

SHORT COMMUNICATION

A new species of *Protoschizomus* (Schizomida: Protoschizomidae) from a cave in Guerrero, Mexico

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Abstract. A new species of the genus *Protoschizomus* Rowland 1975 is described with adult males and females. We collected *Protoschizomus franckei* new species from Cueva del Diablo in the state of Guerrero, Mexico. Currently, the genus *Protoschizomus* is composed of eight species including the new species described here, of which five have been found inside caves.

Keywords: Endemism, schizomids, taxonomy, troglobite

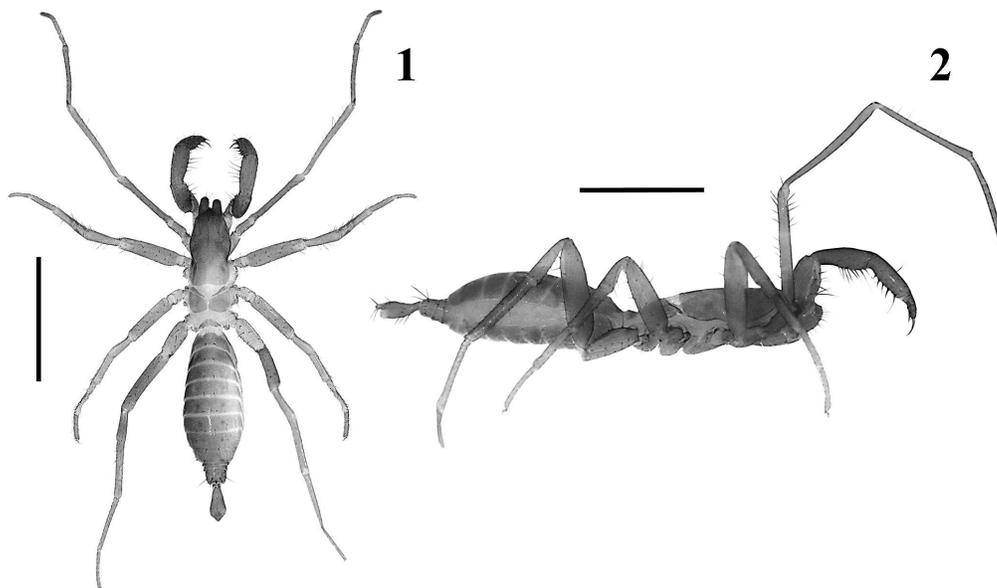
The family Protoschizomidae is a small group of schizomids currently composed of two genera: *Agastoschizomus* Rowland 1971 with five species, all troglobitic, and *Protoschizomus* Rowland 1975 with seven species of which four are also troglobitic (Cokendolpher & Reddell 1992; Harvey 2003; Montaña-Moreno & Francke 2009). The members of this family are considered troglobites because they have undergone several morphological adaptations for living in caves, such as elongated appendages, lack of pigment, lack of ocelli and relatively large body. Actually, *Agastoschizomus lucifer* Rowland 1971, with a body of 12 mm length, is the largest schizomid in the world (Rowland 1971; Cokendolpher & Reddell 1992).

The family is endemic to Mexico and is distributed throughout the states of Colima, Guerrero, Hidalgo, San Luis Potosí, and Tamaulipas (Cokendolpher & Reddell 1992; Montaña-Moreno & Francke 2009). These states have extensive karst formations where limestone is abundant and therefore also have numerous caves. Currently, there are approximately 7,000 caves reported for Mexico

