

NOVEL VERTICAL SUBSTRATE UTILIZATION BY *THOROPA MILIARIS* (SPIX, 1824) (ANURA: CYCLORAMPHIDAE) IN MINAS GERAIS, SOUTHEASTERN BRAZIL

NUEVA UTILIZACIÓN DE SUSTRATOS VERTICALES POR *THOROPA MILIARIS* (SPIX, 1824) (ANURA: CYCLORAMPHIDAE) EN EL ESTADO DE MINAS GERAIS, SUDESTE DE BRASIL

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Resumen.– Los anuros presentan diversos modos locomotores y se encuentran en una amplia variedad de hábitats. Además, a pesar de las preferencias de las especies, varios anuros son capaces de explorar hábitats o sustratos inusuales. Tal es el caso de *Thoropa miliaris*, una rana ciclorránfida endémica del bioma de la Selva Atlántica brasileña. Esta especie está altamente especializada en sustratos rocosos de ambientes de agua dulce y costeros, sin embargo, también se la ha encontrado utilizando axilas de bromelias. Más allá de las bromelias, nunca se ha documentado el uso de otros tipos de vegetación por parte de *T. miliaris*. Aquí informamos por primera vez el uso de vegetación arbustiva por parte de este anfibio en el estado de Minas Gerais, sureste de Brasil.

Palabras clave.– Historia natural, rana de río de roca, uso del hábitat, selva atlántica.

Abstract.– Anurans exhibit diverse locomotor modes and are found in a wide variety of habitats. Furthermore, despite species-specific preferences, several anurans can explore unusual habitats or substrates. This is the case of *Thoropa miliaris*, a cycloramphid frog endemic to the Brazilian Atlantic Forest biome. This species is highly specialized in rocky substrates of freshwater and coastal environments; however, it has been found using bromeliad axils. Beyond bromeliads, the use of other types of vegetation by *T. miliaris* has never been reported. Herein, we report for the first time the use of shrub vegetation by this species in the state of Minas Gerais, southeastern Brazil.

Keywords.– Atlantic forest; habitat use; natural history; rock river frog.

Anurans show a diversity of locomotor modes (e.g., walkers, climbers, long and short jumpers, swimmers) and occupy a wide variety of habitats, such as caves, terrestrial, arboreal, and aquatic environments, with varied functional demands (Soliz & Ponssa, 2016; Buttner et al., 2020). Arboreal anurans have morphological specializations for climbing and moving more efficiently on narrow substrates (Manzano et al., 2008; Herrel et al., 2013). However, it is known that several species of anurans, including the terrestrial ones, can move using the terminal phalanges of the fingers as claws (Vassallo et al., 2021), and

thus utilize unusual habitats or substrates (e.g., Maia-Carneiro & Maia-Solidade, 2020; Souza et al., 2022). This ability may be useful for avoiding predators, escaping from a pit, dispersing into new habitats, accessing new dietary items, coping with stressful environmental conditions, or exploring new ecological niches (Granda-Rodriguez et al., 2008; Hudson et al., 2016; Diogo, 2017).

Thoropa miliaris (Spix, 1824) is a cycloramphid frog, endemic to the Brazilian Atlantic Forest biome in the states of Bahia,

Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo (Frost, 2024). This species is commonly found in the soil and on rocky substrates around freshwater environments (Bokermann, 1965; Cocroft & Heyer, 1988), as well as on rocky marine shores (Abe & Bicudo, 1991). Furthermore, it can also be found using the axils of bromeliads as a diurnal shelter (Teixeira et al., 2006), with a preference for the lower axils (Pertel et al., 2010). The use of this microhabitat places *T. miliaris* a bromelicolous species (sensu Peixoto, 1995), as no tadpoles or egg clutches have been found within bromeliads (Lacerda et al., 2009). The use of vegetation other than bromeliads has never been reported for this species.

In this context, we report the use of vertical substrates by *T. miliaris* in different types of vegetation in the Atlantic Rainforest of Minas Gerais state, southeastern Brazil.

The first observation occurred on 29 April 2011, at 21:30 h during an expedition to the Povoado de Sinimbu, in the municipality of Cataguases (21°20'19" S, 42°45'45" W; WGS 84; 297 m a.s.l.). On this occasion, we recorded a juvenile *Thoropa miliaris* (not collected) perched on the leaf of a *Palicourea* sp. (Rubiaceae), spotted 33 cm above ground level (Fig. 1A). The second observation occurred on 20 June 2016, at 19:00 h during

