

# Discovery of a rare snail-eater snake in Venezuela (Dipsadinae, *Dipsas pratti*), with additions to its natural history and morphology

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## Abstract

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The snail-eating snakes that inhabit the Sierra de Perijá, of both Colombia and Venezuela, have received little attention in part because of the difficult accessibility of this area, due to the roughness of the terrain and the geopolitical boarder instability in this region. One of the rarest and least known snail-eaters, *Dipsas pratti* (type species of its group, *sensu* Peters 1960), is known from 13 specimens (including the holotype). Since its original description in 1897, all known specimens of *D. pratti* have been collected from the Cordillera Central and Oriental of Colombia. In this study, we greatly improve our knowledge of the biology of *D. pratti* based primarily on nine newly collected specimens. Seven of these specimens are the first recorded from Venezuela, expanding the known range of this species by approximately 300 km to the northeast. These specimens provide additional information on external, reproductive, and hemipenial morphology, habitat, and defensive behaviors of the species. Additionally, we provide the first in-life photographs of *D. pratti*. This study sheds light on the biodiversity in a unique and underexplored region as well as bridging a critical knowledge gap in our understanding of an understudied group of Neotropical snakes.

## Introduction

Recently, research on the taxonomy and systematics of South American snail-eating snakes of the genus *Dipsas* has increased (e.g., McCulloch & Lathrop 2004; Cadle 2005; Harvey 2008; Harvey et al. 2008; Harvey & Embert 2008). However, many secretive species from northern South America remain poorly studied and knowledge of behavior, evolution, and natural history is still lacking. This paucity of information can be attributed to a lack of fieldwork in many regions of northern South America. Despite safety concerns at the north-west border between Colombia and Venezuela, a few herpetological surveys have been conducted since 1989 in the Sierra de Perijá – a mountain chain considered

an extension of the Cordillera Oriental of Colombia. These surveys led to the discovery of Venezuelan populations of reptile species formerly known only from Colombia (e.g., Manzanilla et al. 1998, 1999; Rivas et al. 2002; Harvey et al. 2004). *Dipsas perijanensis* Alemán, 1953 was described more than 50 years ago on the Venezuelan side of the Sierra de Perijá and until recently known only from a single specimen. Recent research in the Cordillera Oriental, Colombia has also contributed to additional specimens of this species, which resulted in the allocation of the species to a new genus, *Plesiodipsas* Harvey et al., 2008.

The description of *Dipsas* [*Leptognathus*] *pratti* (Boulenger, 1897) was based on a single female specimen (Fig. 1) collected in Medellín, Colombia by A. E.

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**Figure 1.** Holotype of *Leptognathus pratti* (BMNH 1946.1.20.52, formerly 97.11.12.19) showing the full body (a) and dorsal (b), right side (c), and ventral (d) views of the head. Original image (a) had forceps obscuring tail near tip and was therefore altered. Photographs by Colin J. McCarthy.

Pratt. After Boulenger's description, four species of *Dipsas* were described and later determined to be ontogenetic variants of *D. pratti* and therefore all synonymized with *D. pratti* (Peters 1960; see taxonomic account below). Although *D. pratti* has been designated as the type species for a group (Peters 1960; Harvey 2008), it is known from 13 specimens and its natural and evolutionary histories are still poorly understood. Until recently the species was known only from the Cordillera Central and Cordillera Oriental regions of Colombia, where it was recently reported in the departments of Santander and Bolívar (Moreno-Arias et al. 2006).

In 2007 and 2008, seven specimens of *Dipsas pratti* were collected from the Venezuelan side of the Sierra de Perijá. These specimens represent some important records since the first scientific explorations to the Sierra de Perijá were conducted in the late 1940s and early 1950s (Alemán 1953). In addition to being a new record for Venezuela, these new specimens provide the opportunity to increase the knowledge of the morphology of *D. pratti* and better understand its distribution, behaviours, and natural history. Finally, we provide the first in-life photographs of the species.

## Material and methods

We collected meristic and continuous measurements from 19 specimens of *Dipsas pratti*, including seven new specimens from Zulia state, Venezuela (Appendix). We used a string and meter stick to measure snout-vent and tail lengths and digital calipers for all other measurements. Museum acronyms follow Leviton et al. (1985), except

for Museo de Biología de la Universidad del Zulia, Maracaibo (MBLUZ), Museo de Historia Natural La Salle, Caracas (MHNLS), and Colección Herpetologica de la Universidad Industrial de Santander, Bucaramanga (UIS). All seven Venezuelan specimens are from the Sierra de Perijá, Municipio Villa del Rosario, ca. 1600 m elev. The first four were collected in May 2007 (MBLUZ 889 and MBUCV 6837), February 2008 (EBRG 4888) and September 2008 (EBRG 4820) by Rafael Alastre while two additional specimens were obtained by GRF, TB, and R. Alastre on 22 June 2007 (MBLUZ 892 and UTA R-57479). MHNLS 18799, a juvenile was collected at the same place by Pedro Cabello on 26 March 2008. All specimens were observed crossing a dirt road through the cloud forest (Fig. 2) at night, ca. 1900–2000 h. To facilitate comparisons of standard diagnostic characters with other *Dipsas* species, we follow the format of Harvey (2008).