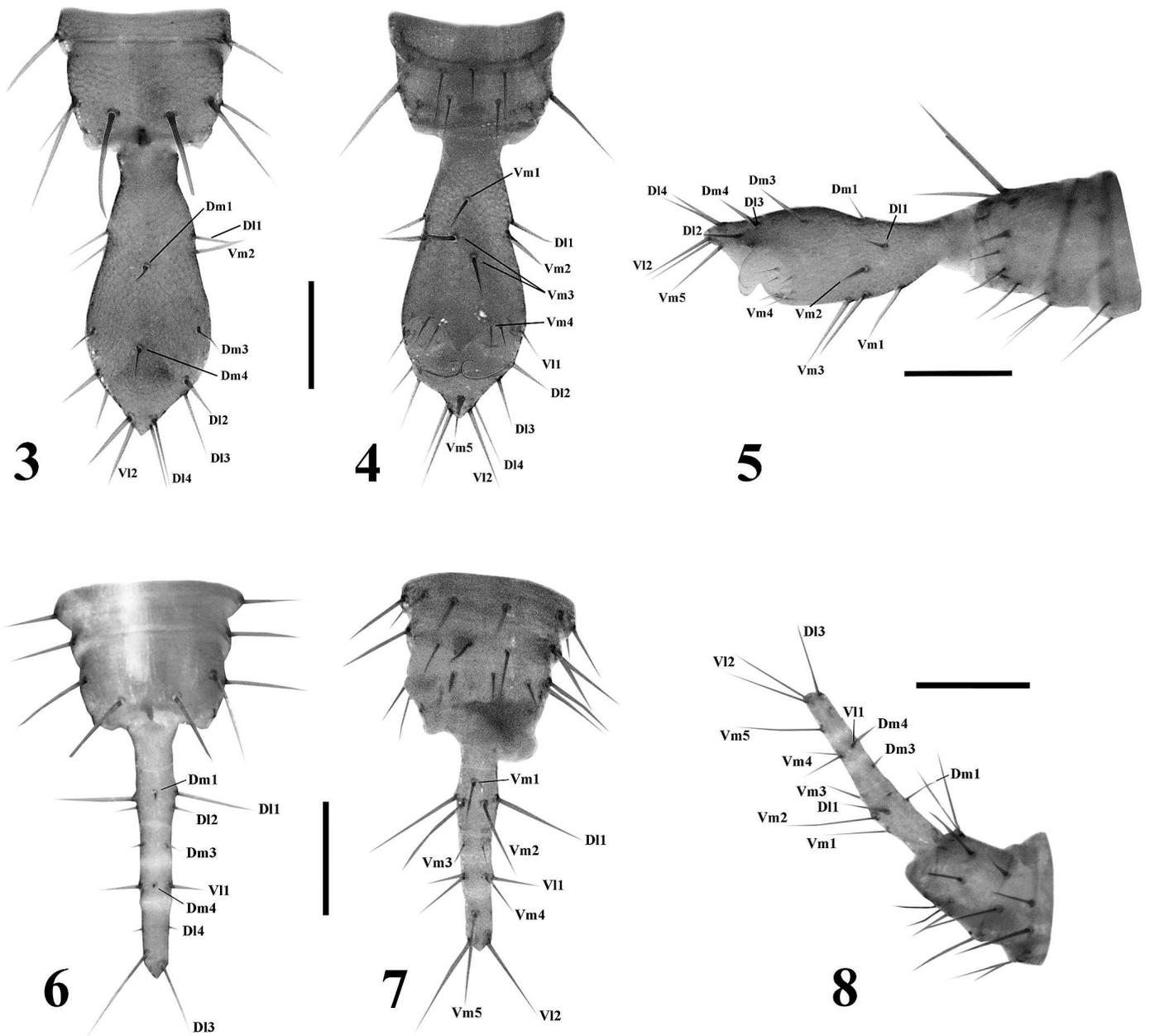
(Lazcano 1983), so there are still many caves in which new schizomids might be found.

Recent contributions regarding this family were made by Reddell & Cokendolpher (1992) and Montaña-Moreno & Francke (2009). Reddell & Cokendolpher (1992) revised and described seven new species and proposed two species-groups in *Protoschizomus* based on the shape of the male flagellum, the number of setae on the propeltidium, and the distribution of setae on the sternites, and introduced the nomenclature for the setation of the female flagellum. Montaña-Moreno & Francke (2009) described *Agastoschizomus jxtlahuacensis* Montaña-Moreno & Francke 2009, collected from a cave in the state of Guerrero and representing the second species from western Mexico.

