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Hydrolutos breweri sp. n., a new aquatic Lutosini species (Orthoptera: Anostostomatidae) from Churí-tepui (Chimantá Massif, Venezuela)

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Abstract

Hydrolutos breweri, a new species of Lutosini (Orthoptera: Anostostomatidae) from Cueva Charles Brewer (Churí-tepui, Guyana Highlands, Venezuela) is described and figured. Inhabiting aquatic environment it represents an unusual orthopteran with sternal and pleural area covered by fine microtrichia forming a plastron.

Key words: Orthoptera, Anostostomatidae, *Hydrolutos*, aquatic, Venezuela, tepui

Introduction

As a typical almost wholly southern hemispheric group of orthopterans Anostostomatidae are believed to owe their distribution to the split of Gondwana (Fleming 1979; Gibbs 2006), however, a dispersal factor to some islands should be taken into account (Knapp *et al.* 2005; Pratt *et al.* 2008). The whole family, formerly included in Stenopelmatidae, has been connected with plenty of longstanding nomenclatural problems, but some of them have been resolved through examination of most of the types (Johns 1997; Gorochov 2001; Jost and Shaw 2006). In their analyses Pratt *et al.* (2008) found support for the monophyly of Anostostomatidae and for the close relationship with the Gryllacrididae and Stenopelmatidae. Anostostomatids occupy a variety of ecological conditions across their zoogeographical range. Their unique phylogenetic status supports a challenge for specific conservation (Gibbs 1998; Johns 2001).

The South American *Hydrolutos* species are medium-sized flightless anostostomatids. The genus *Hydrolutos* (Orthoptera: Anostostomatidae) was known by 4 species: *H. auyan* Issa and Iaffe 1999, *H. chimantea* Issa and Iaffe 1999, *H. roraimae* Issa and Iaffe 1999, *H. aracamuni* Issa and Iaffe 1999, described from four different table mountains – tepuis in SE Venezuela (Issa and Iaffe 1999). Tepuis are peculiar flat-topped table mountains, typical for the Guyana region. They are separated from surrounding wide lowlands and uplands by the sheer cliffs. Tepuis are composed of quartzites and sandstones of the Precambrian Roraima Group, overlaying the igneous metamorphic Guyana Shield (Gibbs and Barron 1993). The Guyana Shield occupies the area of north-eastern South America, extending between the Orinoco River to the north and the Amazon River to the south (Fig. 1A). The Guyana region is known for its extraordinary diversity and high level of endemism, which is, above all, remarkable at the tops of the isolated table mountains (Huber 2005; Rull 2005; Rull and Nogué 2007). The ecological community of their summits is considered a distinct and discontinuous biogeographical province called Pantepui. Pantepui ranges from 1,500 to 3,000 m a.s.l. and covers an area of about 5,000 km^2 (Berry *et al.* 1995, Huber 1995). Tepuis are acknowledged islands supporting high endemism (Huber 2005; Rull 2007; Breure 2009; Breure and Schlögl 2010). This includes many aquatic species with a limited (endemic) geographical distribution (e.g. Čiampor and Kodada 1999; Kodada and Jäch 1999; Derka 2002; Derka *et al.* 2009), such as those of *Hydrolutos* (Issa and Iaffe 1999). All

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of them appear as unique and unusual in their aquatic ecology, enabled by a plastron-like structure on pleurosternal area of thorax and abdomen. Occurrence of numerous specimens of some giant orthopterans from the genus *Hydrolutos* from 10 to 12 cm of length that submerged underneath the water in case of danger was reported by Charles Brewer-Carías from a newly discovered gigantic cave Cueva Charles Brewer at Churí-tepui (Fig. 1C) in Chimantá massif (Šmída *et al.* 2005). The Chimantá massif (approx. 05°15' N 062°10' W) is a series of tepuis in the eastern part of the Guyana Highlands (Fig. 1B). Recently an international scientific expedition has explored the cave systems at Churí-tepui (Šmída *et al.* 2010). This paper reports on the new *Hydrolutos* species from the cave Cueva Charles Brewer at Churí-tepui. Moreover, male genitalia of the genus *Hydrolutos* are figured for the first time.

