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Correspondence

Description of the colouration in life of *Tricheilostoma joshuai* (Serpentes, Leptotyphlopidae). A species tolerant of disturbed habitats?

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Leptotyphlopids are the thinnest and smallest species of snakes, all of which are fossorial (Hedges 2008, Adalsteinsson et al. 2009, Vitt & Caldwell 2009). They occupy a wide variety of habitats along their distribution (McDiarmid et al. 1999, Adalsteinsson et al. 2009), from sea level to altitudes of 3250 m (Bailey 1946, Thomas et al. 1985, Zug 1977), even in disturbed areas (Thomas et al. 1985, Martins & Oliveira 1999, Sawaya et al. 2008). However, due to their secretive habits, many species are poorly known with regard to their morphological characteristics, distribution and natural history. As a consequence, many species are poorly represented in herpetological collections.

Recently, a comprehensive molecular phylogeny of the family Leptotyphlopidae was proposed, where the Neotropical species previously assigned to the genus *Leptotyphlops* were grouped into six new genera (*Epictia*, *Mitophis*, *Rena*, *Siagonodon*, *Tetracheilostoma* and *Tricheilostoma*) (Adalsteinsson et al. 2009). For Colombia and based exclusively on voucher specimens, eight species of leptotyphlopids are known (Pinto et al. 2010). One of them is *Tricheilostoma joshuai*, a species described by Dunn (1944) on the basis of seven individuals from the Cauca river valley.

Besides the large sample analysed by Pinto et al. (2010), the species is still poorly represented. *Tricheilostoma joshuai* is endemic to Colombia and distributed in the Cordilleras Central and Occidental of the Andes, with records from the departments of Antioquia, Caldas, Quindío, Risaralda and Valle del Cauca, between 1600 and 2200 m a.s.l. (see fig. 3 in Pinto et al. 2010). For Caldas, two records exist from the municipalities of Salamina and Villamaría (Dunn 1944, Pinto et al. 2010; see Appendix) without precise georeferenced locations (Fig. 1).

Recently, Pinto et al. (2010) in their revision of the Colombian leptotyphlopids, provided a detailed diagnosis and redescribed the holotype of *T. joshuai* (MLS 13, Museo Universidad de La Salle, Bogotá, Colombia), mainly based on meristic and morphometric characters. However, the colouration in life of *T. joshuai* was not described, owing to the unavailability of live individuals. In this paper, we describe its colouration in life and meristic and morphometric characteristics of this species based on five recently collected specimens of *T. joshuai*. Also, we discuss new records of the species in urbanized habitats.

Specimens examined were deposited in the Museo de Historia Natural de la Universidad de Caldas (MHN-UC). They were identified on the basis of both the original description (Dunn 1944) and the redescription of the species (Pinto et al. 2010). Measurement terminology follows Passos et al. (2006). Measurements were taken under a stereomicroscope with a dial caliper to the nearest 0.05 mm, except for total length (TL) and tail length (TAL), which it were taken with a flexible ruler to the nearest 1.0 mm. Sex was determined by checking for the presence of hemipenes through a ventral incision in the base of the tail. The following variables were taken from each specimen, conforming to Pinto et al. (2010): (1) Total length (TL); (2) tail length (TAL); (3) TL/TAL ratio; (4) middorsal scale counts (rostral and terminal spine excluded); (5) midventral scales (mental scale, cloacal shield and subcaudals excluded); (6) subcaudal scales (terminal spine excluded); (7) dorsal scale rows around the middle of the tail (DSR); (8) midbody diameter (MB); (9) midtail diameter (MT); (10) head length (HL); and (11) head width (HW) (Table 1).

All individuals were found in the urban area of Manizales City, department of Caldas, Colombia (5°08' N, 75°53' W, 2160 m a.s.l.) (Fig. 1). This city is located between the two sites where *T. joshuai* has been previously reported in Caldas. This area is part of the Andean Orobioma on the western flank of the Cordillera Central (Rodríguez et al. 2004), belonging to the Low Montane Wet Forest zone (*sensu* Holdridge 1982 and Hartshorn 2002). The individuals are described as follows:

MHN-UC 0040 and 0051. Both individuals were found dead on a paved road on 02 February and 25 September 2003, respectively.

MHN-UC 0162. This specimen was encountered on 09 May 2007 at 14:00 h, moving on the ground in the botanical garden of the Universidad de Caldas within an area of *Pinus patula* plantations.

