

(SHORT COMMUNICATION)



Predation process of a hope (Orthoptera: Tettigoniidae) in the municipality of Goiânia, Goiás, Brazil

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Abstract

Most of the hopes (Orthoptera: Tettigoniidae) have an arboreal habit, however, some live among the undergrowth, on the ground, or associated with floating aquatic herbaceous plants. In general, species are generalists, feeding on what is available. There are phytophagous species and other predators. With few exceptions, Hopes are most active at night and are often attracted to light, especially Phaneropterinae. Buthidae are found throughout Brazil and make up around 60% of national species. This family includes the genus *Tityus* Koch, 1966 (Scorpiones, Buthidae), the most dangerous. The species that exist in Brazil are divided into four families. The objective of the manuscript is to describe the predation process of hopes (Orthoptera: Tettigoniidae) in the municipality of Goiânia, Goiás, Brazil. Using a cell phone, one of the authors recorded a video from the beginning to the end of the hopes encounter with the scorpion. These images were transformed into figures using the PNG model, which resulted in 4 photos showing all stages of predation. This report took place in the home of one of the authors located in Goiânia, Goiás, Brazil in November 2023. This study reports the first occurrence of a Tettigoniidae (hope) preying on a scorpion in Goiânia in the Central-West Region, State of Goiás, Brazil.

Keywords: Arthropoda; Predator; Scorpion; Tettigoniidae; *Tityus obscurus*

1 Introduction

1.1 Family Tettigoniidae (Orthoptera: Tettigoniidae)

Insects of the Order Orthoptera include species with chewing mouthparts, incomplete metamorphosis, and enlarged posterior femurs adapted for jumping. The order contains two suborders, Ensifera and Caelifera. The first groups are the crickets, the hopes, and the paquinhas, with long antennae, tympana located on the tibia of the first pair of legs, stridulating apparatus on the forewings, and a spadiform ovipositor. The other suborder includes the grasshoppers. Tettigoniidae, popularly known as hopes or leaf bugs, belong to the order Orthoptera, suborder Ensifera, superfamily Tettigoniidae. They have representatives in all biogeographic regions, except in polar regions, being more abundant and diverse in tropical and subtropical regions [1-4].

Males are 28 to 36 mm long, females 32 to 42 mm. Wings included, its size reaches 6 cm for a wingspan of ten. The morphology of the two sexes is very comparable. The insect is usually entirely green, but some specimens are completely yellow or have yellow legs, except for a rust-colored band on the upper part of the body and an identical border along the upper fringe of the elytra. The ovipositor can be seen from the fifth stage onwards, the wings appear for both sexes from the sixth stage of rudimentary formation. The male stridulation organ located at the base of the elytra is usually brown. It is a very attractive group, mainly due to its remarkable ability to camouflage itself with the environment, which can be living leaves, dead leaves, tree bark, branches, mosses, lichens, and stones, and can even be mimetic of other insects. The sound is produced by the friction of two structures located in the basal region of the

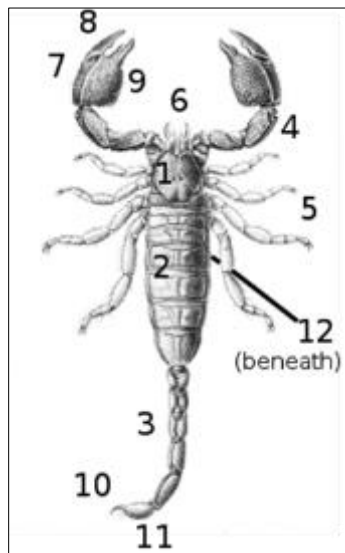
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tegmina: the stridulatory row and the palette. The sound is produced during the closure of the tegmina when the palette brushes against the row of teeth. Hopes adult life only lasts one summer [1-7].

1.2 Family Buthidae

Great diversity in color, with yellow, dark, spotted species, sometimes with dark bands or spots on the body. They are found throughout Brazil. In the vast majority of cases, they have a visible subaculear tubercle, which may be small in some species. The sternum is subtriangular in adults [8-10].