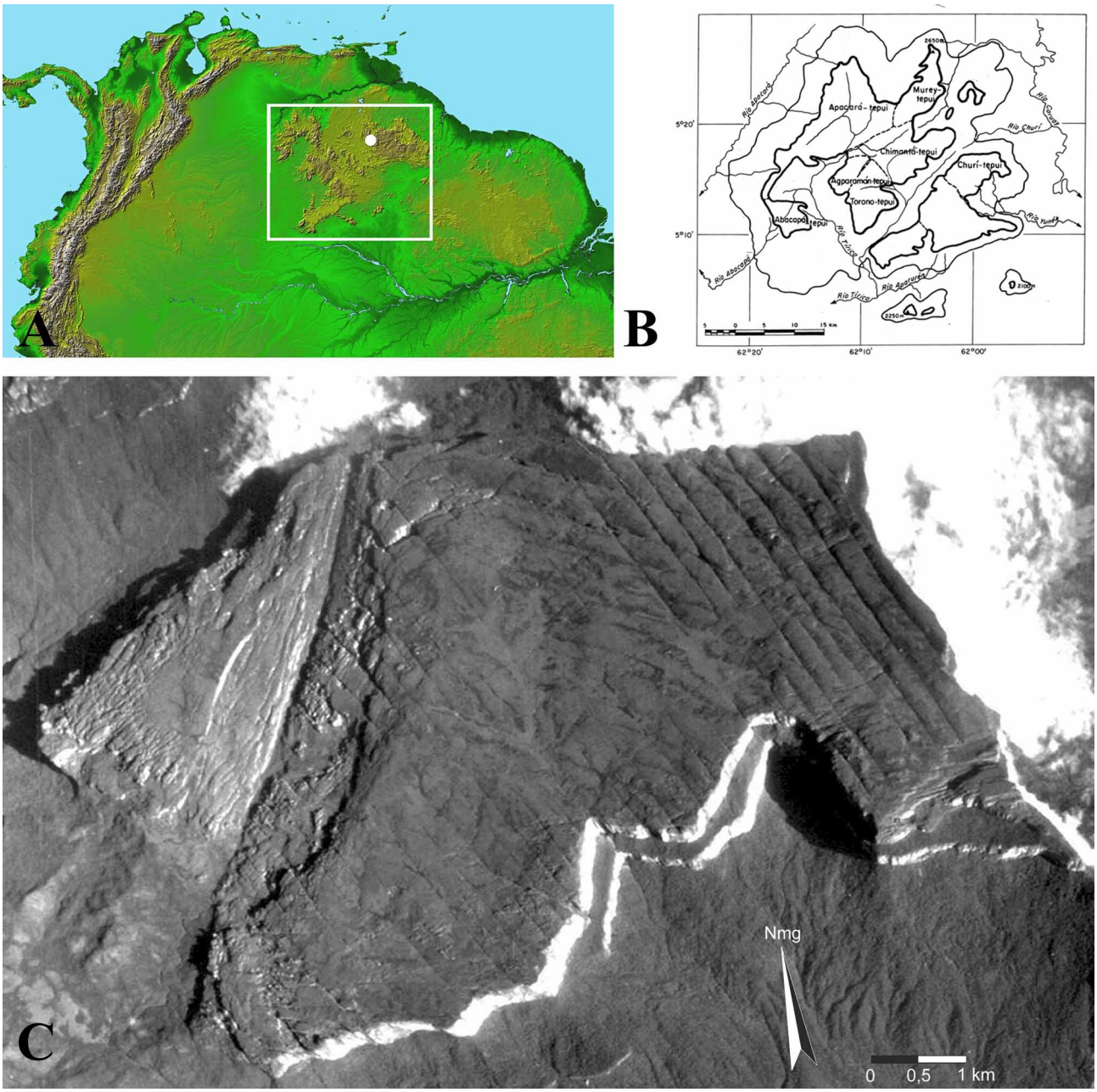

FIGURE 1. The region of Churí-tepui (Chimantá Massif, Venezuela). A. Venezuelan Guayana (white rectangle) with its Chimantá massif. B. Map of Chimantá massif with location of tepuis (modified after Huber 1995). C. Churí-tepui.

