

**Forced copulation attempt in the Blue-tailed Lizard, *Micrablepharus maximiliani* (Reinhardt & Luetken, 1862) (Squamata, Gymnophthalmidae) in the Caatinga of Northeastern Brazil**

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**Abstract:** Forced copulation is characterized by jerky and rapid movements performed by a female in an apparent attempt to escape from a mounting male. This short communication reports a forced copulation attempt by the gymnophthalmid lizard *Micrablepharus maximiliani* in a forest enclave inside the Caatinga biome, Tenente Laurentino Cruz municipality, Rio Grande do Norte, Brazil. The rejection behavior of the female consisted of running, pushing and hiding from the mounting male. Although the causes of female mate rejection remain unclear, it may be possible that on this occasion the female *M. maximiliani* may not have been reproductively active and/or avoided the male deliberately.

**Keywords:** *female rejection behaviors, forced mating, unsolicited copulation, gymnophthalmid lizard, semi-arid.*

GOGLIATH, M., RIBEIRO, L.B. & FREIRE, E.M.X. **Tentativa de cópula forçada no lagartinho-do-rabo-azul, *Micrablepharus maximiliani* (Reinhardt & Luetken, 1862) (Squamata, Gymnophthalmidae) na Caatinga do Nordeste do Brasil.** *Biota Neotrop.* 10(4): <http://www.biotaneotropica.org.br/v10n4/pt/abstract?short-communication+bn02610042010>.

**Resumo:** A cópula forçada é caracterizada por movimentos bruscos e rápidos realizados por uma fêmea em uma aparente tentativa de escapar de um macho no ato da monta. Esta comunicação relata uma tentativa de cópula forçada pelo lagarto gimnoftalmídeo *Micrablepharus maximiliani* em um enclave de floresta dentro do bioma Caatinga, município de Tenente Laurentino Cruz, Rio Grande do Norte, Brasil. O comportamento de rejeição da fêmea consistiu de correr, empurrar e se esconder do macho durante a monta. Embora as causas da rejeição do parceiro pela fêmea não sejam claras, pode ser possível que nesta ocasião a fêmea de *M. maximiliani* não estava reprodutivamente ativa e/ou evitou o macho deliberadamente.

**Palavras-chave:** *comportamentos de rejeição da fêmea, acasalamento forçado, cópula não solicitada, lagarto gimnoftalmídeo, semiárido.*

## Introduction

A “forced” copulation is one in which a female animal struggles physically and violently (including jerky, unusual, rapid, or high amplitude movements) in an apparent attempt to escape from a mounting male (Stamps 1983). In contrast, an “ordinary” copulation occurs when a female rests passively or moves slowly without any noticeable effort to escape when mounted (Stamps 1983). In current literature, few taxa have reviewed incidences of forced copulation. Examples can be found in colonially nesting monogamous birds (Gladstone 1979), waterfowl (McKinney et al. 1983) and elephant seals (Cox & Le Boeuf 1977).

For reptiles, a well-known case of violent copulation occurs between snakes of the species *Thamnophis sirtalis* (Linnaeus, 1758), in which the most persistent male eventually achieves copulation (Garstka et al. 1982). In lizards, there is evidence of attempted forced copulation for the *Iguana iguana* (Linnaeus, 1758) (Rodda 1992), *Conolophus subcristatus* (Gray, 1831) (Werner 1982), *Microlophus delanonis* (Baur, 1890) (Werner 1978), *Norops garmani* (Stejneger, 1899) (Trivers 1976), *Norops valencienni* (Duméril & Bibron, 1837) (Hicks & Trivers 1983) and *Enyalius perditus* Jackson, 1978 (Lima & Sousa 2006).

*Micrablepharus maximiliani* (Reinhardt & Luetken, 1862) is a heliothermic lizard widely distributed from the Brazilian Amazon to Paraguay (Peters & Donoso-Barros 1970, Vanzolini et al. 1980, Vanzolini 1988, Ávila-Pires 1995). It occurs along coastal areas and forest edge. Specimens can also be found in an isolated forest range (known locally as “Brejos de Altitude”) in the semi-arid Caatinga in Brazil (Vanzolini 1974, Rodrigues 1990, Freire 1996, Borges-Nojosa & Caramaschi 2003) where it is commonly observed in leaf litter, herbaceous vegetation and in association with social insects such as termites and ants (Vitt 1991, Mesquita et al. 2006).

Herein, we report the first case of forced copulation attempt in the gymnophthalmid lizard *M. maximiliani* in a Caatinga area of northeastern Brazil.

## Material and Methods

Our observations were made during fieldwork focusing on the thermoregulatory behavior of *M. maximiliani* in a forest enclave (06° 05' 94" S and 36° 42' 94" W, datum: WGS84, 710 m above sea level) inside the Caatinga biome, in the municipality of Tenente Laurentino Cruz, State of Rio Grande do Norte, Brazil. The local climate is semi-arid (BSHw according to Köppen), hot and dry, with rainfall of 706 mm/year, mean temperature of 26.6 °C and humidity of 65% RH (Beltrão et al. 2005).

