

SHORT COMMUNICATION

Excreta grooming behavior in a litter-dwelling scorpion species (Scorpiones: Buthidae) from Brazil

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Abstract. Behavioral studies of scorpions mainly focus on hunting and courtship activity. Few studies have focused on the cleaning processes that these arachnids invest in. This work aims to describe the first report of excreta grooming behavior for Brazilian scorpions. Excreta cleaning behavior was recorded in 37 specimens of *Tityus pusillus* Pocock, 1893 with the behavior lasting around 80 sec. The paste-like nature of the scorpion excreta suggests that it could easily obstruct their anus when dry, so the excreta cleaning behavior may mitigate this probability and further contact with the nitrogenous compounds.

Keywords: Arachnida, cleaning behavior, *Tityus pusillus*

Grooming can be an important activity in individuals' lives (Spruijt et al. 1992; Zhukovskaya et al. 2013). Some studies have described the behaviors associated with grooming in scorpions, reporting that scorpions clean their pedipalps, telsons, and legs after, or while, eating their prey (Bub & Bowerman 1979; Mineo et al. 2003; Rein 2003; Jiao & Zhu 2010). Studies with buthids, scorpionids, euscorpionids, and caraboctonids report individuals grooming their pedipalps, aculeus, and legs by pushing them into the substrate and moving back and forth a few times, sometimes using the pedipalps, legs and telson to brush the body (Bub & Bowerman 1979; Mineo et al. 2003; Rein 2003; Jiao & Zhu 2010). Scorpions display a cleaning behavior to reduce or eliminate the endogenous effects on sensory organs, if the surfaces of these sensory organs are covered in body fluid of injured prey or by other substances (Jiao & Zhu 2010). However, the behavior associated with cleaning after excretion remains poorly documented for these animals (Armas 1980). Thus, we describe the excreting behavior and anal cleaning (hereafter “excreta cleaning behavior”) performed by the Neotropical litter-dwelling scorpion *Tityus pusillus* Pocock, 1893. This scorpion is a small (30–35 mm) sedentary species, commonly found in leaf-litter and dominant in Brazilian Atlantic forest (Lira et al. 2013, 2018).

The excreta cleaning behavior was video recorded (Nikon D5500) in 37 *T. pusillus* adult males and females, during nocturnal behavioral trials, with scorpions placed individually in a circular arena (12 cm diameter) with filter paper as substrate. The scorpions started to move slowly before the excretion. At this point, excreta were identified as a little white dot at the external part of the anus, located at the end of the metasoma. All individuals remained still initially, then made quick and brief movements, up and down with the telson for 34 ± 8.2 sec (mean \pm SD), ranging from 30 to 45 sec. The telson movements were initially subtle and then intensified a few seconds before excretion. Thereafter, the scorpion arched its body, leveling it with its back legs, and touched the substrate with the anus. Then, the scorpion walked while dragging the anus on the substrate and leaving a white excreta trail. After finishing the excretion, the scorpion continued to drag the anus on the substrate with vigorous zig-zag movements brushing the anus on the substrate (See supplemental video materials online at <http://dx.doi.org/10.1636/JoA-S-19-015.s1>). The entire excreta cleaning behavior process took about 79 ± 10.7 sec (ranging 60 to 90 sec). Excreta cleaning behavior performed by *T. pusillus* was very similar to

behavior described by Armas (1980) in three Cuban scorpion species. According to this author, after defecation, a scorpion slowly walks with its mesosoma posteriorly raised, rubbing the anal papillae against the substrate with the metasoma in an arch-like position.

The scorpion excreta are excreted in a very dry state to reduce water loss, and are mostly composed of purine, guanine and uric acid (Hadley 1974). Because of the pasty consistency and composition of scorpion fecal material, their excreta dry quickly. Due to their particular morphology, scorpions differ from other terrestrial invertebrates that defecate liquid/paste directly into the substrate such as butterflies, some orthopterans and fire ant larvae (Gangwere 1993; Weiss 2006). In scorpions, we can speculate that dried excreta could obstruct the anus, preventing the animal from defecating if not cleaned correctly. Also, the scorpion could easily get excreta on their body, blocking and interfering with their sensors. However, future studies are needed to test these hypotheses. Therefore, by spreading the excreta directly on the ground, the scorpion avoids the potential closure of the anus and further contact with the nitrogenous compounds.

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