Material and methods

Material was collected inside the cave Cueva Charles Brewer at Churí-tepui at the Chimantá Massif, Venezuela (Fig. 1), manually or using a hydrobiological kick-net and stored in pure ethanol. Morphological characters were studied and photographed using stereomicroscope Leica M80. The holotype has been preserved dry and pinned. The paratypes are stored in 70% ethanol.

Systematic considerations and taxonomy. Issa and Iaffe (1999), describing the genus, gave the basic information on morphology of four species to distinguish them from other Lutosini relatives. However, the original description is short, with no sufficient details and many points may be applied to some other genera. Moreover it contains several disputable statements and figures.

The original paper by Issa and Iaffe (1999) declares front and middle coxae with no spines, but on the contrary forecoxa carries a moderate lateral spine and midcoxa a short blunt spine. Information on middle tibiae ventrally with a raw of 4 spines on internal side and a line of 3 spines on external side may be most probably expressed as *lapsus calami* as the spines are situated dorsally. Male genitalia were not figured and described. Therefore the taxonomic status of *Hydrolutos* should be discussed and revised more in detail.

Family Anostostomatidae Saussure 1859

Sub-Family Lutosinae Gorochov 1988

Genus *Hydrolutos* Issa & Iaffe 1999

External morphology is highly conserved in this genus, for all species as in the original description of *Hydrolutos* by Issa and Iaffe (1999). In body length the species range between 54–38 mm in males and 62–38 mm in females, that tend to be slightly larger than males.

Apterous, nocturnal, brown-coloured anostostomatids. As aquatic insects, on thorax and abdomen with sternal and pleural area covered by fine microtrichia forming a plastron. Head width usually the same than pronotum width. Fastigium horizontal, slightly flattened, not declinate with a definite median carina. Vertex convex. Maxillary palps well-developed, 5 segmented, S1 and S2 short, S3-S5 longer. S5 terminally pilous and swollen. Eyes weakly elevated, oval and pigmented.

Pronotum slightly elevated over mesonotum, as long as broad, with lateral margins indistinct. Thoracic sterna with 2 spines, on prosternum blunt, on mesosternum and metasternum longer, erected. Front tibiae with tympanal organs present on both sides, dorsally with 1 or 2 spines subapically and 2 apically, ventrally with 2 rows of 5 spines (including the apical ones). Middle tibiae dorsally with a row of 4 spines on internal side and a row of 3 spines on external side, ventrally with 2 rows of 5 spines. Hind tibiae with 2 lateral combs, ventrally with 2 long subterminal and 2 long terminal spines. Front femora without spines, but wrinkled on inner margins. Hind femora laterally compressed and with 2 combs of short spines on inner margins. Abdomen towards S9 uniformly segmented. In males epiproct convex, bilobulate apically, with long cerci. Subgenital plate as long as broad. In females ovipositor medium-sized, curved upwards.

Diagnosis. The main difference is in sternal and pleural area covered by fine microtrichia forming a plastron, generally unique within orthopterans. Pronotum gently projected over mesonotum, as long as broad. In *Apotetamenus* Brunner von Wattenwyl pronotum caudally projected over mesonotum. Front coxae with a distinct spine, medium coxae with blunt spine and hind coxae without a spine. Subgenital plate carries short styles, but there are longer in *Lutosa* Walker. The species of *Neolutosa* Gorochov have a typical structure of male abdominal apex, including complicated processes of paraprocts.

Hydrolutos breweri Derka & Fedor sp. nov.

Description. Male.

