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First report of hemiclitores in a female of the amphisbaenian *Amphisbaena microcephala* (Wagler, 1824)

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The occurrence in females of structures similar to male hemipenes was already observed in several species of squamate reptiles (Hoge et al., 1959; Hardy, 1970; Böhme, 1995; Ziegler and Böhme, 1997). This kind of structure was first described by Böhme (1995) in female *Varanus*, and named "hemiclitoris" by the author. Ziegler and Böhme (1997) report the occurrence of hemiclitores in almost 50 Squamata species, from 36 different genera, including a female *Amphisbaena fuliginosa*. That was the only report of the occurrence of hemiclitoris in amphisbaenians until now.

Here we report the first observation of hemiclitores in a female *Amphisbaena microcephala*, and compare those organs to male hemipenes. The referred specimen was received on April 27 2006, in the Laboratory of Herpetology of Butantan Institute. It had been collected in São Paulo, in southeastern Brazil, and deposited in the herpetological collection Alphonse Richard Hoge in São Paulo (MSP 1423). The female presented 403 mm snout-vent length (SVL), and had complete oviducts and ovaries, showing primary vitellogenesis.

The hemiclitores were everted while fixing the tail with 10% formaldehyde injection. We injected each hemiclitoris using agar with orange aniline-based coloring. Those organs were roughly similar to male hemipenis, although smaller. We also verified the occurrence of retractor muscles associated to the hemiclitores. Right and left hemiclitores presented 6.87 and 6.29 millimeters in length, respectively. We everted and prepared the same way the hemipenes of three male *Amphisbaena microcephala* for comparison with the female structures. We observed male and female organs under stereomicroscope Olympus SZ2-LGB ®, measured their lengths, and calculated their relative measures (organ length / SVL). For standardization, we used the values of length of the right hemipenes and hemiclitoris to calculate the relative measure. The mean SVL for the analyzed males were 336.2 mm, and the length of the right hemipenis were 9.17 mm on average. The relative measure of right hemipenes was 0.027513 on average, while the relative measure for the right hemiclitoris resulted in 0.017047. Thus, the female organ was 1.5 times smaller than the observed male organs. We did not observe hemiclitores in other females of the species.

The observed hemiclitores presented two lobes, sulcus spermaticus and distal tips (Fig. 1A and 1B). Nevertheless, those structures show different morphology when compared to those of hemipenis. Among males, the sulcus spermaticus originates on the lateral basis of the organ and extends longitudinally to the region between the lobes, where it bifurcates. Each branch goes round the lobe to its medial face, then ending on the tip (figure 2). That general morphology is similar to that described for this species by Rosemberg (1967) and by Rosemberg, Cavey and Gans (1991). According to Böhme (1989), the occurrence of a deep, unequivocal bifurcation in the hemipenis, as well as the presence of lamellated tips seem to be common for the continental species from the family Amphisbaenidae.

On the other hand, in the female organ, the sulcus spermaticus originates on the posterior face of the organ, going round its stalk to the region between the lobes, where it ends without bifurcating (figure 1B). That sulcus is shallower than that observed on males, and the tips are only small prominences, without relation with the sulcus.

Within reptiles, the tissue that originates the intromittent organ and the retractor muscles develop similarly in male and female embryos (Raynaud and Pieau, 1985). During male embryogenesis that tissue continues to develop, while in females it commonly degenerates or regresses. At the end of embryogenesis,

