NEST DEFENSIVE BEHAVIOR BY A MALE *PHYSALAEMUS ATLANTICUS* HADDAD & SAZIMA 2004 (ANURA: LEPTODACTYLIDAE)

**Resumo.**— Relatamos um comportamento defensivo de ninho apresentado por um macho de *Physalaemus atlanticus* durante a estação reprodutiva da espécie. Esta é a primeira observação de comportamento de defesa ativa de um ninho no gênero *Physalaemus*. Estudos futuros devem explorar a frequência do comportamento de cuidado parental nesta espécie, bem como a relevância do comportamento defensivo dos machos para a sobrevivência e aptidão da ninhada.

**Palavras chave.**— Cuidado paternal, defesa, ninho de espuma, comportamento reprodutivo, cuidado parental.

**Abstract.**— We report a nest defensive behavior presented by a male *Physalaemus atlanticus* during the species' reproductive season. This is the first observation of active nest defensive behavior on genus *Physalaemus*. Future studies should explore how frequent this parental care behavior is displayed in this species and what the relevance of male defensive behavior is for clutch survival and fitness.

**Key words.**— Paternal care, defense, foam nest, reproductive behavior, parental care.
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for parental individuals and to its advantages for the offspring (Schulte et al., 2020). However, besides foam nest construction, no other active parental care behavior has been reported in *Physalaemus* genus.

*Physalaemus atlanticus* Haddad & Sazima 2004 is a cryptic anuran found only in the municipality of Ubatuba, on the north coast of the state of São Paulo, in southeastern Brazil (Frost, 2021). *P. atlanticus* is the unique species of *Physalaemus* genus that occurs in the area (Hartmann et al. 2010; Sasso et al., 2017). Foam nests of *P. atlanticus* are found in the mirror of water in ponds, anchored in vegetation under the moist foliage near forest edges (Haddad & Sazima, 2004), on wet leaf litter far from ponds (Hartmann et al., 2010), or in water-filled bract of the palm trees (Tanaka et al., 2020). This species inhabits plain seashores at altitudes from sea level to 50 m, usually associated with ponds at the Atlantic Forest coast (Haddad & Sazima, 2004).

On 25 November 2006, at 7:06 PM, a foam nest of *P. atlanticus* was found in the type locality of *P. atlanticus*, in the Serra do Mar State Park, Núcleo Picinguaba, municipality of Ubatuba, state of São Paulo, southeastern Brazil (23°21'29.98’S, 44°50’56.99”W, WGS84; 6 m elev.). The region is characterized by Coastal Rainforest (named as Restinga) (da Silva et al., 2016). The nest was found amongst roots and leaves nearby a temporary pond, in a short land slope inside a lair, partially covered by the leaf litter (Fig. 1). We found the nest by following the advertisement call of one of the several *P. atlanticus* males that were calling in the area (advertisement call described by Haddad & Sazima, 2004).

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**Figure 1.** Foam nest of *Physalaemus atlanticus* constructed among roots and leaves in the municipality of Ubatuba, São Paulo State, southeastern Brazil. Photo: Thiago Silva-Soares.

**Figura 1.** Ninho de espuma de *Physalaemus atlanticus*, construído entre raízes e folhas no município de Ubatuba, Estado de São Paulo, sudeste do Brasil. Foto: Thiago Silva-Soares.
We describe below the behavioral observations concerning this focal calling male.

Upon nest locating, the author TSS removed the leaf litter out of the surroundings of the foam nest, i.e., approaching the hand to the nest. An adult individual of *P. atlanticus* – that was deep in the lair hidden somewhere behind the foam nest – firmly jumped out to the lair’s entrance in response to TSS action. The individual stayed there steady at the foam nest (Fig. 2) until TSS moved away. TSS stepped away two meters from the nest and, about one minute later, the individual hooped back into the deep of the lair. TSS waited one minute and once more approached his hand to the foam nest and touched the leaves and roots that closely surrounded the nest. Promptly, the *P. atlanticus* individual repeated the behavior and showed itself jumping out the nest. Again, TSS stepped back one meter away from the nest and waited two minutes to initiate a third and last provocation. Once more, the individual reacted investing against the simulated threat (TSS), hopping out from the lair to its entrance, remaining steady in this position. This individual was handled and identified as an adult male of *P. atlanticus* by external morphology – i.e. presence of vocal sac, small size, canthus rostralis distinct, orange belly and dorsal skin texture smooth (Haddad & Sazima, 2004). We also could confirm species identification by species-specific advertisement call emitted by the focal and surrounding individuals (Haddad & Sazima, 2004). After species and sex determination, the individual was released. We left the foam nest untouched.
According to Schulte et al. (2020), active egg guarding by females is the most common parental care behavior in amphibians. In the Family Leptodactylidae, most species construct foam nests to egg-laying, and the majority of active parental care behaviors are presented by females (de Sá et al., 2014). In Leptodactylus genus, there are several reports of males aggressively defending clutches with eggs, as L. fallax (Gibson & Buley, 2004), L. chaquensis (Prado et al., 2000) and L. latrans (de Sá et al., 2014). In Physalaemus genus, previous studies has been shown that males can defend territories against intruder males (with or without foam nests deposited), but this behavior has been pointed out as defense of calling sites, not parental care (see Arzabe & Prado, 2006, and Oliveira Filho & Giaretta, 2008). Thus, the P. atlanticus behavior reported in our study is to our knowledge, the first record of active defensive paternal care in the genus.

We were not able to confirm that the observed foam nest was constructed by the focal male, since we did not observed the foam nest construction. Given that males of L. fallax only defend the nests that they have constructed with females during egg-laying (Gibson & Buley, 2004), future studies should confirm whether P. atlanticus males also only defend foam nests constructed by them. Additionally, we recommend that future studies explore the presence and magnitude of positive effects of P. atlanticus male care behavior to offspring survival.

Few hypothesis-testing studies on anuran parental care were developed with species of the Family Leptodactylidae, a knowledge gap that needs to be fulfilled (Schulte et al., 2020). This is especially important considering that Leptodactylidae is one of the species richest, and most geographically widespread, Neotropical anuran families (Frost, 2021). Understanding the evolutionary, physiological and ecological roles of parental care for species of such diverse anuran taxa can clarify theoretical questions about anuran evolution and provide insights on anuran conservation. Thus, we strongly encourage behavioral experiments to confirm the hypothesis of parental care behavior by P. atlanticus males, as well in other Physalaemus, Leptodactylidae and Neotropical anuran species.

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CITED LITERATURE


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