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Predation of a Scolopendrid Prey by the Scorpion *Tityus pugilator* Pocock, 1898, in a Horticultural Landscape of Quito, Ecuador

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Abstract

Scorpions of the genus *Tityus* are a diverse and medically important group, but many aspects of their natural history, particularly feeding ecology, are poorly documented. A coherent understanding of their natural prey is crucial for interpreting the evolution of their potent venoms. During fieldwork in Quito, Ecuador, we recorded a predation event involving a specimen of *Tityus pugilator* Pocock, 1898, subduing a scolopendromorph centipede, *Otostigmus* sp. The centipede was still moving when found, indicating a recent envenomation. This observation adds to the limited knowledge of the genus's feeding habits both locally and regionally, demonstrating that *Tityus* can prey on large and dangerous arthropods. This trophic relationship is worth noting as scorpions of this genus have evolved highly potent venoms. Further in-field observations are needed to fully explore this connection between diet and venom evolution in *Tityus* scorpions.

Keywords: predator-prey interaction; trophic niche; venom; arthropod; Andes

Academic Editors: Yann Hénaut and Luc Legal

Received: 24 August 2025
Revised: 11 September 2025
Accepted: 27 September 2025
Published: 30 September 2025

Citation: Espinoza-Regalado, A.; Quirola, D.R.; Salazar-Valenzuela, D.; Lüddecke, T. Predation of a Scolopendrid Prey by the Scorpion *Tityus pugilator* Pocock, 1898, in a Horticultural Landscape of Quito, Ecuador. *Diversity* **2025**, *17*, 684. https://doi.org/10.3390/d17100684

Scorpions (class Arachnida) are ancient predatory arthropods that have evolved highly complex venoms [1,2]. This chemical secretion in scorpions is delivered through the stinger located in the telson, situated at the distal end of the metasoma, which facilitates prey capture and defense [2,3]. These venoms are key ecological innovations, essential for the scorpion's survival, and they are also of importance for humans due to their role as a public health burden [4] and a potential source of novel drug leads [5].

Scorpions are easily recognizable animals whose taxonomy, evolution, and toxinology have received noteworthy attention. Nevertheless, many aspects of their natural history are either yet unknown or poorly documented, especially for species inhabiting biodiversity hotspots. This knowledge gap is mainly due to their cryptic nature and nocturnal activity [3]. A significant aspect of scorpion natural history is their feeding ecology, as trophic niche is often associated with venom evolution [6]. Venoms and the prey of venomous animals are often engaged in evolutionary arms races where both exert reciprocal selective pressures against each other [6]. As a result, prey selection emerged as the primary evolutionary driver of venoms in many lineages, and venom functions (i.e., mode of action

and potency) are shaped by the trophic niche of a venomous organism [7–9]. Therefore, a coherent understanding of prey spectra is important for interpreting toxinological data in an ecological context [10]. It is widely acknowledged that scorpions are primarily predators of other arthropods, including insects and other scorpions [2]. However, the complete prey spectrum targeted for many species remains unknown, and more field observations are needed to draw a conclusive picture. Hence, we herein report an instance of a scolopendromorph centipede that was preyed upon by the scorpion *T. pugilator* Pocock, 1898, which belongs to the subgenus *Tityus* Koch, 1836, within the family Buthidae C. L. Koch, 1837.

On 5th of May 2023, the authors performed fieldwork in the area of Puembo Parish (a valley close to the capital city of Ecuador, Quito) to monitor fauna diversity, focusing on venomous animals within the horticultural area of the local floriculture company EXPOFLOR CIA. LTDA (Figure 1). The coordinates were −0.157256–78.372989, at 2380 m above sea level. The environmental conditions were dry on a clear night. At 21:14, an adult specimen of *T. pugilator* was observed carrying a large, still moving, individual of a scolopendrid centipede (genus *Otostigmus*, undetermined species) in its chelicerae (Figure 2, Supplementary Video S1). Animals were identified based on diagnostic external morphological traits and by confirming their occurrence within the known species distribution. Specimens were not collected. The authors observed the interaction until the centipede stopped moving and the scorpion began to carry it away and to seek shelter, supposedly to feed. Although the authors did not observe the hunting itself, the fact that the centipede was still moving during the encounter and only subsequently became fully immobilized suggests it had previously been stung and envenomated by the scorpion. Therefore, it appears that specimens of *T. pugilator* occasionally prey on sympatric scolopendromorph centipedes.

Figure 1. Horticultural landscape in Puembo, Quito (Ecuador), where the observation was made. Photo by Diego R. Quirola.

Figure 2. *Tityus pugilator* preying upon a scolopendromorph centipede (*Otostigmus* sp.): (**A**) The image shows the scorpion carrying the immobilized centipede within its chelicerae before it started to seek shelter; (**B**) Close-up of the scorpion holding the centipede. Photos by Diego R. Quirola.

Our report adds to the current, quite limited, understanding revolving around *Tityus* feeding ecology. Members of this genus are known to be quite generalist predators of arthropods, especially insects [2]. There are some reports of predation events by *Tityus* on *Eleutherodactylus* frogs (*E. coqui, E. patriciae*) [11] and some spiders (araneomorphs and mygalomorphs) [12,13]. It has also been reported that they also regularly engage in cannibalism and prey on their conspecifics and congenerics [14]. In laboratory settings, it has further been shown that members of *Tityus* also prey on araneomorph spiders (*Selenops* sp., *Lycosa* sp., *L. thorelli*, *L. carbonelli*, *Schizocosa malitiosa*, *Metaltella* sp., *M. simoni*, *Dysdera crocata*, *Ancylometes rufus*), various orthoptera, termites, cockroaches (*Blaptica dubia*, *Periplaneta americana*, *Pycnoscelus* sp.), mealworm larvae (*Tenebrio* sp., *T. molitor*), and diptera (*Drosophila* sp., *Musca* sp.) [15–19].

Here, we add a report of a predation event of *T. pugilator* targeting a large centipede of the genus *Otostigmus*. On the one hand, this increases the known prey spectrum for members of the genus *Tityus*. On the other hand, it could also help to better understand the species' toxin arsenal. Interestingly, scolopendromorph centipedes are fierce predators that use their powerful venomous bite to hunt arthropods [20]. With that, it appears that members of *Tityus* may be well accustomed to prey upon other, dangerous and well-defended arthropods. Investigating this further, through more natural history observations and gathering venomic data, may help to better understand their toxinology and ecological role.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/d17100684/s1, Video S1: *T. pugilator* preying upon a scolopendromorph centipede (*Otostigmus* sp.).

Author Contributions: Conceptualization, T.L. and A.E.-R.; writing—original draft preparation, T.L., A.E.-R., D.S.-V. and D.R.Q.; writing—review and editing, T.L. and A.E.-R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: No data were generated in the present work.

Acknowledgments: We thank EXPOFLOR CIA. LTDA. and Silvana Vega for supporting the venomous fauna survey and granting the needed permission.

Conflicts of Interest: The authors declare no conflicts of interest.

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