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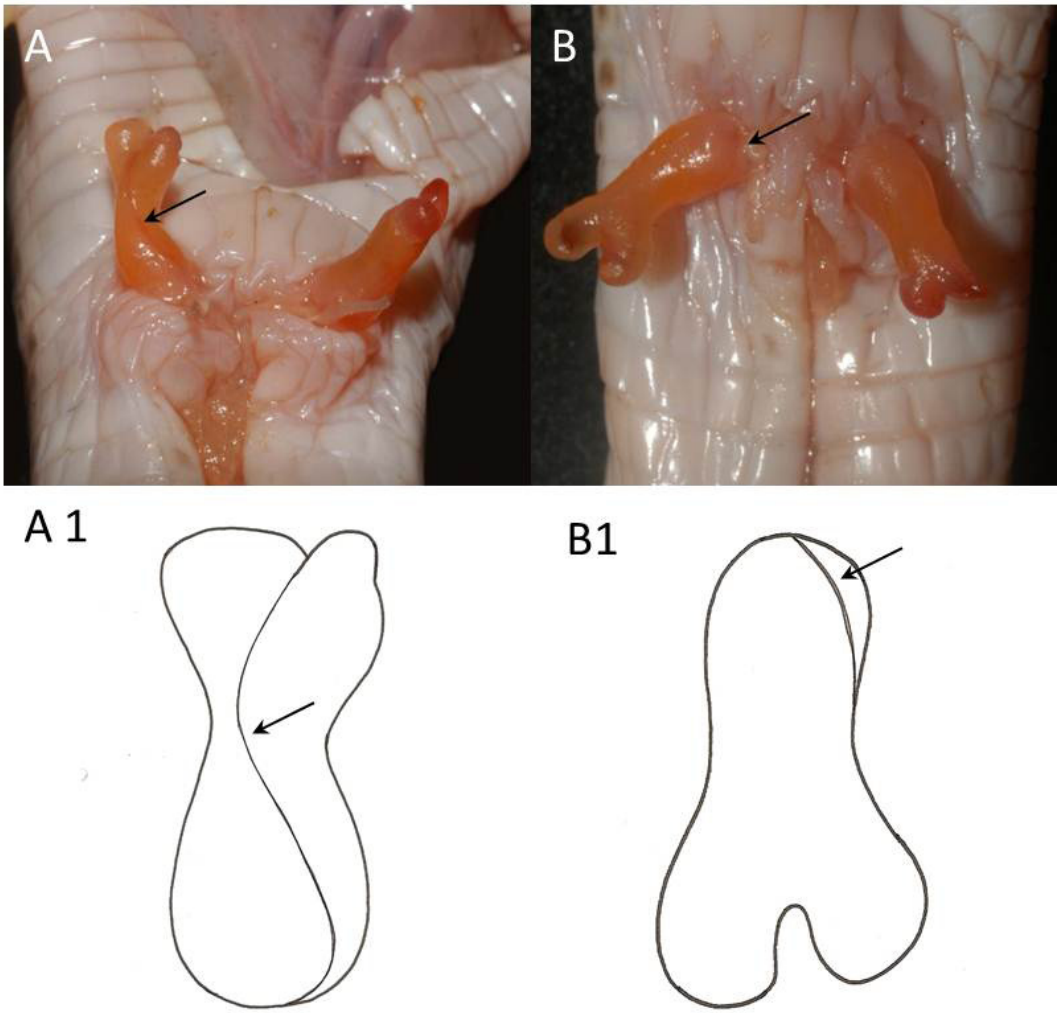

Figure 1. Female hemiclitoris of an *Amphisbaena microcephala*. A and B are real photographs of the specimen; A1 and B1, schematic drawings of the right hemiclitoris. A and A1 show the anterior view, with the sulcus spermaticus and the lobes. B and B1 show the posterior view, with the origin of the sulcus. The arrows point the sulcus spermaticus.

the intromittent organ is absent in females, or it presents only remaining vestigial structures (Hubert and Dufaure, 1968; Raynaud and Pieau, 1985; Neaves et al., 2006). Meanwhile, in some cases, that organ remains during embryogenesis (Dufaure and Chevalier, 1967; Raynaud and Pieau, 1985).

Until now, the only report of the encounter of hemiclitoris in a female *Amphisbaena* was made by Ziegler e Böhme (1997). The authors everted those structures in various specimens from 23 different squamate families, and all the females analyzed presented hemiclitores. Among the specimens listed by them, is included a female *Amphisbaena fuliginosa* (SVL 380 mm), which exhibited a hemiclitoris with approximately 0.2 mm. The authors also suggest that those organs had rudimentar structure, being dellicated and short in comparison with male hemipenis.

