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Polyandrous reproductive behavior of *Boa constrictor* Linnaeus, 1758 (Serpentes, Boidae) in the Brazilian Cerrado, Brazil.

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Resumo

Apresenta-se aqui o primeiro registro de comportamento reprodutivo poliândrico em *Boa constrictor* no Cerrado brasileiro. Em 29 de junho de 2024, às 11h, três indivíduos adultos (dois machos e uma fêmea) foram observados em comportamento de acasalamento em uma área rural do município de Pereira Barreto, estado de São Paulo. A identificação sexual baseou-se na morfologia da cauda. Ambos os machos copularam alternadamente com a mesma fêmea, sem evidências de interações agonísticas. O evento teve duração aproximada de 30 minutos e ocorreu durante a estação seca, coincidindo com o período reprodutivo da espécie. *Boa constrictor* é vivípara, apresenta maturidade sexual dependente do tamanho corporal e elevada plasticidade ecológica. Este registro amplia o conhecimento sobre a biologia reprodutiva da espécie no Cerrado brasileiro.

Palavras-chave

Comportamento sexual; Competição espermática; Ecologia reprodutiva; Poliandria.

ABSTRACT

Here, we present the first record of polyandrous reproductive behavior in *Boa constrictor* within the Brazilian Cerrado. On 29 June 2024, at 11:00 h, three adult individuals (two males and one female) were observed engaging in mating behavior in a rural area of the municipality of the Pereira Barreto, São Paulo State. Sex was identified based on tail morphology. Both males alternately copulated with the same female, with no evidence of agonistic interactions. The event lasted approximately 30 minutes and occurred during the dry season, coinciding with the species' reproductive period. *Boa constrictor* is viviparous, exhibits size-dependent sexual maturity, and shows high ecological plasticity. This record expands the current knowledge of the species' reproductive biology in the Brazilian Cerrado.

Keywords

Polyandry; Reproductive ecology; Sexual behavior; Sperm competition.

There are three primary reproductive strategies identified among vertebrates: monogamy, polygamy, and promiscuity (Karl, 2008; Rubenstein & Alcock, 2019). Monogamy is characterized by the formation of a pair bond between a male and a female and may last for one or more reproductive cycles; it is the least common of the three strategies among reptiles (Karl, 2008; Rubenstein & Alcock, 2019). Polygamy is subdivided into three categories: polygyny, where one male mates with multiple females; polyandry, where one female mates with several males; and polygynandry, which involves multiple males and females forming a network of mating relationships (Karl, 2008; Rubenstein & Alcock, 2019). Lastly, promiscuity refers to a reproductive strategy in which both males and females mate with multiple partners without forming long-term bonds (Karl, 2008; Rubenstein & Alcock, 2019).

Polyandrous reproductive behaviors have been extensively documented in various vertebrate groups, such as turtles (Valenzuela, 2000; Pearse & Avise, 2001; Fantin et al., 2008, 2010), snakes (Rivas et al., 2015; Couto et al., 2022), and amphibians (Couto et al., 2024). Generally, female reptiles are able to store sperm for extended periods (Uller & Olsson, 2008), a strategy that is particularly advantageous in polyandrous species (Moore et al., 2008).

The genus *Boa* has a broad distribution across the Neotropical region, extending from Mexico to Argentina (Henderson et al., 1995), and *Boa constrictor* Linnaeus, 1758 is restricted to South America (Nogueira et al., 2019; Gonzalez et al., 2024). It occupies highly varied habitats, demonstrating significant ecological plasticity and the ability to adapt to diverse environments (Henderson et al., 1995; Boback, 2005; Henderson & Powell, 2007).

On June 29, 2024, at 11:00 a.m. (during the dry season), we recorded a case of polyandrous reproduction in *B. constrictor* in a rural area within the municipality of Pereira Barreto, São Paulo, Brazil (20°34′41.6″ S, 51°04′54.9″ W). Three adult individuals of similar size were observed in close proximity, exhibiting reproductive behaviors consistent with polyandry (Fig. 1). Sex determination was based on morphology, specifically tail length and thickness (Chiaraviglio et al., 2003; Boback, 2005; Wright, 2012), that permitted us to identify two males and a female engaged in reproductive activity. The observation lasted approximately 30 minutes. Males exhibited undulatory body movements, keeping the head positioned over the females' head, accompanied by chin movements, dorsal cephalocaudal waves, and attempts to locate the cloaca for copulation. Copulation was inferred from the juxtaposed cloacal positioning between male and female. During the observation period, at least two copulations were recorded for each male, occurring in an alternating manner.



Figure 1. Polyandrous reproductive behavior of *Boa constrictor* Linnaeus, 1758 observed in Pereira Barreto, São Paulo, Brazil. M = Male; F = Female.

In general, female reptiles are capable of sperm storage (Uller & Olsson, 2008), a trait that represents a particularly important reproductive strategy in polyandrous species (Moore et al., 2008). Under this reproductive mode, sperm from the same male may form aggregates in the female's body, conferring greater efficiency compared to individual spermatozoa (Fisher & Hoekstra, 2010). Although sperm

competition among different males does not guarantee population increase (Karl, 2008), it promotes the maintenance and enhancement of genetic diversity (Martínez et al., 2000; Valenzuela, 2000; Pearse et al., 2006; Yue et al., 2010). In contrast, mating involving few males and a large number of females may lead to population declines (Fantin et al., 2008), In this situation, only a small fraction of males contribute genetically to the next generation, leading to a loss of genetic diversity, increased inbreeding, and greater genetic drift (Fantin et al., 2008).

We report polyandrous reproductive behavior in *Boa constrictor* within the Brazilian Cerrado, the first such record for this biome, with records only found in the Atlantic Forest (Almeida-Santos & Ramalho, 2025). The observed alternating copulations involving a single female and two males provide strong evidence for polyandry in neotropical snakes (Couto et al., 2022; Almeida-Santos & Ramalho, 2025) and highlight the importance of behavioral plasticity in the reproductive strategies of *B. constrictor*. Considering the species' well-documented capacity for sperm storage (Uller & Olsson, 2008) and the potential implications of sperm competition for genetic diversity, this behavior may represent an adaptive mechanism with important evolutionary and demographic consequences. The present record demonstrates the relevance of detailed natural history observations for elucidating poorly documented aspects of snake reproduction.

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