Colour and markings: Body dark brown. Head capsule, including mandibles, dark brown with a bright belt-like pattern on vertex and 3 bright spots triangularly situated on frons, shiny and almost smooth, eyes black. Palpi light basally and distally, with dark middle section. Thorax and abdomen very dark brown dorsally, with light bands on terga (light area on pronotum). Legs brighter than body (Fig. 2, 3).

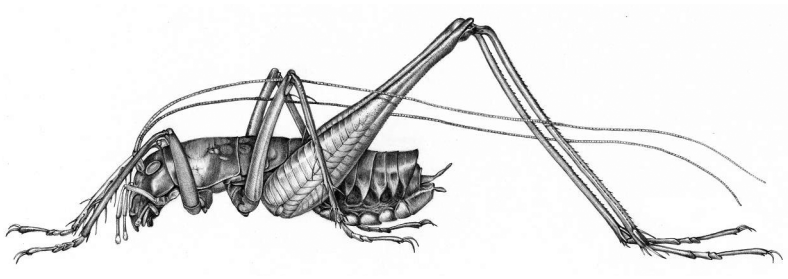

FIGURE 2. male *Hydrolutos breweri* **sp. n.** —a total view.

FIGURE 3. male *Hydrolutos breweri* **sp. n.** —a total view.

Head: Antennal flagellum about 2.5 times total body length, proximally smooth, in middle and distal section swollen and covered by short fine microsetae. Fastigium as broad as antennal segment S1, horizontal, slightly flattened, not declinate, with a median carina. Vertex convex, clypeus subtriangular with indistinct median carina. Labrum heart-shaped, proximally broader than distally, with median carina in its apical half. Maxillary palps bright, the last segment swollen and covered by short fine and soft microsetae. Eyes elevated in frontal view (Fig. 4).

Thorax: Pronotum slightly elevated over mesonotum, as long as wide, bordered by a smooth rolled margin, containing both smooth and gently rugose areas. All thoracic sterna with 2 spines, prosternum: 2 moderate spines posterolaterally elevated, mesosternum: 2 spines posterolaterally elevated, metasternum: 2 distinct spines with no lateral elevation (Fig. 2, 3).

Legs long, forecoxa with a moderate lateral spine, midcoxa with a short blunt spine, femora without spines. Fore tibiae dorsally with 2 spines subapically and 2 apically, ventrally with 2 rows of 5 spines (including the apical ones). Middle tibiae dorsally with a row of 4 spines on internal side and a row of 3 spines on external side, ventrally with 2 rows of 5 spines. Hind tibiae with 2 lateral combs of short but firm spines, ventrally with 2 moderate subterminal and 2 superior terminal spines. Tympanum elypsoid, dark brown.

Abdomen: Abdominal apex and genitalia as on Figures 5, 6, 7. Abdominal tergites smooth with fine transverse striae mesally and with posterior edges darker. Genitalia pubescent. Supra-anal plate bilobulate terminally slightly curved upwards. Cerci cylindrical, rugose, directed gently upwards, with blunt apices and without internal processes. Subgenital plate as long as wide, very gently concave laterally, without any emargination between styles, with flat posterior margin and long styli directed ventrad.

Measurements. Body length 43.2 mm (including cerci 47.1), fastigium width 1.2 mm, interocular space 5 mm, pronotum length 9.9 mm, width 11.1 mm, hind femur length 35.5, width (7 mm max.), (2 mm min.), hind tibia length 35.5 mm, hind tarsus length 11.3 mm, hind tarsi length: I 4.1 mm, II 3.0 mm, III 2.1 mm, IV 1.5 mm, abdomen length (without cerci) 22.4 mm.

Female. Unknown.

FIGURE 4. Head of male *Hydrolutos breweri* **sp. n.**—a frontal view (photographed by C. Brewer-Carías).

FIGURE 5. Genitalia of male *Hydrolutos breweri* **sp. n.** —a dorsal view.

FIGURE 6. Genitalia of male *Hydrolutos breweri* **sp. n.** —a lateral view.