Four of the seven known species of *Protoschizomus* have been collected inside caves (Cokendolpher & Reddell 1992), about 500 to 700 m from the entrance. The caves where these species have been collected are extensive systems, receiving massive amounts of



Figures 1–2.—*Protoschizomus franckei* new species. Male holotype. Habitus: 1. Dorsal view. 2. Lateral view. Scale bars = 2 mm.

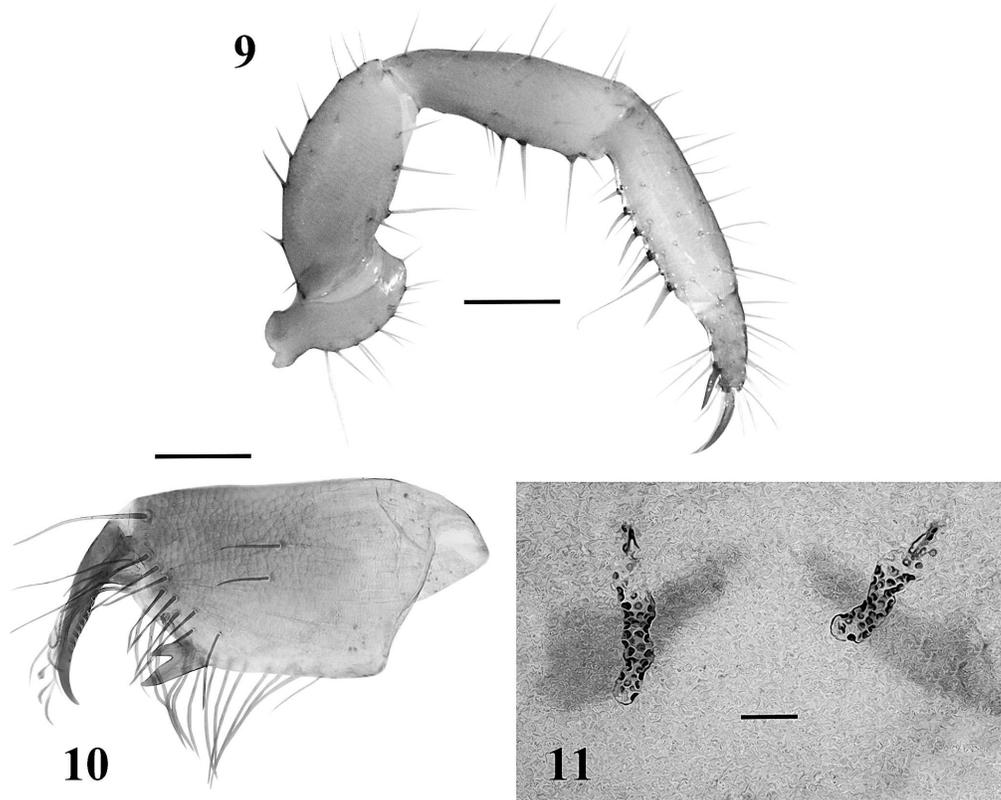


Figures 3–8.—*Protoschizomus frankei* new species: 3–5. Male holotype, flagellum: 3. Dorsal view; 4. Ventral view; 5. Lateral view. 6–8. Female paratype, flagellum: 6. Dorsal view; 7. Ventral view; 8. Lateral view. Scale bars = 0.2 mm. Setal terminology after Reddell & Cokendolpher (1992): Dm: dorsal median setae; Dl: dorsal lateral setae; Vm: ventral median setae; Vl: ventral lateral setae.

floodwater and organic material during the rainy seasons. In general, the specimens have been collected in total darkness, where they actively roam across silt banks or walk on the walls or between karst formations (Rowland & Reddell 1979; Cokendolpher & Reddell 1992). The objective of this work is to describe a new species of the genus *Protoschizomus* from a cave in Guerrero, which confirms that the distribution of the family extends from the north to south of Mexico along the Sierra Madre Oriental and westward through the Mexican Trans-Volcanic Belt to the states of Guerrero and Colima.

