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Taxonomic revision of the Brazilian Atlantic Forest *Atractus* (Reptilia: Serpentes: Dipsadidae)

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Table of contents

Abstract	3
Resumo	3
Introduction	4
Material and Methods	5
<i>Material and Techniques</i>	5
<i>Statistical Analyses</i>	5
<i>Scope and Style of the Study</i>	6
Species Accounts	7
<i>Atractus caete</i> sp. nov.	7
<i>Atractus francoi</i> sp. nov.	12
<i>Atractus guentheri</i> (Wucherer, 1861)	17
<i>Atractus maculatus</i> (Günther, 1858)	19
<i>Atractus pantostictus</i> Fernandes & Puerto, 1993	21
<i>Atractus paraguayensis</i> Werner, 1924	24
<i>Atractus potschi</i> Fernandes, 1995	30
<i>Atractus reticulatus</i> (Boulenger, 1885)	32
<i>Atractus ronnie</i> Passos, Fernandes & Borges-Nojosa, 2007	37
<i>Atractus serranus</i> Amaral, 1930	40
<i>Atractus thalesdelemai</i> Passos, Fernandes & Zanella, 2005	44
<i>Atractus trihedrurus</i> Amaral, 1926	47
<i>Atractus zebrinus</i> (Jan, 1862)	50
Key to the Atlantic Forest species of <i>Atractus</i>	52
Discussion	53
Acknowledgements	55
References	56
Appendices	60

Abstract

Dipsadine snakes of the genus *Atractus* are endemic to the Neotropical region, occurring from Panama to Argentina. Currently, the taxonomic status of most species of the genus is unclear and previous attempts of taxonomic revisions have been local in scale. In this paper we evaluate the taxonomic status of the Brazilian Atlantic Forest species of *Atractus* based on meristic, morphometric, maxillary dentition, and hemipenis characters. Quantitative and qualitative analyses suggest the recognition of one new species (*A. caete* sp. nov.) from the state of Alagoas, another (*A. francoi* sp. nov.) from the mountain regions of the states of Rio de Janeiro and São Paulo, and the synonymy of *A. kangueryensis* with *A. thalesdelemai*. Specimens previously assigned to *A. taeniatus* in Argentina and Brazil are here considered *A. paraguayensis*. A key to the Atlantic Forest *Atractus* is provided and three new species groups are proposed for some cis-Andean *Atractus*, mainly on the basis of hemipenial morphology: the *A. emmeli*, *A. maculatus*, and *A. pantostictus* species groups.

Key words: *Atractus*, Atlantic Forest, South America, Morphology, Geographical variation, Taxonomy

Resumo

As serpentes dipsadíneas do gênero *Atractus* são endêmicas da região Neotropical, ocorrendo do Panamá à Argentina. Atualmente, o posicionamento taxonômico da maioria das espécies do gênero é confuso e as tentativas de revisões taxonômicas foram limitadas à escala regional. Neste trabalho, nós avaliamos o posicionamento taxonômico das espécies de *Atractus* da Floresta Atlântica brasileira por meio de caracteres merísticos, morfométricos, de dentição maxilar e morfologia do hemipênis. Análises quantitativas e qualitativas sugerem o reconhecimento de uma nova espécie (*A. caete* sp. nov.) do estado de Alagoas e outra (*A. francoi* sp. nov.) da região serrana dos estados do Rio de Janeiro e São Paulo e a

sinonimização de *A. kangueryensis* com *A. thalesdelemai*. Ademais, os espécimes previamente assinalados a *A. taeniatus* na Argentina e Brasil são aqui considerados *A. paraguayensis*. Uma chave é fornecida para as *Atractus* da Floresta Atlântica e três novos grupos de espécies são propostos para algumas *Atractus* cisandinas, baseado principalmente na morfologia do hemipênis: os grupo de espécies de *A. emmeli*, *A. maculatus* e *A. pantostictus*.