Although Harvey & Embert (2008) described the hemipenes of numerous *Dipsas* species, the hemipenis of *D. pratti* has not been described fully. The hemipenes of the adult male specimen (UTA R-57479) were nearly fully everted during preservation. The left organ was removed and prepared following the methods of Myers & Cadle (2003) and Zaher & Prudente (2003) with the addition of blue petroleum jelly inserted into the hemipenis during eversion, as described and illustrated in Smith & Ferrari-Castro (2008) and Jadin & Smith (2010). A dissecting microscope and optical micrometer were used for measuring the hemipenis. Terminology follows Dowling & Savage (1960), Myers & Campbell (1981), and Harvey & Embert (2008).

## Results

### *Dipsas* [*Leptognathus*] *pratti* (Boulenger, 1897)

*Leptognathus pratti* Boulenger, 1897: 523 [BMNH 1946.1.20.52, Medellín, Antioquia Colombia]



**Figure 2.** Road that all the Venezuelan specimens were crossing when collected (a). This road runs through cloud forest (a and b) on the Venezuelan side of the Sierra de Perijá, 1600 m. Photographs by Tito Barros (a) and Pablo Velozeo (b).

*Leptognathus triseriatus* Cope, 1899: 13 [AMNH R-17525, New Granada, Colombia]

*Leptognathus nigriceps* Werner, 1916: 310 [Coñon (sic) del Tolima, Colombia]

*Dipsas niceforoi* Prado, 1940: 14 [MLS 165, Quindío, Colombia]

*Dipsas tolimensis* Prado, 1941: 345 [Tolima, Libano, Colombia]

*Dipsas pratti* Peters (1960: 112) [synonymization of *Dipsas niceforoi*, *D. tolimensis*, *Leptognathus nigriceps* and *L. triseriatus* with *D. pratti*]