The specimens were collected manually and preserved in 80% ethanol. They were subsequently examined and measured with a Nikon SMZ645 stereoscopic microscope fitted with an ocular

micrometer. The measurements are given in mm, following Cokendolpher & Reddell (1992). The female spermathecae were dissected in 80% ethanol and cleared in lactophenol for 10 min (Krantz & Walter 2009), after which they were fixed in Hoyer's liquid, mounted in a permanent preparation, and examined with an optical microscope Nikon Eclipse E100. The male chelicerae were dissected in ethanol and observed in a semi-permanent preparation. The male flagellum and palp were suspended in 96% gel alcohol (to position firmly and prevent movement at the moment the picture is taken), and then were covered with a thin layer of liquid ethanol (80%) to minimize light diffraction during photography. We took photographs with a Nikon Coolpix S10 VR camera equipped with a microscope adapter and



Figures 9–11.—*Protoschizomus franckei* new species. Male holotype. 9. Right pedipalp, ectal view. 10. Right chelicera, ectal view. Female paratype. 11. Spermathecae. Scale bars: 0.2 mm (Figs. 9, 10), 0.05 mm (Fig. 11).

then edited the photographs with Adobe Photoshop CS5. The specimens are deposited in the Colección Nacional de Arácnidos (CNAN), Instituto de Biología, Universidad Nacional Autónoma de México (UNAM).

TAXONOMY

Family Protoschizomidae Rowland 1975

Genus *Protoschizomus* Rowland 1975

Protoschizomus Rowland 1975:2.

Type species.—*Agastoschizomus pachypalpus* Rowland 1973 by original designation.

***Protoschizomus franckei* new species**

Figs. 1–11

Type material.—MEXICO: *Guerrero*: holotype adult male, Cueva de Boca del Diablo, Acuitlapán, Municipio Taxco de Alarcón (18.59916°N, 99.54579°W, 1594 m), 21 April 2012, G. Contreras, J. Mendoza, R. Monjaraz, D. Ortíz (CNAN-T0384). Paratypes: 1 adult female, 1 immature, same data as holotype (CNAN-T0385).

Etymology.—This species is dedicated to Dr. Oscar Francke for his contributions to Mexican arachnology and for his support provided to the author.

Diagnosis.—A species belonging to the *pachypalpus* species-group with a conical flagellum in the male, rather than a globose flagellum; propeltidium with four pairs of dorsal setae; and sternites II–VII with two irregular rows of setae. Males can be distinguished by the conical shape of the flagellum, ending in a triangular projection (Figs. 3–5);

longer and narrower than that of *P. occidentalis* Rowland 1975; by the presence of two rows of setae, with five and three setae on the patella and five spinose setae on tibia (Fig. 9), in comparison to *P. occidentalis* which has three setae on the patella and four on the tibia, respectively.

Description.—*Male (holotype)*: Pale brownish. Length, from anterior margin of propeltidium to base of flagellum 4.56 (Figs. 1, 2). *Prosoma*: Propeltidium 1.22 long, 0.60 wide; anterior process curved downward; with row of two setae on anterior process and one pair setae at base of process; with four pairs of dorsal setae, the second pair longer than the others and the last pair missing; without ocular spots. Mesopeltidial plates 0.26 long; gap between the plates 0.12. Metapeltidium divided, each plate 0.34 wide. Anterior sternum with 10 setae plus two sternopophysial setae; posterior sternum with four setae.

Chelicera: Serrula with eight teeth. Setae 1=3, 2=4, 3=9, 4=2, 5=0, 6=1 (Fig. 10).

Palp: Trochanter not produced distally, semi-ovate, without sharp distal margins and without mesal spur. Femur with four long, spiniform setae ventrally and four prolaterally. Patella ventrally with two rows of spiniform setae; mesal row with five setae, ectal row with three spiniform setae, basal shortest and distal longest. Tibia with three ventrolateral rows of spiniform setae, two mesal and one ectal, first mesal row with five setae, second mesal row with five setae and ectal row with five setae (Fig. 9). Basitarsus-tarsus with two symmetrical spurs 0.14 long; claw 1.22 long (Fig. 9).