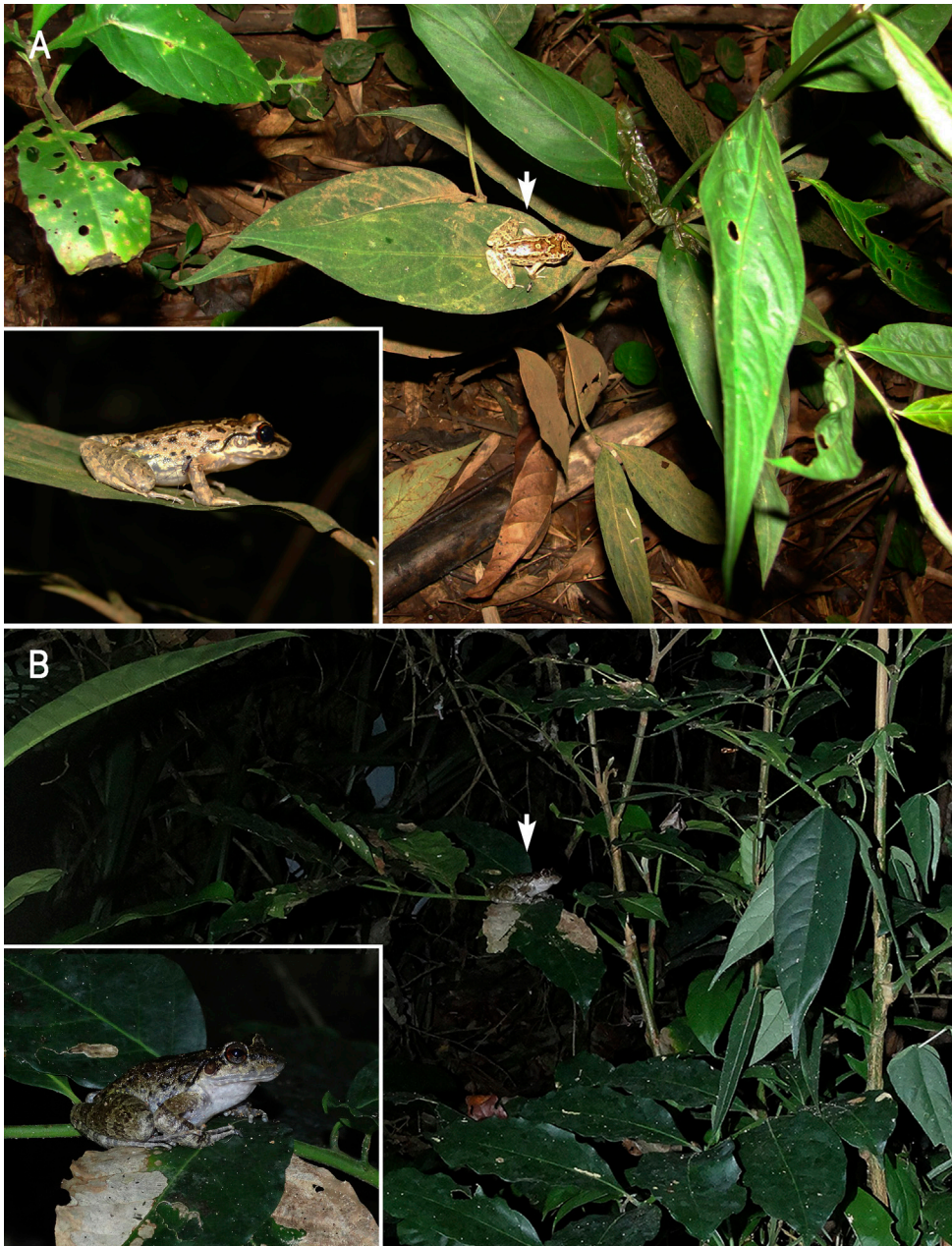


Figure 1. (A) Juvenile *Thoropa miliaris* (not collected) observed on *Palicourea* sp. (33 cm above ground level) in Cataguases municipality, Minas Gerais state, Brazil; (B) Adult male *T. miliaris* (MZUFV 15627) observed on *Matayba* sp. (120 cm above ground level) in Mesquita municipality, Minas Gerais state, Brazil. White arrows indicate the individuals perched on the vegetation and to the left and below each photo is a close-up of the same individuals. Photos: Henrique Folly.

Figura 1. (A) Juvenil de *Thoropa miliaris* (no colectado) observado en *Palicourea* sp. (33 cm sobre el nivel del suelo) en el municipio de Cataguases, estado de Minas Gerais, Brasil; (B) Macho adulto de *T. miliaris* (MZUFV 15627) observado en *Matayba* sp. (120 cm sobre el nivel del suelo) en el municipio de Mesquita, estado de Minas Gerais, Brasil. Las flechas blancas indican los individuos posados sobre la vegetación y a la izquierda y debajo de cada foto hay una aproximación de los mismos individuos. Fotos: Henrique Folly.

an expedition to Cantinho do Céu Farm, in the municipality of Mesquita (19°15'31" S, 42°33'14" W; WGS 84; 682 m a.s.l.). During this expedition, we recorded an adult male *T. miliaris* perched on the leaf of a *Matayba* sp. (Sapindaceae), spotted 120 cm above ground level (Fig. 1B). This individual was collected and euthanized using 2% lidocaine, fixed in 10% formalin, stored in 70% ethanol, and housed at the Museu de Zoologia João Moojen (MZUFV 15627), Universidade Federal de Viçosa, municipality of Viçosa, state of Minas Gerais, Brazil.

Our observations expand the range of microhabitats used by *Thoropa miliaris*, including new types of substrates in the shrub vegetation. This species reproduces in temporary water films that flow over rocks after rainfall, including vertical rock walls (Giaretta & Facure, 2004; Haddad & Prado, 2005). The ability to climb these rocky environments likely enables the species to utilize other substrates (see Teixeira & Rödder, 2007), including the plant branches and leaves reported here. Furthermore, it remains unclear whether *T. miliaris* reaches shrub leaves by climbing their vertical branches or by jumping directly onto the leaves. The use of vegetation in this species might be related to the escape from terrestrial predators (Oliveira et al., 2022), as observed in some Bufonidae (Lindquist et al., 2007; Granda-Rodriguez et al., 2008; Noronha et al., 2013) or even related to the search and increased access to new food items, likely exploring new niches for occupation. Thus, further investigations about *T. miliaris* habitat preferences, including observation in other sites within the species' range, may help to shed light on these questions and register new occurrences in distinct environmental conditions.

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