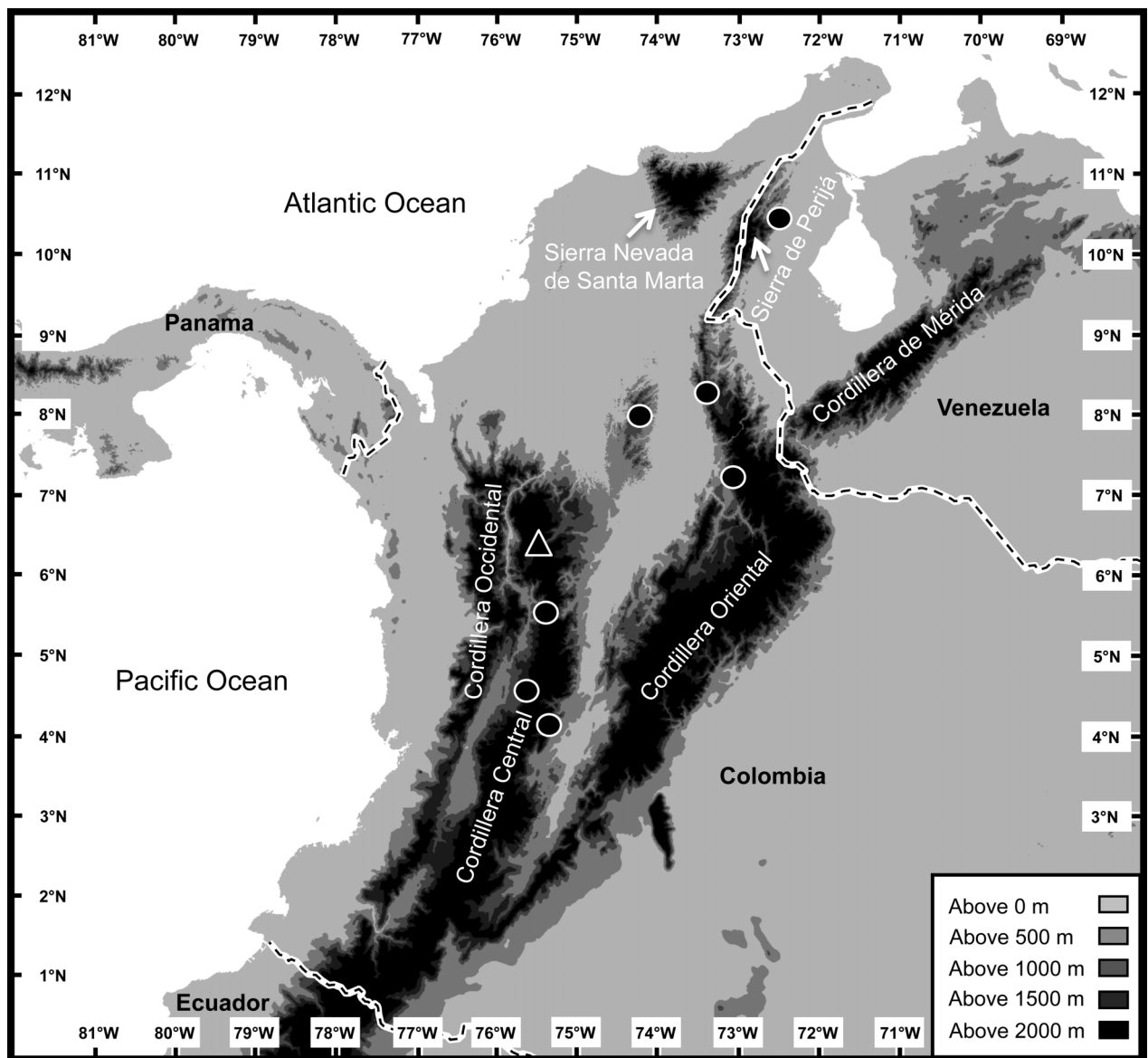
**Distribution.** Specimens collected during this study from the Sierra de Perijá, Estado Zulia, Venezuela represent the first records for Venezuela and northernmost localities for the species, extending the known range approximately 300 km northeast from the nearest locality in the Cordillera Central of Colombia (San Pedro Frio, Bolívar, 1600 m). All other known specimens of *D. pratti* are from the Cordillera Central (departments of Bolívar, Medellín, Quindío and Tolima), Cordillera Oriental (department of Santander) in Colombia (Fig. 3). Located in northwestern Venezuela, the Sierra de Perijá comprises the northernmost extension of the Cordillera Oriental in Colombia, and is separated from the Mérida Cordillera to the southeast by the Maracaibo basin. Even so, there are some shared zoological and floristic affinities, principally with the low and moderate elevations of the Colombian Sierra Nevada de Santa Marta, Cordillera Oriental, and the Cordillera de Mérida (Rivas et al. 2002; Rivera-Díaz & Fernandez-Alonso 2003).

The seven new Venezuelan specimens of *D. pratti* were collected from a mountainous habitat with abrupt relief and altitudinal cotes between 1300 and 1950 m (Fig. 2), located in the sub-Andean strip (1000–2400 m, Cuatrecasas 1958) with a sub-humid bioclimatic floor. Huber & Alarcón (1988) classified the area as submontane and montane evergreen forests. These ombrofilous forests have a high canopy where *Didymopanax morototoni*, *Spondias mombin*, and *Gutteria cardoniana* are the dominant tree species (Zambrano et al. 1992). Ewel et al. (1968) described the area as

very humid, with premontane and montane forests. This area is part of a larger biome, which in Perijá covers an area of 1,811 km<sup>2</sup>. The temperature in the high peaks fluctuates between 16–24 °C with annual rain accumulations between 2,000 and 4,000 mm. Rain regimes are bimodal and tetra-seasonal; the area has dry periods on December–March and June–August, and rainy periods from April–June and August–November.

The Venezuelan specimens were collected early in the morning or between late evening and night. Apparently, these snakes often cross the open road on the summit and according to this peculiar habit their collection in this locality has been relatively easy.

**Diagnosis.** *Dipsas pratti* is a robust snake of the tribe Dipsadini defined by the following characters: (1) dorsal scale rows 15–15–15; (2) temporals excluded from the orbit by postoculars; (3) two pairs of infralabials in contact behind the mental; (4) infralabials broadly contacting first and second pairs of chinshields, sublabials separating infralabials from preventrals and ventrals; (5) loreal variable, though more specimens exhibit loreals that are longer than high or slightly square and occasionally higher than long, entering orbit; (6) preocular present above loreal, excluding prefrontal from orbit; (7) dorsal surface of head uniform brown in adults, young specimens with some yellow marks on the cephalic scales; (8) labial scales heavily pigmented yellow both in adults and juveniles, young specimens with a narrow yellow bar extending from behind the eyes to the last supralabials; (9) nuchal collar absent in adults, but present in young specimens; (10) usually fewer than 30 bands with or without lighter centers but rarely resembling paired ellipses, first band without contacting parietals; (11) bands complete in young specimens, however in adults and old specimens only the faint narrow yellow line can be observed on either side of the diffuse bands; (12) interspaces brown but lighter than the bands; (13) venter uniform grey brown; (14) ventrals, excluding preventrals, 175–181 in males,



**Figure 3.** Geographic distribution of *Dipsas pratti* based on material examined in this study and data from the literature (Boulenger 1897; Cope 1899; Werner 1916; Prado 1940, 1941; Peters 1960; Harvey 2008). Dots correspond to both materials examined by the authors as well as having been referred formerly in the literature. The type locality of *Dipsas pratti* is shown by a triangle.