FIGURE 7. Genitalia of male *Hydrolutos breweri* **sp. n.** —a ventral view.

FIGURE 8. Male *Hydrolutos breweri* **sp. n.** in its natural habitat.

Material examined. Holotype. 1 ♂ body length 43.2 mm, Venezuela, Edo. Bolívar, Chimantá Massif, Churí tepui, Cueva Charles Brewer, ca 2300 m a.s.l., 15.I. 2009. Holotype has been preserved dry and pinned.

Paratypes. ♂ body length 43 mm, 1 ♀ nymph, body length 30 mm. The same data as holotype. The paratypes are stored in 70% ethanol. Holotype and paratypes will be deposited in Museo del Instituto de Zoología Agrícola (MIZA), Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Edo. Aragua, Venezuela.

Etymology. Species named in honour of Charles Brewer-Carías, in recognition of his great contribution to exploration of Venezuelan Guyana. He has led over 200 expeditions in Venezuelan Guyana Highlands. His most famous discoveries are in geological features in the tepuis such as the giant sink holes on Sarisariñama, the world's largest quartzite cave on Churí-tepui and many other previously unexplored caves.

Ecology. As other members of the genus, *H. breweri* inhabits aquatic habitats. Numerous individuals were observed walking and swimming inside the stream and walking outside the water at the bottom and walls of the Cueva Charles Brewer (Fig. 8). Thanks to high ability to cling by means of strong legs and tarsal claws it is able to move even against strong current. Because of permanent darkness in the cave, individuals were observed active 24 hours, not only during the night as it was reported for other members of the genus (Issa & Iaffe 1999, pers. observ.). However, it can not be considered troglobiont because of lack of typical adaptations (e.g. reduction of eyes and coloration), and the occurrence of this species can be expected in other streams at Churí-tepui plateau outside the Cueva Charles Brewer.

Diagnosis. The species is easily distinguished on a few characters. Clypeus triangular (subtriangular in *H. chimantea*), laterally more distinct than in *H. ayuan*. Palpi bright but dark in *H. aracamuni*. Labrum heart-shaped, but oval in *H. raraimae* and *H. auyan*. Fastigium as broad as antennal segment I, but broader in *H. roraimae* and *H. aracamuni*. Epiproct bilobulate terminally, but oval in *H. aracamuni*. *H. breweri* is unique among other members of the genus by extremely long hind tibiae reaching length of hind femur. In remnant *Hydrolutos* species hind femur is always longer then hind tibia.

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References

Berry, P.E., Holst, B.K. & Yatskievych, K. (1995) *Flora of the Venezuelan Guayana, Vol. 1. Introduction.* St. Louis: Missouri Botanical Garden Press, 306 pp.

Breure, A.S.H. (2009) New Orthalicidae (Mollusca, Gastropoda) from Venezuelan Guayana: unravelling secrets from the Lost World. *Zootaxa*, 2065, 25–50.

Breure, A.S.H. & Schlögl, J. (2010) Additional notes on Orthalicidae from the Chimantá massif, Venezuelan Guayana, with descriptions of new species of *Plekocheilus* Guilding, 1828 (Mollusca: Gastropoda). *Zootaxa*, 2416, 51–60.

Čiampor, F. & Kodada, J. (1999) Description of two new species of the genus Jolyelmis from Mount Roraima, Venezuela (Coleoptera: Elmidae). *Entomological Problems*, 30, 2, 55–60.

Derka, T. (2002) *Massartella devani*, a New Mayfly Species from Venezuela's Highlands (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). *Aquatic Insects*, 24, 309–316.

Derka, T., Svitok, M. & Schlögl, J. (2009) *Massartella hirsuta* sp. nov. (Ephemeroptera: Leptophlebiidae: Atalophlebiinae) and new data on mayflies of Guayana Highlands. *Aquatic Insects*, 31, Suppl. 1, 83–94.

Fleming, C.A. (1979) *The geological history of New Zealand and its life*. Oxford University Press, Auckland, New Zealand. 141 pp.

