SCIENTIFIC NOTE

Unusual habitat use by Micrurus silviae (squamata, elapidae) in a forest fragment of eastern Paraguay

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Abstract: Ecological affinities in snakes are influenced by habi-tat structure, prey availability, and climatic condi-tions, with many species showing strong preferences for specific ecosystems. The genus Micrurus includes both habitat generalists and specialists. Within the Complejo de Reservas Guyra Reta (CRGR) in the Reserva para Parque San Rafael, Micrurus corallinus is typically found in forests, while Micrurus silviae is associated with grasslands. This study reports a M. silviae specimen found in a forest, suggesting possible ecological plas-ticity in habitat use. CRGR, spanning 73,000 hectares, is a critical conservation area in eastern Paraguay, en-compassing remnants of the Alto Paraná Atlantic Forest and Southern Cone Mesopotamian Grasslands. During a REDD+ project, a M. silviae individual was found 70 me-ters from grasslands in a wooded fragment, indicating that this grassland species might use forest environ-ments as refuge from periodic burns. This finding high-lights the need for further studies on habitat use and ecological flexibility in M. silviae and similar species for encompassing effective conservation strategies.

Key-words: forest, grasslands, Serpentes.

Notas sobre afinidades ecológicas inesperadas para *Micrurus silviae* (squamata, elapidae)

Resumo: As afinidades ecológicas em serpentes são influenciadas pela estrutura do habitat, disponibilidade de presas e condições climáticas, com muitas espécies mostrando fortes preferências por ecossistemas específicos. O gênero Micrurus inclui tanto generalistas quanto especialistas em habitat. Dentro do Complexo de Reservas Guyra Reta (CRGR), na Reserva para Parque San Rafael, Micrurus corallinus é tipicamente encontrado em florestas, enquanto Micrurus silviae está associado a pastagens. Este estudo relata um espécime de M. silviae encontrado em uma floresta, sugerindo possível plasticidade ecológica no uso do habitat. O CRGR, com uma extensão de 73.000 hectares, é uma área crítica para a conservação no leste do Paraguai, abrangendo remanescentes da Floresta Atlântica do Alto Paraná e das Pastagens Mesopotâmicas do Cone Sul. Durante um projeto REDD+, um indivíduo de M. silviae foi encontrado a 70 metros de uma área de pastagem em um fragmento florestal, indicando que espécies de pastagem podem utilizar ambientes florestais como refúgio contra queimadas periódicas. Este achado destaca a necessidade de estudos adicionais sobre o uso do habitat e a flexibilidade ecológica de M. silviae e espécies semelhantes para estratégias de conservação eficazes.

Palavras-chave: floresta, prado, Serpentes.

Ecological affinities in snakes are largely influenced by factors such as habitat structure, prey availability, and climatic conditions; and many snake species exhibit strong habitat preferences, often being closely associ-ated with specific ecosystems such as forests, grasslands, or wetlands (Wasko & Sasa, 2012). In this regard, there are species with broad ecological plasticity which are usually those exhibiting larger distribution ranges. On the other hand, some species are more restricted to a particular type of habitat, being more susceptible to habitat loss and further extinction (Segura et al., 2007). In the case of the coral snakes genus Micrurus, although most of the taxa are habitat-generalists, and some species such as M. corallinus are strongly associ-ated with forests (Marques, 1996; Cacciali, 2024) or with grasslands as is the case of M. silviae (Giraudo et al., 2015; Cacciali, 2024). These two species are pre-sent in the Complejo de Reservas Guyra Reta (CRGR) in-side the Reserva para Parque San Rafael (eastern Para-guay); the first is present in the forest (Núñez, 2012), while the latter was exclusively recorded in natural grasslands (Cacciali et al., 2011; Cacciali, 2013; Ca-bral & Sforza, 2014). In this communication we report the presence of a specimen of the grassland-dwelling coral snake M. silviae inside a forest area, discussing its presence outside its typical environment.

The CRGR is found within a hill complex that spans a considerable part of the eastern region of Paraguay. It encompasses approximately 73,000 hectares and is one of the largest and significant remnants of the Alto Paraná Atlantic Forest in Paraguay. Consequently, it is consid-ered critical for biodiversity conservation in the re-gion, and also bears high levels of endemism (Myers et al., 2000). Besides, it was also named as an Important Bird Area (Cartes & Clay, 2008). Additionally, it inlcudes a portion of the of the Southern Cone Mesopota-mian Grasslands biome, intermixed with forests, thereby imparting a considerable heterogeneity to the landscape (Fig. 1). The area its characterized by a humid subtrop-ical climate, with temperatures ranging from 10 to 20 °C in winter, and 25 to 35 °C in summer, and significant rainfall throughout the year with annual precipitation of 1,500 to 2,000 mm. The region is home to a number of snakes that are strongly associated with the forest hab-itats, including Spilotes pullatus, Oxyrhopus guibei, Philodryas olfersii, Bothrops diporus and Micrurus cor-allinus (Núñez, 2012; Cacciali, 2013). The grasslands also exhibit a diversity of snakes strongly linked to this environment, like Erythrolamprus almadensis, Philo-dryas patagoniensis, Bothrops alternatus and the threat-ened Atractus thalesdelemai and M. silviae.