167–176 in females; (15) subcaudals 75–81 in males, 62–75 in females, although Harvey (2008) reports 60–89 for the species; (16) maxillary teeth more than 15 [see Tables 1–2 as well as descriptions of *D. pratti* in Harvey (2008) and Harvey & Embert (2008)].

**Coloration.** The background colors of most of the specimens are brown with darker brown bands, which are surrounded by a narrow yellow line. There are numerous visible bands but only the first are easy to detect, the first starting just behind the head. The bands are 6–9 scales in length and are bordered by a light yellow line less than a single scale in width. The bands do not form a continuous band around the snake but do extend from the middorsum to the ventral scales. The continuations of the bands towards the venter are without a well-defined pattern of light color. Bands become light-

er posteriorly and then become difficult to see as vestiges of the lines that bordered the bands are all that remain. In contrast, specimens EBRG 4888 and UTA R-57479 (Figs 4a, b) only have the narrow yellow rings or lines that formerly bordered the bands; these rings seem to always become less distinct toward the tail. There is a thin golden line that extends from the posterior border of the eye to the last supralabial and the area occupied by the supralabials and just below this line is darker than the rest of the head (Figs 4c, d). The male specimen UTA R-57479 is the largest known specimen and has the most uniform pattern with respect to the other specimens (see Figs 4a–f). These color changes seem to be consistent in the *pratti* group because the dark brown bands become clearer or disappear when the specimens become adults, and therefore only traces of some of the clear lines along the dark bands persist

**Table 1.** Measurement and meristic characters of examined *Dipsas pratti* specimens. Ranges are followed by means + standard deviations in parentheses. Scales are counted as right/left and measurement are in millimeters. TDCA = too diffuse to count accurately.

Variable or character	BMNH 1946.1.20.52 female (Type)	Venezuelan male UTA R-57479	Venezuelan females (n = 6)	Colombian males (n = 3)	Colombian females (n = 7*)
Snout-vent length	616	670	338–650 (563.83 ± 128.15)	245–614 (409 ± 187.88)	185–616 (466 ± 154.50)
Tail length	151	193	95–178 (152 ± 33.09)	78–179 (119.66 ± 52.76)	52–179 (123.87 ± 43.22)
Head length	25	22.2	12–25.5 (21.9 ± 5.23)	11.5–21.18 (15.69 ± 4.96)	10–25 (18.14 ± 5.23)
Eye-nostril distance	4.8	4.3	2.8–5.1 (4.36 ± 0.9)	2.4–4.24 (3.16 ± 0.96)	1.9–4.8 (3.47 ± 1.02)
Eye diameter	3.7	4.6	3.1–4 (3.68 ± 0.3)	2.08–4.06 (3.36 ± 0.63)	2.2–4.06 (3.27 ± 0.62)
Loreal length	3.2	2.8	1.6–3.8 (2.88 ± 0.8)	1.4–2.45 (1.8 ± 0.56)	1.2–3.2 (2.26 ± 0.71)
Loreal height	2.9	2.4	1.95–4 (2.72 ± 0.76)	1.77–2.7 (2.09 ± 0.52)	1.4–2.9 (2.32 ± 0.57)
Postoculars	2	2	1 or 2	2	1 or 2
Ventrals	171	181	167–173 (170.83 ± 2.4)	175–176 (175.66 ± 0.57)	169–176 (171.25 ± 2.55)
Subcaudals	70	81	67–75 (70.16 ± 2.99)	75–79 (77.33 ± 2.08)	62–73 (70 ± 4.92)
Pairs of chinshields	3	2	2 and 3 in MHNSL 18799	2 or 3	2 or 3
Body bands	TDCA	TDCA	20 bands for MHNSL 18799	18, 18 and 21	12, 12, 13, 17, 18, 20, 20 (Adult specimens lost some bands)
Bands on tail	TDCA	TDCA	9 in MHNSL 18799 and 8 in MBLUZ 892	8, 9 and TDCA in ICN 8060	9, 9, 9, 8, 7, 6 No data in AMNH 35607
Supralabials	8/9	8/8	8/8; 8/7; 8/9; 9/9; 9/8	10/9; 9/8; 9/8	88/8; 9/8; 8/8; 9/9; 8/8; 9/8; 8/8
Infralabials	10/10	9/10	12/10; 10/11; 10/10; 12/11; 11/11; 11/12	12/11; 11/12; 13/12	11/11

\* Ranges, means, and standard deviations include the holotype, while scale counts do not.

in older individuals (Peters 1960). According to Harvey (2008), many of the species of the *pratti* group become melanistic with age. The color in life is the same as in preservative, with the exception that the light color in preservative is yellow in life.