Legs: Leg I, including coxa, 5.61 long; basitarsal-tarsal proportions: 23: 5: 6: 6: 6: 5: 21. Femur IV 4.2 times longer than deep.

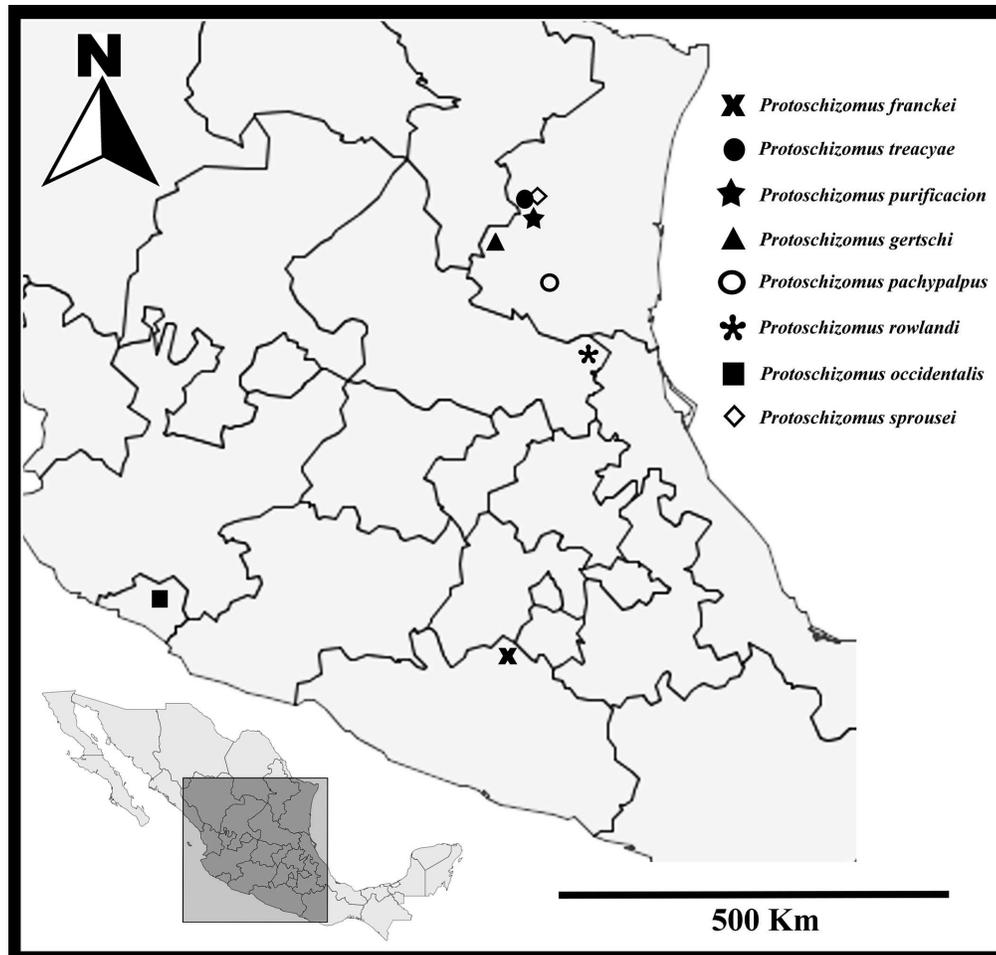


Figure 12.—Distributional records of the genus *Protoschizomus* Rowland 1975 in Mexico.

Opisthosoma: Tergite I with four anterior microsetae (in a row) and two large posterior setae; tergite II with six anterior microsetae (in a row) and two large posterior setae; tergites III–V and VII with two dorsal and two dorsolateral setae each; tergite VI with five setae, three dorsal and two dorsolateral setae; tergite VIII with two dorsal, four dorsolateral setae (in a row) and two lateral setae; tergite IX with two dorsal and two lateral setae; tergites X–XII semi-telescopic, XII being longest. Sternites II–VII with two irregular rows of setae near posterior margin; sternites VIII–IX with one row of setae; sternite X with one irregular row of setae; Genital plate clearly sclerotized. Sternite VI 3.5 times wider than long; width/length ratio versus body length, 1.2. Flagellum (Figs. 3–5) 0.64 long, 0.27 wide; conical, gradually expanded distally, with ventrolateral bulbs; seta dm2 absent.