Buthidae are found throughout Brazil and make up around 60% of national species. This family includes the genus *Tityus* Koch, 1836, the most dangerous. The species that exist in Brazil are divided into four families. Three of them are harmless or cause stings that cause milder effects: Bothriuridae, small scorpions that live in the South, Southeast, Central-West, and Northeast; Chactidae, which are dark and of varying size, common in the Amazon; and Hormuridae, which comprises large, dark scorpions, which live in some regions of the Midwest and the Amazon and rarely cause accidents (Figure 1) [11-14].



Source: <https://en.wikipedia.org/wiki/Scorpion>

Figure 1 Scorpion anatomy: 1 = Cephalothorax or Prosoma; 2 = Preabdomen or Mesosoma; 3 = Tail or Metasoma; 4 = Claws or Pedipalps; 5 = Legs; 6 = Mouth parts or Chelicerae; 7 = Pincers or Chelae; 8 = Moveable claw or Tarsus; 9 = Fixed claw or Manus; 10 = Stinger or Aculeus; 11 = Telson (anus in previous joint); 12 = Opening of book lungs

Ten (10) genera and 111 species are known in Brazil. Four of these species are considered to be of health interest and can cause serious accidents. They are all of the genus *Tityus* Koch, 1836: *Tityus bahiensis* (Perty, 1833) (brown scorpion), *Tityus obscurus* Gervais, 1843 (Amazonian black scorpion), *Tityus serrulatus*, Lutz & Mello, 1922, (yellow scorpion), and *Tityus stigmurus* (Thorell, 1876) (northeastern yellow scorpion [15-17].

Young *T. obscurus* and other closely related species closely resemble adults of other *Tityus* species that do not cause serious accidents, such as *Tityus silvestris* Pocock, 1897, which live in the same regions of the Amazon. Both have a subaculear tubercle next to the stinger and a yellowish-brown body with many dark spots. They can be distinguished by the shape of the subaculear tubercle. *T. obscurus* and related species, such as *Tityus metuendus* Pocock 1897, are spinoid (shaped like a spine) [18-19].

Objective

The objective of the manuscript is to describe the predation process of hopes (Orthoptera: Tettigonioidae: Tettigoniidae) in the municipality of Goiânia, Goiás, Brazil.

2 Materials and Methods

Using a cell phone, one of the authors recorded a video from the beginning to the end of the hoper encounter with the scorpion. These images were transformed into figures using the PNG model, which resulted in 4 photos showing all

stages of predation. This report took place in the home of one of the authors located in Goiânia, Goiás, Brazil in November 2023 (Figures 2-6).



Figure 2 Scorpion and hoper facing each other, both predators



Figure 3 The scorpion turns its body to try to insert the telson into the hope



Figure 4 The hope cuts off part of the scorpion's mesosome and telson to prevent the introduction of the venom-containing telson



Figure 5 The scorpion tries to sting the hope with its telson. At this moment, the hope holds the telson with its front legs and amputates it with its mouthparts



Figure 6 The hope is ingesting its prey

Most hopes have an arboreal habit, however, some live among the undergrowth, on the ground, or associated with floating aquatic herbaceous plants. In general, species are generalists, feeding on what is available. There are phytophagous species and other predators. They feed on fruits and flowers, but there are predatory families capable of devouring hope or even other species. There is an unusual record of a scorpion (Scorpiones: Chactidae) preyed on by a scorpion (Orthoptera: Tettigoniidae) in the western Brazilian Amazon. Natural predators are birds, birds, primates, lizards, and amphibians [20-21].

It is worth remembering that most scorpion species are not responsible for causing serious accidents in the population. On the contrary, this is an arachnid that is of great importance for environmental balance, as it feeds on insects, controlling the population of pests and disease vectors. In addition to environmental control, scorpions also have great importance in scientific research. The venom of several species contains molecules that have been studied to treat diseases or be used as pharmacological tools [22].

3 Conclusion

This note reports the first occurrence of a Tettigoniidae (hope) preying on a scorpion in Gioânia in the Central-West Region, State of Goiás, Brazil.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

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