Working on a forest inventory in the framework of a REDD+ project (Reducing Emissions from Deforestation and Forest Degradation) we spotted an individual of Micrurus silviae in the forest while removing leaf litter. The specimen was coiled on the forest ground at the base of a tree. The snake was photographed in situ (Fig. 2) and not disturbed. The observation took place on April 25th at 4:33 pm, in a wooded fragment (26°28’11.618”S, 55°51’2.415”W) located 70 meters from the grassland and close to a watercourse, this patch is located at La Amistad Community, in the buffer area of the San Rafael Reserve (Fig. 1).

Micrurus silviae is a rare species, inhabiting Rio Grande do Sul in Brazil, Corrientes in Argentina and a single location (San Rafael Reserve) in Itapúa, Paraguay (Nogueira et al., 2019). Along with its distribution, all previous records refer to the habitat of this spe-cies as natural grasslands or savannas (Di-Bernardo et al., 2007; Giraudo et al., 2015). It has been documented that colubrid snakes associated to grasslands may use forest environments as well, sometimes inhabiting the ecotone between them (DeGregorio et al., 2011; Stephen-son et al., 2024), and also as a consequence of habitat fragmentation or other anthropogenic impacts (Graitson et al., 2020). These environmental constraints would not be considered since San Rafael Reserve is relatively well conserved and grassland habitats are in good condi-tion. The only event that may affect grassland wildlife in the area is periodical burns, affecting both forest and grasslands (Lorenz et al., 2021). Even when most of the reptile fauna can use burrows and remain underground during wildfires in fire-adapted ecosystems (Davis, 1946; Friend, 1993), some snakes may flee to the forest habitat that are usually not impacted by fire (Pausas, 2018).

Finally, although Micrurus silviae is mainly associ-ated with grasslands, the fact that it was found in the forest area may suggest a greater ecological plasticity in habitat use, which could be linked to search for refuge or prey. This observation of a grassland snake in the forest makes us think we do know too little yet about the ecological affinities of most of the ophidians in Paraguay, and this is a first spark to deeply dig in-to the intricated relations of forest-grasslands ecology and the biodiversity that inhabits them. This observa-tion also carries implications for conservation since M. silviae may be able to use forest areas to move among grasslands patches. More studies oriented to the use of forest by this, and other grassland species, are ex-tremely needed to contribute to the knowledge of the fragile ecosystems as of grasslands.

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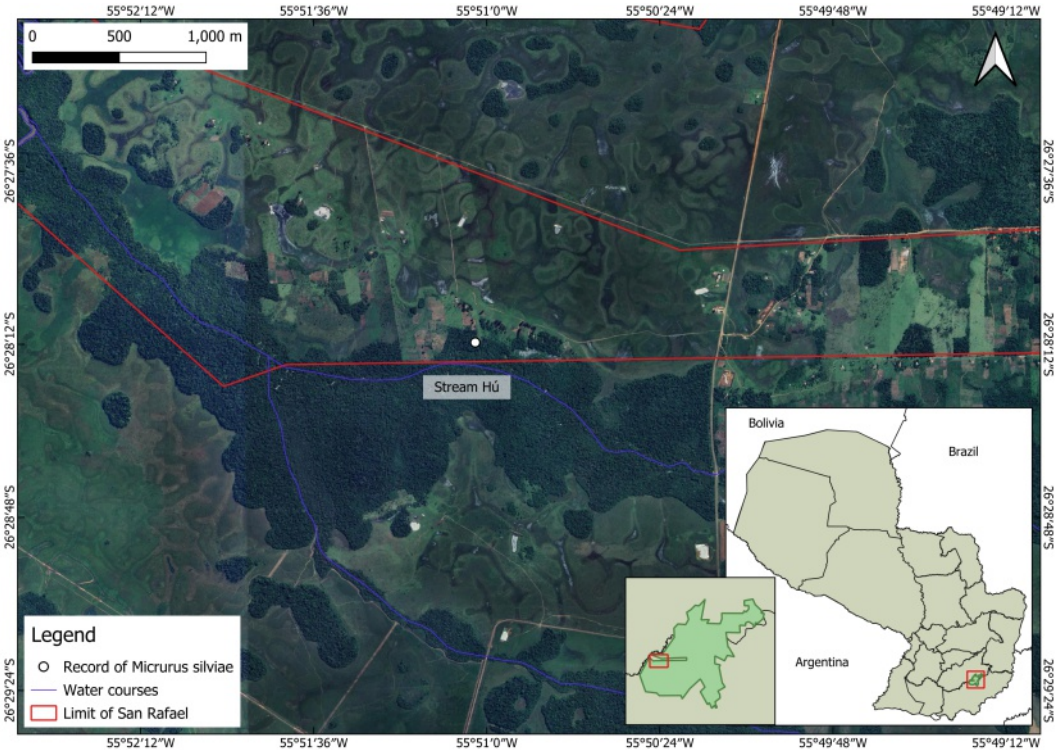

Fig. 1. Location of record of Micrurus silviae in the forest (white dot) in the San Rafael National Park.

Fig. 2. Adult male of Micrurus silviae, found in the forest in Paraguay.

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