Female (paratype): Similar to the male, differences: length from anterior margin of propeltidium to base of flagellum, 3.92. Propeltidium 1.48 long, 0.70 wide; setation as on male. Tergite setation as on male, except tergite VIII with two rows of setae on anterior and posterior margins, with five setae each. Sternite setation as on male, except on sternites VII and IX with two dorsal setae and four dorsolateral setae each; Sternite VI 3.6 times wider than long; width/length ratio versus body length, 1.08. Flagellum (Figs. 6–8) 0.60 long; dm2 setae absent; segments/articles I, III–V present. Spermathecae (Fig. 11) with one pair of short, tubular lobes not

increasing in diameter apically; with two sclerotized plates behind the lobes. Chelicera: serrula with seven teeth. Setae 1=3, 2=4, 3=11, 4=2, 5=0, 6=1. Leg I, including coxa, 5.24 long; basitarsal-tarsal proportions 17: 5: 5: 4: 5: 6: 20. Femur IV 3.4 times longer than deep.

Variation.—The male is larger than the female. The male pedipalps are longer and wider than on female. The number of teeth on the serrula of the chelicerae is eight in male and seven in female. Cheliceral setation: G3 varies, with nine on male and 11 on female.

Measurements (mm).—Male holotype (Female paratype): Pedipalp: trochanter 0.49 (0.42); femur 0.73 (0.68); patella 0.70 (0.64); tibia 0.67 (0.56); basitarsus-tarsus 0.30 (0.30); total 2.89 (2.60). Leg I: coxa 0.52 (0.44); trochanter 0.34 (0.34); femur 1.34 (1.10); patella 1.40 (1.28); tibia 1.26 (1.10); basitarsus 0.46 (0.27); tarsus 0.75 (0.71); total 5.61 (5.24). Leg IV: trochanter 0.60 (0.62); femur 1.28 (1.24); patella 0.64 (0.58); tibia 0.96 (0.90); basitarsus 0.84 (0.84); tarsus 0.62 (0.60); total 4.94 (4.78).

Distribution.—This species is known only from the type locality in the state of Guerrero (Fig. 12).

Related species.—*Protoschizomus franckei* resembles *P. occidentalis* Rowland 1975, from Colima, in that the male flagellum is broadly joined at the base, and seta vm4 is present; but they differ in size; *P. franckei* is larger (4.56) than *P. occidentalis* (4.00). The flagellum is narrower and longer in *P. franckei* than in *P. occidentalis* (Cokendolpher and Reddell 1992; Figs. 52, 53). The proportion of

pedipalp length versus body length is 0.63 for *P. franckei*, whereas for *P. occidentalis* it is 0.69. The number of spiniform setae varies from one species to the other: on the patella *P. franckei* has two rows of setae, with five and three setae, whereas on *P. occidentalis* it possesses only three setae; the tibia has three rows of setae, the ectal row with five setae, and on *P. occidentalis* it has only four setae. The spur is smaller (0.14) and the claw is bigger (1.22) in *P. franckei* than in *P. occidentalis* (0.3 and 0.6 respectively). The serrula has eight teeth on *P. franckei*, whereas *P. occidentalis* has seven; the number of setae varies throughout the chelicera. The propeltidium on *P. franckei* has one pair of setae less than on *P. occidentalis*.

Natural history.—We collected the specimens in a karstic cave, under a big rock, approximately 40 m from the entrance. The cave presents a considerable accumulation of mud on the ground and walls, indicating that it is subjected to periodic flash floods in the rainy season. The cave shows a high degree of human disturbance. The habitat outside the cave is deciduous oak forest.

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