**Hemipenis.** The hemipenes of *D. pratti* are cylindrical, bulbous, and fully capitate (Fig. 5). The proximal edge of the capitulum terminates in a free flap that overlaps a small portion of the most distal row of spines. The right attached hemipenis extends to the end of the 7th subcaudal (~19 mm in length) and the capitulum begins at the end of the 5th subcaudal (~12 mm). The left hemipenis was everted and prepared and measures approx. 24 mm from cloaca to the tip, and 9.7 mm at the broadest point. The left organ is likely larger than the

right due to expansion during the preparation procedure. The base of the hemipenis is covered by numerous spinules (< 0.3 mm). With a length of approx. 10 mm, the capitulum takes up nearly half of the organ's surface on the sulcate side. Shortly after reaching the capitulum (~1 mm), the *sulcus spermaticus* bifurcates. Its branches extend centrolaterally towards the opposite ends of the hemipenis to a maximum distance of 9 mm from each other, coming closer together at the hemipenis tip and ending at a distance of 7 mm from each other. The *sulcus spermaticus* is embedded approximately 0.5 mm deep in the hemipenis with smooth interior walls; however, the surface is bordered by small spines through the base followed by spinulate calyces approximately 1 mm prior and throughout the capitulum. The sulcate side of the capitulum is covered in 17



**Table 2.** Measurements and meristic characters of former type specimens. Data for *Dipsas niceforoi* (MLS 165), *D. tolimensis* (Museu do Colegio del Sagrado Corazón, Cúcuta, Colombia 204), and *Leptognathus nigriceps* (lost) were obtained from the literature (Prado 1940, 1941; Werner 1916). Measurements are in millimeters.

Variable or character	<i>D. niceforoi</i> (Female)	<i>D. tolimensis</i> (Male)	<i>L. nigriceps</i> (unknown)
Snout-vent length	200	210	175
Tail length	56	54	58
Ventrals	176	168	175
Subcaudals	73	65	89
Pairs of chinshields	3	?	3
Body bands	?	?	21
Bands on tail	?	?	8
Supralabials	8	8	8
Infralabials	11	11	?

rows of spinulate calyces with the distal spinulate calyces extending outward further (up to 1 mm) than the proximal calyces (< 0.6 mm). On the asulcate side, the capitulum is approximately 7 mm in length and contains 11–12 rows of spinulate calyces extending approximately 0.7 mm in length throughout. Fifty-one spines and hooks (1–3 mm in length) with calcified struts are arranged in 2–3 rows that wrap around the entire base of the hemipenis, extending to 3–5 mm below the capitulum. Additionally, the asulcate side has two basal hooks (~ 1.5 and 2.5 mm in length) separated from the spine rows by the asulcate patch.

**Reproduction.** An adult female (MBUCV 6837) contained eight oviductal eggs, three in the left oviduct and five in the right oviduct. The largest egg was the first in the left oviduct (34 × 12 mm) and the smallest was the second in the right oviduct (25 × 13 mm). The female specimen EBRG 4820 had five fully developed (i.e., shelled) oviductal eggs, three in the right oviduct and two in the left oviduct. The female EBRG 4888 laid eight eggs approximately one month after its capture. These eggs were deposited by the snake under newspaper on the bottom of its terrarium, which were discovered by its keeper, Luis Merlo, approximately three days later. The delay in finding the eggs likely led to the eggs being dried out and in poor condition when found.

**Behaviour.** Although none of the specimens collected in this study displayed aggressive behavior, TB and R. Alastre, observed defensive behaviors by two of the Venezuelan *D. pratti* specimens in the field during capture. After collection, a young *D. pratti* (MBLUZ 892) was removed from a snake bag and it immediately went into a balling-posture (Fig. 4e). This specimen also compressed its body laterally and when grasped with the hand it was difficult to carry. A second specimen (UTA R-57479; Fig. 4b), collected a few minutes later, did not show any particular defence behavior but was rather

moving the body brusquely for some time after capture. An additional young specimen was photographed at the same locality and assumed a threat posture of triangulation of the head accompanied with body undulations (Fig. 4f).

