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Intraguild predation by two species of *Hottentotta* (Scorpiones: Buthidae) in Pakistan

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Abstract
Intraguild predation constitute an important ecological interaction in many ecosystems. We report two cases of intraguild predation involving scorpion as predator of centipede and assassin bug (Heteroptera: Reduviidae) during a nocturnal search for scorpions in Pakistan. In first case, *Hottentotta jalalabadensis* scorpion was found on rocks feeding a scolopendromorph centipede. On second, *H. alticola* individual was found with an assassin bug in their pedipalps and chelicerae also on rocks. In both cases when disturbed, the scorpion tries to flee to rock crevices without releasing its prey. To the best of our knowledge, this is the first report of intraguild interactions involving Pakistani scorpions.
Keyword: Reduviidae, *Hottentotta*, natural history, chilopod, assassin bug

Depredación intragremial por dos especies de *Hottentotta* (Scorpiones: Buthidae) en Pakistán
Resumen: La depredación intragremial constituye una importante interacción ecológica en muchos ecosistemas. Se reportan dos casos de depredación dentro de un gremio que involucran a escorpiones como depredadores de ciempiés y chinches asesinas (Heteroptera: Reduviidae) durante una búsqueda nocturna de escorpiones en Pakistán. En el primer caso, el escorpión *Hottentotta jalalabadensis* fue encontrado en las rocas alimentándose de un ciempiés escolopendromorfo. En segundo lugar, se encontró un individuo de *H. alticola* con una chinche asesina en sus pedipalpos y quelíceros, también en rocas. En ambos casos, cuando se sintió molestado, el escorpión intentó huir hacia las grietas de las rocas, sin soltar a su presa. Hasta donde sabemos, este es el primer informe de interacciones entre gremios que involucran escorpiones pakistaníes.
Palabras clave: Reduviidae, *Hottentotta*, historia natural, quilópodo, chinche asesina.

Intraguild predation (IGP) is a direct and antagonist interaction between organisms of the same trophic guild (Holt & Polis, 1997). This interaction occurs broadly across many systems, resulting in killing and consuming of potential competitors (Polis *et al*., 1989). Therefore, it plays an important role on demography structure in communities (Arim & Marquet, 2004).

Intraguild predation is considered as an adaptive strategy because can act as additional food resource during periods when prey is scarce (Wise, 1993; Haghani *et al*., 2019). Overall, IGP is common among generalist predators (Polis *et al*., 1989), and has been reported for several taxa (e.g., Polis & McCormick, 1986; Dinter, 1988; Wise & Chen, 1999). Among them, scorpions are venomous predators able to capture a great variety of prey ranging from invertebrates to small vertebrates (Polis, 1990; McCormick & Polis, 1990). Eventually, these arachnids include poisonous animals such as spiders, myriapods and others scorpions in their prey items (McCormick & Polis, 1990). Despite this, IGP records involving Asian scorpions are scarce in the literature. Recently was reported an event with an *Orthochirus* sp. individual preying a *Hottentotta tamulus* (Fabricius, 1798) juvenile in India (Joshi & Deshpande, 2023). This lacking of reports is surprising, because Asian continent possess a higher scorpion diversity (e.g., Lourenço, 2007; Karatas *et al*., 2012; Di *et al*., 2014). In addition, reports of field predation are important because they provide useful information about the animals' natural history that may serve as subsidies for ecological studies. Therefore, here we described two cases of IGP involving scorpion species from Pakistan.

All the IGP events were recorded through nocturnal sampling between 19:00-2:00 h. First observation was made on June-2017 in Khyber Agency (33°55'10" N, 71°26'04" E), Pakistan. The second observation was made on July-2018 in district Chitral (36°20'32" N, 72°07'37" E.), Pakistan. After the photographical record of the IGP events, scorpions and their prey were collected. Animals were stored in ethanol 70% and a posteriori, scorpions were identified through Kovařík (2007). Prey items were identified to lower level as possible. Voucher specimens were deposited in the Arachnological Collection of Islamia College University Peshawar, Pakistan.

In the first case, an adult female of the scorpion *Hottentotta jalalabadensis* Kovařík 2007 was found feeding on a half scolopendromorph centipede by their anterior body part (Fig. 1A), on a rock near to soil, under large stones from walls which are surrounding small field of crop. When disturbed, the predator fled to rock crevices present on old wall cracks constructed from the stones, with the centipede in its chelicerae, without releasing their prey. In the second case, an adult female of the scorpion *Hottentotta alticola* (Pocock 1895) was found feeding a reduviid bug by their abdomen on rocks (Fig. 1B) near human settlements. Similarly, when disturbed, the predator fled to below rocks, with the assassin bug in its chelicerae, without releasing they prey.

Despite centipedes are venomous predators, their predation by scorpions have been recurrent recorded in literature, principally in Neotropical region (e.g., Polis, 1990; Rodríguez-Cabrera *et al*., 2015; Gonzaga *et al*., 2021). For example, Gonzaga *et al*. (2021) reported that *Tityus pusillus* Pocock, 1893 is able to predate scolopendromorph centipedes in Brazilian Atlantic Forest. In Cuba, *Centruroides gracilis* (Latreille 1805) acts as habitual predator for at least three centipede genera (Rodríguez-Cabrera *et al*., 2015). In this way, centipedes may be a usual prey item for *H. jalalabadensis* in Pakistan.

At the best of our knowledge, the record of assassin bugs predation by *H. alticola* is the first involving scorpions. Previous studies reported the assassin bug may act as predators of scorpions (Stevenson *et al*., 2012; Lira *et al*., 2016). These insects may consume relatively large prey, allowing them to prey on a large variety of animals (Cohen, 1995) by the use of venomous saliva that paralyzes their prey within a short duration of time (Evangelin *et al*., 2014). Despite this, assassin bugs are also subject to predation. Bernardi *et al*. (2020) found *Enoploctenus cyclothorax* (Bertkau 1880)



Fig. 1. Intraguild predation involving scorpion species in Pakistan. **A**) *Hottentotta jalalabadensis* preying a scolopendromorph centipede in Khyber Agency. **B**) *Hottentotta alticola* preying an assassin bug on Chitral district.

spiders preying the assassin bug *Zelurus diasi* (Lima 1940) on limestone caves in Brazil. In our study, *H. alticola* capture the reduviid bug by posterior region and may be avoided the venomous mouthparts of the insect. In summary, the observations reported in this study extends the list of prey items of Asian scorpions. Further studies are required to obtain more and detailed information on those IGP interactions to understand their ecological implications.

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