Gibbs, G.W. (1998) Why are some weta (Orthoptera Stenopelmatidae) vulnerable yet others are common? *Journal of Insect Conservation*, 2, 161–166.

Gibbs, G. (2006) *Ghosts of Gondwana: the history of life in New Zealand.* Craig Potton Publishing, Auckland, New Zealand, 232 pp.

Gibbs, A.K. & Barron, C.N. (1993) *The Geology of the Guyana Shield.* Oxford Monographs on Geology and Geophysics, 22, 246 pp.

Gorochov, A.V. (2001) A higher classification, phylogeny and evolution of the superfamily Stenopelmatoidea. In: Filed, L.H. (ed.). *The biology of wetas, king crickets, and their allies.* Wallingford, CABI Publishing, p. 3–33.

Huber, O. (1995) Geographical and physical features. In: Berry, P.E., Holst, B.K. & Yatskievych, K. (Eds.), *Flora of the Venezuelan Guayana, 1. Introduction*. Missouri Botanical Garden Press, St. Louis, pp.1–61.
Huber, O. (2005) Diversity and vegetation types in the Guayana Region, an overview. *Biologiske Skrifter*, 55, 169–188.
Issa, S. & Jaffe, K. (1999) *Hydrolutos*: un género nuevo y cuatro especies nuevas de Lutosini Neotropicales (Orthoptera: Anostostomatidae). *Nouvelle Revue d'Entomologie (N.S.)*, 16, 2, 111–121.
Johns, P.M. (1997) The Gondwanaland weta family Anostostomatidae (formerly in Stenopelmatidae, Hemcidae or Minermidae) nomenclature! problems, world checklist, new genera and species. *Journal oj Orthoptera Research*, 6, 125–138.
Johns, P.M. (2001) Distribution and conservation status of ground weta, *Hemiandrus* species (Orthoptera: Anostostomatidae). Department of Conservation, Wellington, New Zealand, 25 pp.
Jost, M.C. & Shaw, K.L. (2006) Phylogeny of Ensifera (Hexapoda: Orthoptera) using three ribosomal loci, with implications for the evolution of acoustic communication. *Molecular phylogenetics and evolution*, 38, 510–530.
Knapp, M., Stockler, K., Havell, D., Delsuc, F., Sebastiani, F. & Lockhart, P.J. (2005) Relaxed molecular clock provides evidence for long distance dispersal of *Nothofagus* (Southern Beech). PLoS Biol 3 (1), e 14.
Kodada, J. & Jäch, M.A. (1999) *Roraima carinata* gen. et sp. nov. and *Neblinagena doylei* sp. nov., two Larainae from Mount Roraima, Venezuela (Coleoptera: Elmidae). *Entomological Problems*, 30, 1, 13–29.
Pratt, R.C., Morgan-Richards, M. & Trewick, S.A. (2008) Diversification of New Zealand weta (Orthoptera: Ensifera: Anostostomatidae) and their relationships in Australasia. *Philosofical Transactions of the Royal Society,* B 363, 3427–3437.
Rull, V. (2005) Biotic diversification in the Guayana Highlands: a proposal. *Journal of Biogeography*, 32, 921–927.
Rull, V. & Nogué, S. (2007) Potential migration routes and barriers for vascular plants of the Neotropical Guyana Highlands during the Quaternary. *Journal of Biogeography*, 34, 1–16.
Šmída, B., Brewer-Carías, Ch. & Audy, M. (2005) Speleoexpedície do vnútra masívu Chimantá (Venezuela) v roku 2004. Cueva Charles Brewer – Najväčšia kvarcitová jaskyňa sveta. *Bulletin of the Slovak Speleological Society*, 2, 1–190.
Šmída, B., Brewer-Carías, Ch., Audy, M., Mayoral, F., Bakšić, D., Vlček, L. & Stankovič, J. (2010) Churí-tepui Cave System:Inside the second largest quartzite cave in the world. *National Speleological Society*, 68, 7, 16–23.