## Discussion

The difficult accessibility of this area, due to the roughness of the terrain and the political condition, in the Sierra de Perijá, where these specimens were obtained, makes this discovery even more valuable. For decades, *Dipsas pratti* was known from only a few specimens, collected in the Cordillera Central in Colombia. Some localities in this region are separated by narrow valleys, which apparently do not present a dispersal barrier for some species such as *D. pratti*. The species was recently recorded from a few localities in the Cordillera Oriental (Moreno-Arias et al. 2006). Interestingly, some of the Colombian specimens of *Plesiodipsas perijanensis*, known for decades from only a single locality in the Sierra de Perijá, came from these same localities (Harvey et al. 2008).

The Sierra de Perijá, at least much of it, is legally protected as the Sierra de Perijá National Park. Unfortunately, the region is heavily used for agricultural activities, primarily cultivating coffee (*Coffea arabica*), malanga (*Xanthosoma sagittifolium*), corn (*Zea mays*), avocados (*Persea americana*), as well as wood extraction and coal mining development. In 2007, the loss of forest in the high basins of the rivers located in northern Perijá was at 35% with respect to the original vegetation known in 1989 (1418 km<sup>2</sup>), representing a lost of 513 km<sup>2</sup> of original forests between these years. This deforestation has caused a significant loss of biodiversity, including some endemic bird subspecies of the Sierra de Perijá (Viloria and Portillo 2000; Hernandez-Montilla and Portillo-Quintero 2010). The discovery of *D. pratti* could be an important indicator of a healthy environment because it only seems to occur in cloud forest and is absent from cultivated areas. Interestingly, during several surveys of the area prior to 2007, one of us, TB, did not find any specimens of *D. pratti* even though numerous other reptiles (e.g., *Lampropeltis triangulum* and *Anolis jacare*) were collected in the region. *Dipsas pratti* is sympatric in Venezuela with other reptiles including *Anolis euskalerrari*, *A. jacare*, *Atractus* sp., *Chironius monticola*, *Dendrophidion nuchale*, *Liophis epinephelus*, *Mastigodryas boddaerti*, and probably *Plesiodipsas perijanensis*.

All specimens examined in this study, except the type, possess a truncated to slightly round snout (see Figs 1, 4). However, it is possible that the head of the type became misshapen as it was fixed and transported from South America to Europe at the end of the 1800 s. Interestingly, the male UTA R-57479 is a little bit darker, is the largest known specimen, and has the most uniform pattern. It has three supralabial scales in



**Figure 4.** Venezuelan specimens of *Dipsas pratti*. **a.** Adult female, EBRG 4888; **b.** Adult male, UTA R-57479; **c.** Young female, found in Las Antenas, Sierra de Perijá, MHNLS 18799; **d.** Young female, MBLUZ 892; **e.** Balling defensive posture, MBLUZ 892; **f.** Head expansion defensive posture, MHNLS 18799. Note the patternless coloration in adult specimens (**a** and **b**). Photographs by L. Merlo (**a**), C. L. Barrio-Amorós (**b**, **d**), P. Velozo (**c**, **f**), and T. Barros (**e**).

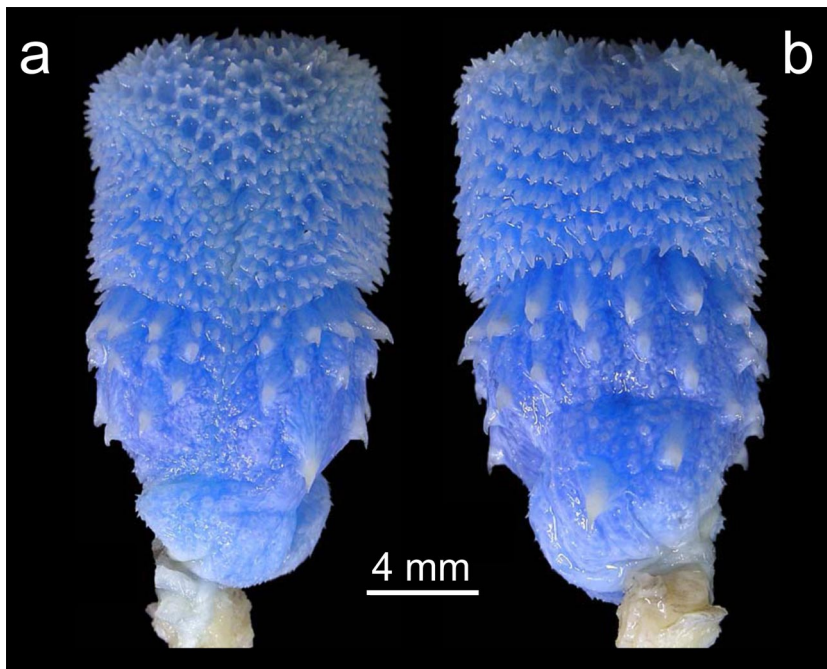
contact with the orbit on both sides, and has fewer infralabial scales. Additionally, the diameter of the eye is larger than the height of the 5th supralabial (ca. 1.2 times compared to ca. 0.8–0.9 among all other specimens examined, including the type), and the specimen has more ventral and subcaudal scales. Here we tentatively assign this specimen to *Dipsas pratti* in spite of these differences for the following reasons:

1) Specimens of the *D. pratti* group become melanistic with age, which would explain the more uniform

pattern though some pattern can still be seen (see Fig. 4b). However, the transverse bands shown in an adult female (EBRG 4888) were very faint when present along the body (Fig. 2a), similar to those shown in UTA R-57479, which were only observed in life on the posterior part of the body (Fig. 2b).

2) Generally, the females are larger than males among dipsadines; however, the lack of sufficient numbers of specimens makes this a challenge to know for certain *Dipsas*. For example, Harvey et al. (2008) found that for *D. sanctioannis* males are larger and





**Figure 5.** Completely everted left hemipenis of *Dipsas pratti* (UTA R-57479), showing sulcate (a) and asulcate (b) views.

possess more ventral and subcaudal scales than females; However, this phenomenon could be due to the paucity of specimens leading to the examination of only a single female and six males.

- 3) UTA R-57479 as compared to the type has only two large paired chinshields, as compared to two or three in the rest of the specimens. In some *Dipsas*, this character is quite variable, such as in *D. temporalis* that may exhibit 2, 3, or 4 pairs of chinshields (see Harvey 2008).
- 4) Cadle (2005) mentions that the males of *D. elegans* have more ventral scales than the females, contrary to the more common pattern of sexual dimorphism in colubrids including Dipsadinae. This condition may also occur in *D. pratti* as males tend to average greater number of ventral and subcaudal scales than females (Table 1). Curiously, two other species of the *D. oreas* group, *D. oreas* and *D. ellipsifera*, do not show sexual dimorphism for these characters (Cadle 2005). Cadle (2005) also mentions that the sexes of some *Dipsas* must be analyzed separately to see the distinctions clearly.

In his key to the genus *Dipsas*, Harvey (2008: 444) mentioned that *D. pratti* has the “loreal square to higher than long”, however the type, as well as at least four of the Venezuelan specimen, have the loreal longer than high. In two Venezuelan specimens, EBRG 4820 and 4888, the loreal appears to be square; however when the loreal is measured, it is slightly longer than high. Harvey’s assertion is likely due to him examining two of the three specimens deposited at AMNH – one of them is the cotype of *L. triseriatus* – which have the loreals higher than long. The third individual reviewed by Harvey, FMNH 63758, was collected in the Departamento de Antioquia, Colombia and apparently has the

same condition (longer than high), being also the specimen with more subcaudal scales known (69). The three specimens housed in the AMNH, as well as the one from FMNH, are the smallest and likely to be the youngest specimens known. However, rather than being an ontogenetic variation, we consider that the shape of the loreal scale is polymorphic within the species.

In this study, we found that *Dipsas pratti* possesses the three main derived hemipenial characters of the Dipsadinae – “(1) reduction or loss of bilobation, (2) capitation, and (3) bifurcation of the *sulcus spermaticus* within the capitulum” – described in Harvey et al. (2008: 122). Additionally, similarities of *D. pratti* with *Plesiodipsas* – considered a basal taxon to the dipsadines – include a “(17) capitulum of hemipenis covered in papillate calyces; ... (19) base of hemipenis encircled by rows of large spines separated from pair of basal hooks by asulcate patch; (20) nude basal pocket present on lateral side of the hemipenis.” (Harvey et al. 2008: 110–111). Several studies examining closely related species within a genus have shown remarkable variation in hemipenis morphology (e.g., Schargel et al. 2005; King et al. 2009; Jadin et al. 2010), providing insights into evolutionary histories and reproductive behaviours. We find this lack of hemipenial variation across the dipsadine genera to be intriguing and an investigation of the mechanisms behind this conservative nature of hemipenial morphology within the Dipsadinae would be useful.