It is possible that the hemiclitoris present in the female *Amphisbaena microcephala* here reported resulted from an extremely long period of developing of its phallic anlagen, which may have been influenced by hormonal fluctuations during embryogenesis.

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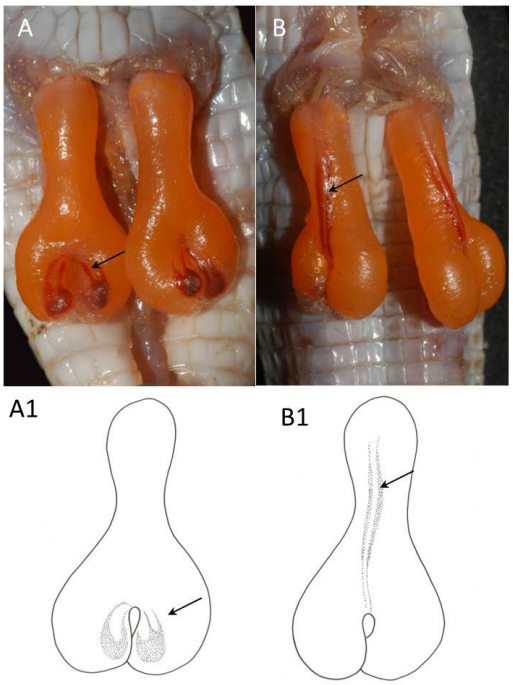

Figure 2. Male hemipenis of an *Amphisbaena microcephala*. A and B are real photographs of the specimen; A1 and B1, schematic drawings of the right hemipenis. A and A1 show the anterior view, with the final portions of the bifurcated sulcus spermaticus and the tips. B and B1 show the posterior view, with the initial portion of the sulcus spermaticus. The arrows point the sulcus spermaticus.

References

Böhme, W. (1989): Zur systematischen stellung der Amphisbänen (Reptilia: Squamata), mit besoreder Berücksichtigung der Morphologie des Hemipenis. Z. Zool. Syst. Evolutionsforsch. **27**:330-337.

Böhme, W. (1995): Hemiclitoris discovered: a fully differentiated erectile structure in female monitor lizards (*Varanus* ssp.) (Reptilia: Varanidae). J. Zoo. Syst. Evol. Research. **33**:129-132.

Dufaure, J. P., Chevalier, M. (1967): Le développement des tubercules génitaux chez *Chamaeleo bitaeniatus* et *Mabuia megalura*. Arch. Biol. (Liège). **78**:371-387.

Hardy, L. M. (1970): Intersexuality in a mexican colubrid snake (*Pseudoficimia*). Herpetologica. **26**:336-343

Hoge, A. R., Belluomini, H. E., Schreiber, G., Penha, A. M. (1959): Sexual abnormalities in *Bothrops insularis* (Amaral, 1921) (Serpentes). Mem. Inst. Butantan. **29**:17-88.

Hubert, J., Dufaure, J. P. (1968): Table de développement de la vipère aspic: *Vipera aspis*. L. Bull. Soc. Zool. France. **93**:135-148.

Neaves, L., Wapstra, E., Birch, D., Girling, J. E., Joss, J. M. P. (2006): Embryonic gonadal and sexual organ development in a small viviparous skink, *Niveoscincus ocellatus*. J. Exp. Zool. A. **305**:74-82.

Raynaud, A., Pieau, C. (1985): Embryonic development of genital system. In: Biology of the Reptilia, Development B, v. 15, p. 151-300. Gans, C., Billet, F., Ed., New York, John Wiley & Sons.

Rosemberg, H. I. (1967): Hemipenial morphology of some amphisbaenids (Amphisbaenia: Reptilia). Copeia. **1967** (2): 349-361.

Rosemberg, H. I., Cavey, M. J., Gans, C. (1991): Morphology of the hemipenes of some Amphisbaenia (Reptilia: Squamata). Can. J. Zool. **69**:359-368.

Ziegler, T., Böhme, W. (1997): Genitalstrukturen und Paarungsbiologie bei squamaten Reptilien, speziell den Platynota, mit Bemerkungen zur Systematik. Mertensiella. **8**:1-207.

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