Palavras-chave: *Atractus*, Floresta Atlântica, América do Sul, Morfologia, Variação geográfica, Taxonomia

Introduction

The dipsadine genus *Atractus* is endemic of the Neotropical region, occurring primarily on the mainland from 11° North to 35° South, from sea level to 4,500 meters elevation, in almost all South American biomes (Passos 2008). The genus comprises small to moderate-sized snakes, having secretive (semi-fossorial or cryptozoic) lifestyles and feeding on earthworms, arthropods, and mollusks (Cunha & Nascimento 1993; Martins & Oliveira 1993, 1999; Cisneros-Heredia 2005). *Atractus* is a diverse genus of snakes closely related to *Adelphicos* and *Geophis* (Savage 1960; Downs 1967; Fernandes 1995b; Passos 2008), including about 130 valid species, many of them known only from their type specimens and sometimes having restricted distributions (Passos & Fernandes 2008; Prudente & Passos 2008; Passos & Arredondo 2009; Passos *et al.* 2009a,b,c,d,e,f). To date, the taxonomic status of several species remains unclear, and all attempts of taxonomic revisions have been limited to a local scale (Savage 1960; Roze 1961; Cunha & Nascimento 1993; Martins & Oliveira 1993; Giraud & Scrocchi 2000; Myers 2003; Silva 2004; Esqueda & La Marca 2005). The major problem with *Atractus* taxonomy is that geographical variability data as well as sexual and/or ontogenetic variations are unknown for most currently recognized taxa (Passos *et al.* 2009 a,c,e). Lack of comparative specimens and poor knowledge of intraspecific variation led some authors to recognize new taxa on the basis of slight nuances in colour pattern and/or meristic characters (e.g., Scrocchi & Cei 1991; Alvarez *et al.* 1992; Bernal-Carol & Roze 1996). These taxa, in many cases, were shown to not be diagnosable from previous recognized species after the examination of large series of specimens (e.g., Passos *et al.* 2009d; Fernandes 1996; Passos *et al.* 2009c).

The Brazilian Atlantic Forest is one of the most diverse and threatened ecosystems on Earth, with only about 7% of its original coverage remaining (Morellato & Haddad; Oliveira-Filho & Fontes 2000). Its remarkable diversity has been attributed to the presence of a rich flora with unique physiological adaptations to unusual biophysical characteristics (Pessenda *et al.* 2009). The biome is composed of two major vegetation types, the coastal forest or Atlantic Rainforest (*sensu strictu*) and the tropical seasonal forest or Atlantic Semi-deciduous forest (Morellato & Haddad 2000). The Atlantic Rainforest covers mostly low to medium elevations (≤ 1000 m) of the eastern slopes of the mountain chain that runs subparallel and close to the coastline from southern to northeastern Brazil; the Atlantic Semi-deciduous forest extends across the plateau (usually > 600 m) in the centre and southeastern interior of the country (Morellato & Haddad 2000). The Atlantic Rainforest experiences warm and wet climate without a well defined dry season, while a seasonal climate with relative severe dry season (generally from April to September) predominates over the distribution of the Atlantic Semi-deciduous forest (Morellato & Haddad 2000). The biome lies almost entirely within Brazil, with a small portion extending to northeastern Argentina and southeastern Paraguay (Oliveira-Filho & Fontes 2000). Currently, 11 species of Atlantic Forest *Atractus* are recognized (*A. guentheri*, *A. kangueryensis*, *A. maculatus*, *A. paraguayensis*, *A. potschi*, *A. ronnie*, *A. serranus*, "*A. taeniatus*", *A. thalesdelemai*, *A. trihedrurus*, and *A. zebrinus*), and two other are distributed on transitional zones between Atlantic Forest and general open formations in central and southern Brazil (*A. pantostictus* and *A. reticulatus*) (Fernandes 1996; Passos *et al.* 2005b; Cacciali *et al.* 2007; Passos *et al.* 2007b).

The aim of this study is to provide a comprehensive revision of the Atlantic Forest *Atractus* in order to evaluate the validity of the currently know taxa, and to present accurate diagnostic characters and data on intraspecific and interspecific variation for all recognized species in the area.