The thermoregulatory behavior of *M. maximiliani* was recorded using focal animal sampling on different individuals, with one session from 0800-1100 hours and another from 1400-1700 hours, on two consecutive days. The observations were made in an in situ captive pen construction on sandy soil in enclave forest. The construction comprised a rectangular wooden enclosure (200 × 100 × 30 cm) covered on all sides and the base by plastic canvas to prevent the lizards from escaping. The substrate of the enclosure was enriched with sand and litter leaf (ca. 5 cm deep) to allow the lizards to hide.

## Results

A total of five specimens of *M. maximiliani* were housed in the enclosure on 21 June, 2010. At 1420 hours, during focal observations of thermoregulatory behavior, we observed one male engaging in a forced copulation attempt.

Male interaction (35.1 mm Snout-Vent Length [SVL]) with the female (40.5 mm SVL) commenced without courtship display. The male approached the female and grasped her neck with his jaws. The female then ran along the enclosure with the male clinging to her laterally. On five occasions the female stopped in the leaf litter and the male assumed a mating position on the female's dorsum with a neck-bite hold and front leg hold on the female's trunk. A hind leg hold on the base of the female's tail was also applied by the male (Figure 1a). In this position, the male twisted his tail under the female's bringing the cloaca close to hemipenis insertion. Although it was not possible to see the exposed hemipenis, in all of the intromission attempts the female did not show any submissive behavior (for example, remaining still with the tail raised at the base). Instead, the female violently pushed the base of the male's tail away with her hind leg and ran along the enclosure, attempting to escape the male's neck-bite hold. This sequence of behaviors lasted approximately 21 minutes, when the male released his neck-bite hold.

The female remained free for only a few seconds until the male grasped her again, this time biting the tip of her tail (Figure 1b). The male then chased the female through the leaf litter rapidly whilst maintaining the tail bite hold. After pursuing the female for approximately 1 minute, the male again managed to apply a neck grip. This time the male did not attempt hemipenis intromission, and after five minutes the female escaped, pushing the male's torso with her hind leg. The female then hid among leaf litter and was no longer chased by the male, who was unsuccessful in achieving copulation.



**Figure 1.** a) Male *Micrablepharus maximiliani* attempting copulation by mounting the female's dorsum with a neck-bite hold, front leg hold on the female's trunk, and hind leg hold on the base of female's tail; and b) the male biting the tip of the female's tail during chase.

## Discussion

Tokarz (1995), in a review of mate choice in lizards, noted that there was less evidence for female mate choice in reptiles than other biota such as fish, amphibians and birds. Most studies on female choice in lizards have focused on territorial species. It is thought that females of territorial species have little opportunity to assess and compare different males because the latter tend to arrange their territories to encircle that of the female, thereby excluding other males from that area. As such, females rarely encounter more than one male at a time (Stamps 1983). In non-territorial species, however, females have the opportunity to encounter several males in a single day (Anderson & Vitt 1990, Censky 1995). Censky (1996) reports that females of *Ameiva plei* (Duméril & Bibron, 1839) choose large males as mates. However, in this study it was unclear whether female choice was based on male body size or age/experience.

Copulation persistence may be beneficial to males, even those that are not experienced adults, because despite being energetically costly, it may provide fitness benefits. For example, if a female stores sperm between ovarian cycles, as has been observed in *Ctenophorus maculosus* (Mitchell, 1973) (Olsson 1995). In the finding herein, it is possible that male *M. maximiliani* adopts a forced copulation approach to immobilize the female. Alternatively the female may have promoted her own interests by putting the male's physical capability to the test (Rodda 1992). According to Stapley (2008), persistent male courtship may also indicate male quality and therefore be used by females as a cue for mate choice during subsequent ovarian cycles. Furthermore, although rejection may be as energetically costly as copulation, a female may potentially gain indirect genetic benefits from rejecting all but the most persistent males (Chapman et al. 2003, Kokko et al. 2003). However, forced copulation attempts may cause injury or even death for a female as previously observed during a copulation of *C. maculosus*, where the female's spine was penetrated by the male's teeth (Olsson 1995).

Female mate rejections may also occur when she is no longer in her receptive period of ovulation or immediately after copulating with another male. At this point, a female lizard often rejects a male using a characteristic rejection posture (Cogger 1978). Similar behavior has been observed for *E. perditus* in a study where individuals were placed in a terrarium in groups to facilitate manipulated reproductive observations (Lima & Sousa 2006). In Lima & Sousa (2006) study, following courtship, a female that had previously copulated with a first male, rejected a second mate. In this situation, the rejected male adopted tactics of forced copulation, biting the nape to immobilize the female. She aggressively avoided three persistent assaults, fleeing from the male and biting its mouth.

Further investigations are needed to provide a conclusive explanation for forced copulations for many species of lizards, as the benefits of female rejection of non-preferred males are still unclear. Nevertheless, the results from this study confirm the existence of forced copulation attempts in *M. maximiliani*, a behavior previously unknown for this species.

## Acknowledgments

We thank the Programa PELD/CNPq – Caatinga: Estrutura e Funcionamento and the municipal government of Tenente Laurentino Cruz for logistical support, and three anonymous reviewers for valuable suggestions on the manuscript. This study was supported by doctorate and postdoctorate fellowships from *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES) awarded to M. Gogliath and L.B. Ribeiro, respectively, and by a research fellowship granted by CNPq to E.M.X. Freire (304077/2008-9).

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Received 03/08/2010

Revised 09/09/2010

Accepted 05/11/2010