Recent work has shown numerous aggressive and defensive behaviors in dipsadine species (e.g., Cadle & Myers 2003; Rojas Morales & Escobar Lasso 2010). Some authors propose that the balling-posture behavior is a stereotypic response that protects fragile parts of the body during an attack by a predator (see Bustard 1969 and references therein). Head triangulation is be-



lieved to occur as mimicry in species that coexist with pitvipers (Pough 1988; Greene 1997). At the moment, we have not collected any specimens of *Bothrops* within the cloud forest that *D. pratti* inhabits, although a few specimens of *B. asper* have been collected at lower elevations, 900–1200 m, in the same mountain range. The presence of a species of mountainous viperid, such as a *Bothriechis* spp., cannot be rejected.

### Remarks

Recent molecular studies have investigated the evolutionary relationships of several species of *Dipsas*. In particular, Daza et al. (2009) found a strongly supported relationship between *D. pratti* and *D. catesbyi*, the only other *Dipsas* in the analysis. However, we have been made aware that the *D. pratti* specimen (MHUA 14278, Museo de Herpetología de la Universidad de Antioquia, Medellín, Colombia) cited by Daza et al. (2009, 2010) and Pyron et al. (2011) is *D. sanctijoannis* (J. M. Daza, pers. comm.), a lowland species. Therefore, the phylogenetic position of *D. pratti* remains to be evaluated using molecular data. Additionally, Zaher et al. (2009) and Vidal et al. (2010) include several species of *Dipsas* in their analyses and found the genus to be paraphyletic with respect to the genera *Atractus*, *Sibon*, *Sibynomorphus*, and *Ninia*. This suggests that much work is still required to confidently resolve the relationships among the species of this genus, including more than one species inside each species group (Peters 1960; Harvey 2008), and that a taxonomic revision of this genus is required.

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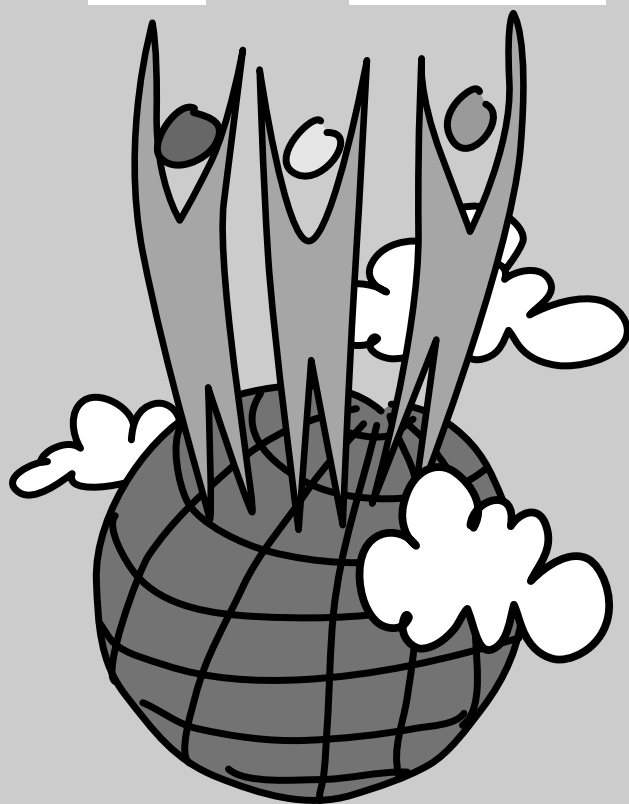
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## Appendix

### Specimens examined

The acronyms are listed in the materials and methods, except those listed in Leviton et al. (1985). *Dipsas pratti*: **COLOMBIA**: **Antioquia**: Medellín: BMNH 1946.1.20.52 [holotype], AMNH R-35553, R-35607; New Granada: AMNH R-17525 [cotype of *Leptognathus triseriatus*]; **Bolívar**: Santa Rosa del Sur, San Pedro Frío, 08°06'1" N, 74°08'35" W, 1600 m, ICN 7957; Santa Rosa del Sur, ICN 8060; **Cesar**: municipio de González, vereda San Cayetano, 1600–1750 m, ICN 11484; **Quinido**: Cordillera Central, MLS 165; **Santander**: Bucaramanga, km 18 road to Pamplona, 07°07'06" N, 73°04'25" W, 1600 m, UIS-R 1302; Floridablanca, El diviso, 07°06'53" N, 73°03'13" W, 2000 m, UIS-R 938; Tona, vereda El Brasil, 07°07'10.3" N, 73°04'36" W, 1680 m, ICN 10423–10424. **VENEZUELA**: **Zulia**: Cerro Las Antenas, municipio Rosario de Perijá, Sierra de Perijá, 10°20' N, 72°35' W, 1600 m, EBRG 4820 [formerly MBLUZ 902], EBRG 4888 [formerly MBLUZ 893], MBLUZ 892, 889, MBUCV 6837 [formerly MBLUZ 890], MHNLS 18799, UTA R-57479 [formerly MBLUZ 891].

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