopod *Lirceolus sp.*, juvenile individuals of the shrimp *Palaemonetes antrorum* Benedict, 1896, juveniles of the amphipod *Stygobromus sp.* and a single individual of the thermosbaenacean *Tethysbaena texana* (Maguire, 1965). *Seborgia relict* has been recorded from Ezells Cave, Hays County (Gibson et al. 2008), Comal and Hueco Springs, Comal County (Gibson et al. 2008), and from alluvium in Hondo Creek, Medina County (Holsinger 1992), all in central Texas. Dye tracing established a hydrologic connection between Ezell's Cave, the artesian well, and Deep Hole Spring, which is also in Spring Lake, 140 m from Diversion Spring (Ogden et al. 1986). Given the hydrological connection, this new record is unsurprising. Nevertheless, it represents a northern range extension of about 0.5 km for the species.

***Stygobromus russelli*** (Holsinger, 1967) (Amphipoda, Crangonyctidae). TEXAS: Hays County: San Marcos: Sessom Creek Spring. In the bed of Sessom Creek at the junction of Sessom Creek Drive and State Street. (Zone 14N, 3307116.39 mN,

602656.81 mE, datum: WGS 1984). Three individuals collected 6 June 2012 by Ruben Tovar and Benjamin F. Schwartz. Identified by Benjamin T. Hutchins.

*Stygobromus russelli* (Holsinger 1967) is a common and morphologically variable species found throughout the Edwards and adjacent Trinity aquifers. A complete list of records is not given here, but is summarized in Reddell (1970) and Mitchell and Reddell (1971). Three individuals of the Texas blind salamander, *Eurycea rathbuni* (Stejneger, 1896), were also collected during the sampling period, but had been previously recorded from this locality (Zara Environmental LLC 2010b).

***Cirolanides texensis* Benedict, 1896** (Isopoda, Cirolanidae). TEXAS: Uvalde County: Uvalde: Ruiz well (Zone 14N, 3230852.14 mN 420696.55 mE, datum: WGS 1984), in an unoccupied lot 300 m west of N. Lovers Lane on the north side of Fort Clark Road, approximately 70 m from the road in a small patch of trees. Collected 9 March 2012. Twenty-six individuals collected and identified by Benjamin T. Hutchins.

*Cirolanides texensis* (Benedict 1896) is the most common stygobiont in the Edwards Aquifer. The distribution for this species was recently summarized by Krejca (2008) and includes 57 sites in Texas and northern Mexico. Individuals were collected from Ruiz well during a single sample event. A single, undetermined amphipod (*Stygobromus* sp.) was also collected, and down bore video showed a troglomorphic flatworm.

***Sphalloplana* sp.** (Tricladida, Planariidae). TEXAS: Hays County: San Marcos: Spring Lake: Deep Hole Spring (Zone 14N, 3307341.00 mN, 603100.00 mE, datum: WGS 1984). One individual collected 8 October 2012 by Benjamin T. Hutchins.

Mitchell (1968) described four species of flatworms in the genus *Sphalloplana* from caves of central Texas. These were later synonymized to *S. mohri* Hyman 1938 by Kenk (1977). The species are known from 5 sites in both the Edwards and adjacent Trinity aquifers. The presence of the species at Diversion well is not surprising considering the hydrologic connection between Ezell's Cave, the type locality for the species, and Deep Hole Spring (Ogdon et al. 1986). Identification of this species was not verified, but it was superficially indistinguishable from *S. mohri* (Hyman 1938) collected from Ezell's Cave. Other collections of apparently stygobiotic flatworms have been made from additional sites (Jean Krejca, Zara Environmental LLC; Randy Gibson, U.S. Fish and Wildlife Service; James Reddell, pers. comm., 2010).

## Literature Cited

Barr, C.B. 1993. Survey for two Edwards Aquifer invertebrates: Comal Springs Dryopid beetle *Stygoparnus comalensis* Barr and Spangler (Coleoptera: Dryopidae) and Peck's Cave Amphipod *Stygobromus pecki* Holsinger (Amphipoda: Crangonyctidae). U.S. Fish and Wildlife Service, 75 pp.

