

## First record of male-male combat and courtship in the brown vine snake *Oxybelis aeneus*

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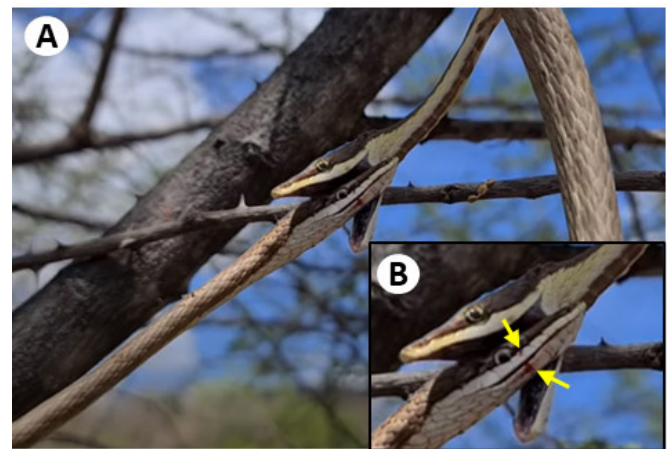
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The brown vine snake *Oxybelis aeneus* Wagler 1824, occurs in the American tropics (Uetz et al., 2022). This opisthoglyphous colubrid has morphological traits typical of arboreal snakes, such as an extremely slender body, long tail, and elongated head (Jadin et al., 2020). In North America, vitellogenesis begins in March, and egg-laying occurs between June and August, followed by complete reproductive quiescence extending to the following March (Censky & McCoy, 1988). However, little is known about the reproductive biology of this species in Brazil.

Combat between male snakes has been described for several families (Senter, 2022) and has been associated with both dominance for ecological and reproductive resources, and competition for food (Almeida-Santos et al., 1998; Muniz-da-Silva & Almeida-Santos, 2013; Batista et al., 2021). The main feature of this behaviour is body contact between males to exert pressure on a rival to subjugate it (Carpenter, 1977). In some cases the combat may involve males biting each other's bodies and heads (Capula & Luiselli, 1997). Combat-related injuries have been observed in the colubrid *Leptophis ahaetulla*, the boid *Corallus hortulana* and xenopeltid *Xenopeltis unicolor* (Mattos et al., 2017; Goodyear & Gilbert, 2018; Santos et al., 2020). Here we report male combat in *O. aeneus* in the Brazilian Caatinga.

Around 08:00 h on 16 November 2021 (spring time), two male *O. aeneus* were sighted after falling from a tree (*Acacia* sp.) at Sítio Bom Sucesso (7° 54'23.4" S, 38° 10'40.2" W), a rural area of the municipality of Serra Talhada, Pernambuco state, north-eastern Brazil. On the ground, the males were intertwined and biting each other for approximately five minutes. Next, the males disengaged, climbed the tree, and started biting one another again. At this time, some blood was visible on the supralabial and infralabial scales of one of the males (Fig. 1A, B). The injury was possibly caused by the enlarged teeth on the posterior maxillae, since the males opened their mouths widely to grasp their rival's head. A third individual *O. aeneus* was then sighted at the top of the tree. This individual was probably a female, based on its large body size and subsequent reproductive behaviour reported below. The males disengaged soon after the observer approached the tree to record a video. One male moved to the left side of the tree, and the other moved to the upper right side, where the female was. The events reported above lasted around



**Figure 1.** Male-male combat in the brown vine snake *Oxybelis aeneus* in Pernambuco, north-eastern Brazil - **A.** A male biting its opponent's head, **B.** Note the blood on the supralabial and infralabial scales of one of the males (arrows)



**Figure 2.** A courting male (blue arrow) and a female (red arrow) brown vine snake *Oxybelis aeneus* during a tail-search copulatory attempt (dashed circle) on a tree at night

90 minutes. At 19:20 h, one male and the female were seen together on the tree (Fig. 2). No copulation was observed, but some courtship-related behaviours were noted such as tactile-chase, tactile-alignment, and a tail-searching copulatory attempt (sensu Gillingham et al., 1977). The couple remained

together on the tree until at least 16:00 h the next day, when the observer stopped watching. The complete videotaped sequence is available in a database in the cloud “Banco de Vídeos GERES\_LEEV” of the Laboratório de Ecologia e Evolução of the Instituto Butantan (001\_LEEV\_VD\_HB).

Colubrid species that show male combat generally have a male biased sexual size dimorphism (SSD) index of lower than 0.27 (Shine, 1994). However, *O. aeneus* has a slightly female-biased SSD (0.07; calculated from mean SVL values provided by Goldberg, 1998; see also Mesquita et al., 2010). There is a similar SSD index (0.09) in the congener *O. fulgidus*, although no male combat has been reported in this species (Scartozzoni et al., 2009). Here, we recorded a male combat with biting in a female-biased SSD species. Bites in male combat have already been recorded in other New-World opisthoglyphous colubrids, such as *Sonora* and *Scolecophis* (Goode & Schuett, 1994; Wilson et al., 2002; Chernov et al., 2020; Senter, 2022). Vigorous biting during combat, such as that observed here for *O. aeneus*, has been previously reported in other colubrid such as *L. ahaetulla* (Mattos et al., 2017) and *Macroprotodon cucullatus* (Capula & Luiselli, 1997) which show enlarged teeth (bladed and grooved, respectively) on the posterior maxillae that aid in envenomation of prey or opponent (Achille, 2015; Sánchez et al., 2018).

## ACKNOWLEDGEMENTS

We thank Fabio Nunes and Luana Teodoro for the photos and essential information to describe the behaviours and Henrique Braz for editing the language of the manuscript.

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Accepted: 22 September 2022