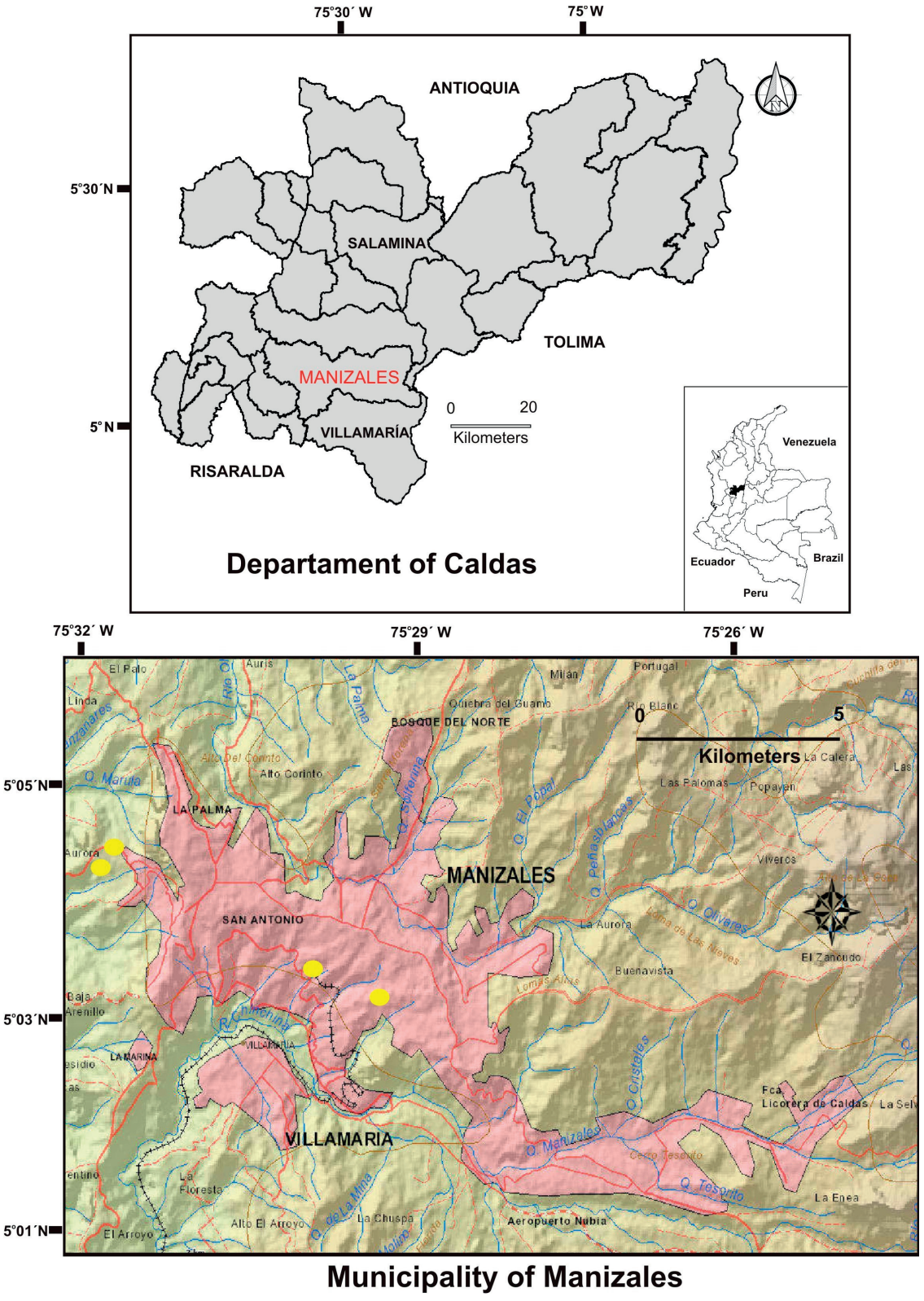

Figure 1. Locality records of *Tricheilostoma joshuai* (yellow spots). The pink area demarcates the urban zone of Manizales City.

MHN-UC 0160 (Figures 2A-C). This specimen was found dead on a paved road at the edge of a forested hillside in a state of intermediate succession (see Mejía 2005 for a description of this urban area) on 03 July 2009 at 15:40 h.

MHN-UC 0161. This snake was found dead on 12 October 2010 at 14:30 h on the lawn of a park approximately 200 m from where MHN-UC 0160 had been collected.