- Benedict, J.E. 1896. Preliminary descriptions of a new genus and three new species of crustaceans from an artesian well at San Marcos, Texas. *Proceedings of the United States National Museum* 18: 615–617.
- Culver, D.C., Christman, M.C., Sket, B., and Trontelj, P. 2004. Sampling adequacy in an extreme environment: species richness patterns in Slovenian caves. *Biodiversity and Conservation* 13: 1209–1229.
- Gibson, J.R., Harden, S.J., and Fries, J.N. 2008. Survey and distribution of invertebrates from selected springs of the Edwards Aquifer in Comal and Hays counties, Texas. *The Southwestern Naturalist* 53: 74–84.
- Holsinger, J.R. 1967. Systematics, speciation, and distribution of the subterranean amphipod genus *Stygonectes* (Gammaridae). *Bulletin of the United States National Museum* 259: 1–176.
- Holsinger, J.R. 1992. Four new species of subterranean amphipod crustaceans (Artesiidae, Hadziidae, Sebidae) from Texas, with comments on their phylogenetic and biogeographic relationships. Pp. 1–23 in Reddell, J.R. ed. *Studies on the cave and endogean fauna of North America II*. Texas Memorial Museum Speleological Monographs, 3. The University of Texas at Austin, Austin, Texas, USA.
- Holsinger, J.R. and Longley, G. 1980. The subterranean amphipod crustacean fauna of an artesian well in Texas. *Smithsonian Contributions to Zoology* 308, 62 pp.
- Hyman, L.H. 1938. Additional North American cave planarians. *Anatomical Record* 72: 137, supplement.
- Kenk, R. 1977. Freshwater triclads (Turbellaria) of North America, IX: The genus *Sphalloplana*. *Smithsonian Contributions to Zoology* 246, 38 pp.
- Krejca, J.K. 2008. New records for *Cirolanides texensis* Benedict, 1896 (Isopoda: Cirolanidae), including possible extirpations at impacted Texas caves. *Cave and Karst Science* 35: 41–46.
- Krejca, J.K. and Weckerly, B. 2007. Detection probabilities of karst invertebrates. Texas Parks and Wildlife Department, 27 pp.
- Longley, G. 1981. The Edwards Aquifer: earth's most diverse groundwater ecosystem? *International Journal of Speleology* 11: 123–128.
- Mitchell, R.W. 1968. New species of *Sphalloplana* (Turbellaria: Paludicola) from the caves of Texas and a reexamination of the genus *Speophila* and the family

- Kenkiidae. *Annales de Spéléologie* 23: 597–620.
- Mitchell, R.W. and Reddell, J.R. 1971. The invertebrate fauna of Texas caves. Pp. 35–90 in Lundelius, E.L. & Slaughter, B.H. eds. *Natural history of Texas caves*, Gulf Natural History. Dallas, Texas, USA.
- Notenboom, J., Hendrix, W., and Folkerts, A.-J. 1996. Meiofauna assemblages discharged by springs from a phreatic aquifer system in the Netherlands. *Netherlands Journal of Aquatic Ecology* 30: 1–13.
- Ogden, A.E., Quick, R.A., and Rothermel, S.R. 1986. Hydrochemistry of the Comal, Hueco, and San Marcos springs, Edwards Aquifer, Texas. Pp. 115–130 in Abbott, P.L. & Woodruff, C.M., Jr. eds. *The Balcones Escarpment: Geology, hydrology, ecology and social development in Central Texas*. Geological Society of America Annual Meeting. Geological Society of America, San Antonio, Texas, USA.
- Reddell, J.R. 1970. A checklist of the cave fauna of Texas. IV. Additional records of Invertebrata (exclusive of Insecta). *Texas Journal of Science* 21: 389–415.
- Schneider, K. and Culver, D.C. 2004. Estimating subterranean species richness using intensive sampling and rarefaction curves in a high density cave region in West Virginia. *Journal of Cave and Karst Studies* 66: 39–45.
- Stejneger, L. 1896. Description of a new genus and species of blind tailed batrachian from the subterranean waters of Texas. *Proceedings of the United States National Museum* 18: 619–621.
- Zara Environmental LLC. 2010a. Final report for deep aquifer biota study of the Edwards Aquifer. Edwards Aquifer Authority, 109 pp.
- Zara Environmental LLC. 2010b. Hays County karst invertebrate distribution and cave development. Texas Parks and Wildlife Department, 54 pp.