

Defensive behaviour of *Proceratophrys boiei* (Wied-Neuwied, 1824) (Amphibia, Anura, Cycloramphidae)

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Abstract. The selective pressures exerted by predation on amphibians are related to the development of physiological, morphological and behavioral mechanisms that reduce the chance of being detected or consumed by predators. In this article we report the adoption of stiff-legged posture by a species of the genus *Proceratophrys* and provide a short overview of this behaviour reported so far for Anura. During a field expedition five individuals of *Proceratophrys boiei* were observed displaying stiff-legged defensive posture. This behaviour has already been reported for seven species of anurans from the families Cycloramphidae, Microhylidae, Leptodactylidae and Bufonidae.

Keywords. ecology, Atlantic forest, Stiff-legged, *Proceratophrys boiei*.

Introduction

Anurans, when compared to other vertebrates such as birds, reptiles and mammals, have a skin devoid of any protection such as hair or feathers, are usually small and relatively slow (Duellman, 1994). These characteristics make anurans susceptible to predation by invertebrates such as centipedes, spiders and scorpions, in addition to all groups of vertebrates including amphibians (Wells, 2007). Predation has been important to the evolution of many peculiar characteristics of amphibians such as toxic and distasteful skin secretions, cryptic and aposematic coloration and a wide variety of defensive postures and behaviours (Wells, 2007). Some leaf-litter frogs such as *Stereocyclops parkeri* (Wettstein, 1934), *Proceratophrys appendiculata* (Günther, 1873) (Sazima, 1978) and *Zachaenus parvulus* (Girard, 1853) (Sazima, 1978; Rocha et. al. 1998) have a defensive behaviour called stiff-legged posture, during which the frogs flatten their bodies and remain immobile with legs distended. The genus *Proceratophrys* Miranda-Ribeiro 1920, is represented by 18 species distributed within eastern and southeastern Brazil, northeastern Argentina and Paraguay (Frost, 2009).

Proceratophrys boiei (Wied-Neuwied, 1824) is an inhabitant of the Atlantic Rainforest litter, occurring on the Brazilian coast within the Santa Catarina and Pernambuco states (IUCN, 2009). Although the stiff-legged behaviour has already been observed in this genus, it is the first report of such behaviour for the species *P. boiei* (Figure 1).

Material and Methods

Individuals of *Proceratophrys boiei* were observed exhibiting defensive behaviour during field expeditions conducted between 20 to 25 May and 26 to 30 August 2009 in an Atlantic Rainforest area located in Rio Claro municipality, Rio de Janeiro state, Southeastern Brazil (22° 46'53"S, 44° 13'52"W). Individuals were photographed, manually collected and, subsequently anesthetized with xylocaine 5% and fixed with formalin solution 10%. The material was deposited in the Coleção de Anfíbios da Universidade Federal do Estado do Rio de Janeiro (UNIRIO).

Results and Discussion

The stiff-legged defensive posture was observed in five out of six specimens of *P. boiei* (UNIRIO 3713, 3714, 3715, 3716, 3717) immediately upon being disturbed (Figure 2). When disturbed, the individuals hopped, flattened their body, and became motionless with distended legs on the litter (Figure 3).

Individuals that were turned ventral side up (Figure 4), quickly returned to the normal position, with their ventral surface turned to the ground. The same behaviour was reported by Sazima (1978) for *Proceratophrys appendiculata* and *Stereocyclops parkeri*. The displayed

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Figure 1. Specimen of *Proceratophrys boiei* (Wied-Neuwied, 1824) from Rio Claro municipality, State of Rio de Janeiro, Southeastern Brazil. Photo: Thiago Silva-Soares.



Figure 2. *Proceratophrys boiei* displaying the stiff-legged defensive posture. Photo: Thiago Silva-Soares

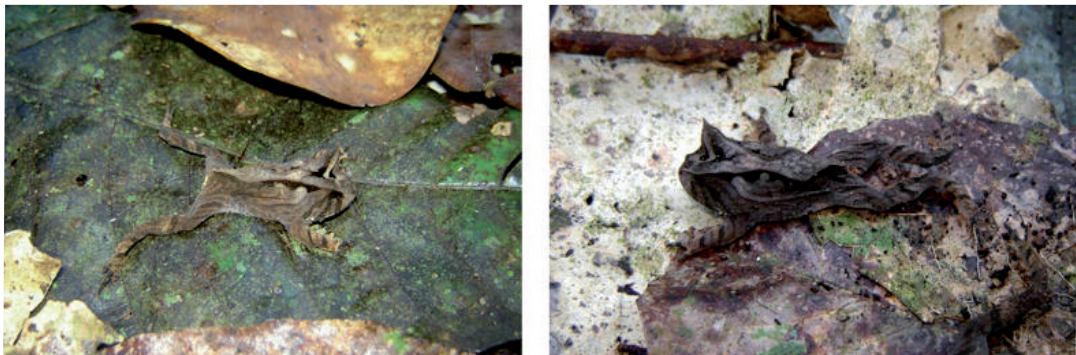


Figure 3. Further specimens of *P. boiei* displaying the stiff-legged defensive posture. Photo: Thiago Silva-Soares



Figure 4. Ventral surface of an individual of *P. boiei*. Photo: Thiago Silva-Soares

behaviour seems to be caused by the fact that the animals avoid exposing their ventral surface, which lacks the cryptic coloration and pattern of the dorsal surface.

Proceratophrys boiei exhibits skin appendices and cryptic coloration giving them the appearance of dead leaves. Assuming this posture with the legs distended, the animal takes a more elongated form, improving its appearance of a dead leaf. According to Sazima (1978), such behaviour probably increases the animal camouflage protection to visually oriented predators.

The stiff-legged posture has now been recorded in seven species of frogs, from four families: Microhylidae with *Stereocyclops parkeri* (Sazima, 1978), Cycloramphidae with *Proceratophrys boiei* (this paper), *Proceratophrys appendiculata* (Sazima 1978), and *Zachaeus parvulus* (Sazima, 1978; Rocha et al. 1998), Leptodactylidae with *Scythrophrys sawayae* (Garcia, 1999) and Bufonidae with *Dendrophryniscus leucomystax* and *Dendrophryniscus brevipollicatus* (Bertoluci et.al. 2007).

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