All specimens agree with the meristic and morphometric characteristics described in the diagnosis of Pinto et

Table 1. Meristic and morphometric variation (in millimetres) of the individuals of *Tricheilostoma joshuai* reported on in this paper and the holotype.

Specimen	Sex	TL	TAL	TL/ TAL	Middorsal scales	Midventral scales	Subcaudal scales	DSR	MB	MT	HL	HW	Data source
MLS 13	F	259	16	16.2	195	181	15	12	8.3	–	4.9	–	Pinto et al. (2010)
MHN-UC 0040	F	142	9	15.77	196	182	16	12	3.7	3.15	3.85	3.0	This paper
MHN-UC 0051	F	131	9	14.55	187	165	18	12	3.1	3.1	3.05	3.1	This paper
MHN-UC 0162	F	320	14	22.85	191	180	14	12	7.1	6.4	8.45	5.8	This paper
MHN-UC 0160	M	100.9	8	12.61	186	179	13	12	3.45	3.05	3.85	3.15	This paper
MHN-UC 0161	?	100.8	6.5	15.50	191	183	15	12	3.2	3.0	4.0	3.05	This paper

al. (2010). One of them (MHN-UC 0162) is the largest recorded specimen, exceeding the largest known female by 20 mm (300 mm *sensu* Pinto et al. 2010).

Colouration in life. Juvenile individuals (MHN-UC 0160-61) had a very distinctive colouration (Fig. 2A), which consisted of seven rows of uniform silvery grey dorsal scales and seven rows of uniform white ventral scales; lateral scales of the body were half silvery and half white. The head was bright red from the rostral scale to the sixth dorsal scale. The red colour faded from the interparietal scale, becoming grey blending with the general colouration of the body. The terminal spine of the tail was not pigmented. In preservative, both individuals (MHN-UC 0160-61) have uniformly dark brown dorsal and cream ventral scales (Figure 2B, C). The dorsal side of the head is paler than the dorsal body scales, with some brown pigmentation in MHN-UC 0161. MHN-UC 0162 (adult female, Table 1), was uniformly dark silvery dorsally in life, contrasting with the whitish cream colour of the venter; the head was dorsally paler than the rest of the body. In preservative (after four years in 70% Ethanol), this specimen presents a more uniform colour throughout its dorsal face of the body, save

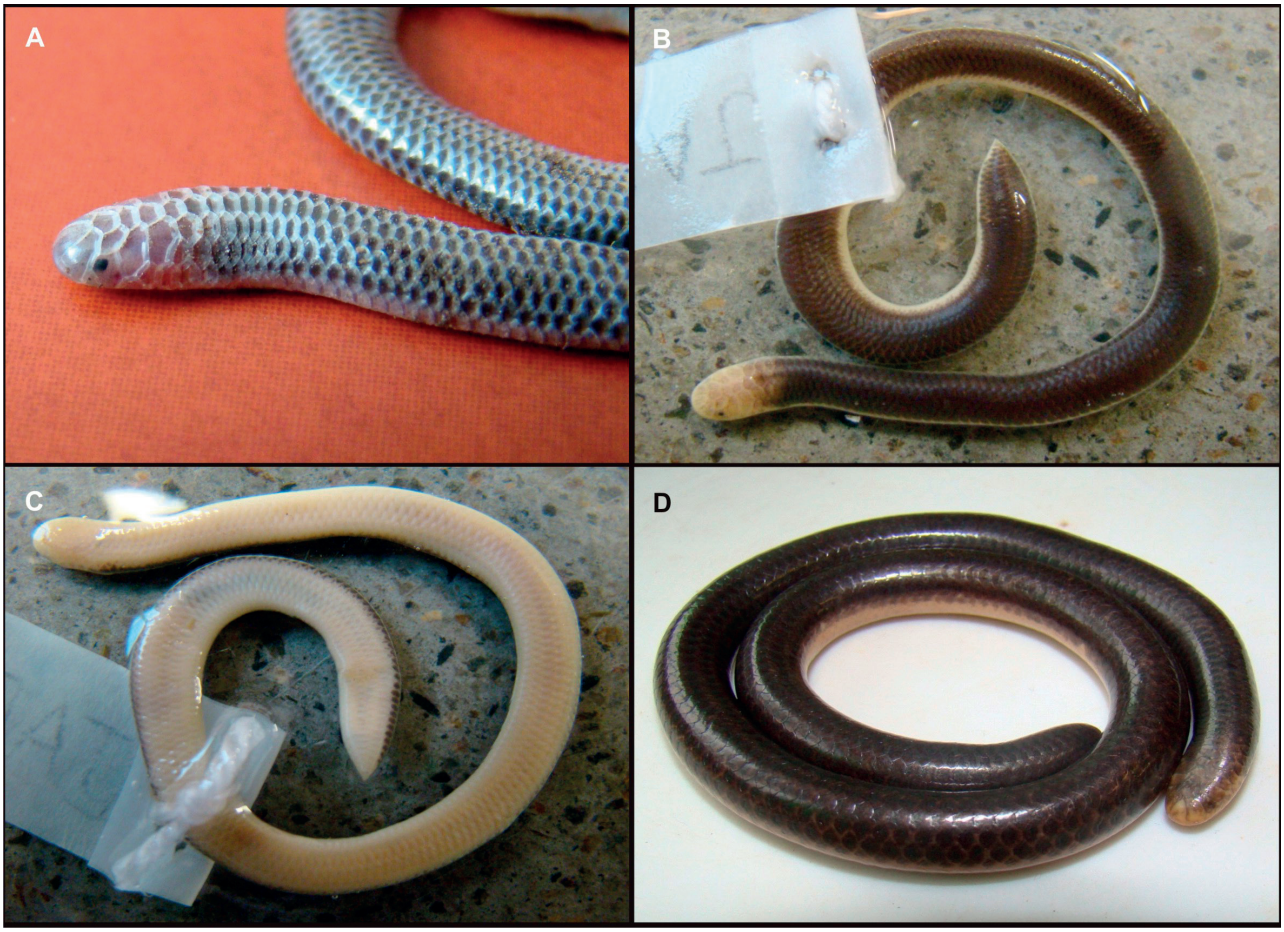

Figure 2. Details of the head in dorsal view of a recently deceased individual (MHN-UC 0160), showing the colouration in life of the species; note the difference in colouration between the head and the rest of body (A); body in dorsal (B) and ventral views (C) of MHN-UC-0160 in preservative. Body in dorsolateral view (D) of an adult specimen in preservative (MHN-UC 0162). Photos: Julián Andrés Rojas-M.

for a light brown patch on the head (Fig. 2D) that covers the top halves of the oculars and the posterior supralabials. The venter is uniformly creamy white, including the head.

The characteristics of the colouration of *T. joshuai* described above may suggest that there is an ontogenetic change in the pigmentation of the head and even in the silver tone of the whole body. In leptotyphlopids (especially in members of the tribe Epictini, subfamily Epictinae *sensu* Adalsteinsson et al. 2009), ontogenetic changes in body colouration are poorly known. In *Tricheilostoma kopessi* (Amaral, 1954), for example, adults are dark grey dorsally and light grey ventrally, while juveniles are pink (Sawaya et al. 2008). In *T. fuliginosum* (Passos et al. 2006), on the other hand, individual differences in colouration have been noted, but have been attributed to the process of moult (ecdysis) (R. R. Pinto. pers.comm.). In *T. joshuai*, both assumptions need to be tested with larger samples to identify the true extent of plasticity in colouration of this species.

On the other hand, the observations in Manizales lead us to believe that this species is difficult to find, but apparently tolerant of urbanized environments and can survive in parks and forest fragments. This ability has also been reported for different species of Neotropical scolecophidians (e.g., *Typhlops brongersmianus*, *Epictia diaplocia*, *Tricheilostoma macrolepis*, *Tricheilostoma kopessi*, *Liotyphlops wilderi*) (Strussmann 1992; Martins & Oliveira 1999; Bernarde & Abe 2006; Sawaya et al. 2008; Costa et al. 2010; respectively).

While our results suggest that *T. joshuai* can live in disturbed areas, it would be premature to hypothesize about possible adaptations to such environments. It is important to mention that some areas of Manizales are surrounded by forest fragments, which besides offering potential microhabitats for snakes, also harbour many types of prey (e.g., invertebrates). In the specific case of *T. joshuai*, although apparently being a generalist in terms of habitat utilization, it should be expected to largely depend on forests. Therefore, it is necessary to maintain these environments to ensure the continued existence of its populations and generate educational strategies to encourage the conservation of snakes in this portion of the Colombian Andes.

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