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When life gives you carcasses: first record of necrophagy by *Coriomeris hirticornis* on European rabbit (*Oryctolagus cuniculus*) (Hemiptera: Coreidae)

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Abstract
This study reports the first observation of necrophagy in the phytophagous leaf-footed bug *Coriomeris hirticornis* (Fabricius, 1794). Two individuals were observed feeding on the carcass of a European rabbit (*Oryctolagus cuniculus* L., 1758) in a peri-urban meadow near Madrid, Spain. This finding underscores the adaptive dietary flexibility of *Coriomeris hirticornis* under extreme environmental conditions, providing new insights into its ecological role and trophic interactions within Mediterranean ecosystems.

Keywords: Leaf-footed bug, Carrion feeding, Trophic interactions, Mediterranean ecosystems, Opportunistic scavenging, Phytophagous insects, Resource scarcity

Introduction

Understanding trophic interactions is fundamental to the structure and functioning of ecosystems, as these interactions form the basis of ecological networks (Thébault & Fontaine 2010). However, cryptic interactions can obscure the essential roles species play within ecosystems (Millette et al. 2018). Therefore, it is crucial to comprehend the full dietary range of species to thoroughly understand their ecological functions.

Mediterranean temperate zones are characterized by dry summers and high temperatures (Giorgi & Lionello 2008). These harsh conditions often lead to a reduction in species abundance and richness (Seager et al. 2019), resulting in a reduced availability of resources. This scarcity can promote opportunistic behaviors, allowing species to occasionally exploit unusual trophic resources.

One example of a scarce and sporadic resource is carrion, a key trophic resource that plays a fundamental role in ecosystem functioning (Barton et al. 2013). Carrion is characterized by a discrete spatial and temporal distribution in the landscape (BM 1987). Due to this nature, trophic interactions associated with carrion are typically carried out by specialized necrophagous fauna (specialized scavengers) or occasionally by opportunistic necrophagous fauna (facultative scavengers) (DeVault et al. 2003).

The Coreidae family, leaf-footed bugs, is represented by 36 species on the Iberian Peninsula and the Balearic Islands (Dolling 2006). These insects are predominantly phytophagous, feeding primarily on plant sap, fruit juices, and, less commonly, dry seeds (Kumar 1965). However, some species have also been observed consuming carrion naturally (Adler & Wheeler 1984; Constant 2007), as well as carrion introduced into the environment, such as mammalian remains (e.g., Gu et al. 2014; Diaz-Martín, 2016), and even mammal and bird feces (Adler & Wheeler 1984; Steinbauer, 1996).

Within the genus *Coriomeris* (Coreidae: Pseudophloeinae), five species are found in the Iberian-Balearic region: *C. affinis* (Herrich-Schaeffer, 1839), *C. alpinus* (Horváth, 1895), *C. denticulatus* (Scopoli, 1763), *C. hirticornis*, and *C. scabricornis* (Panzer, 1805). Among these, *C. denticulatus* has been documented feeding on mammal carcasses, including those of the field mouse (*Apodemus sylvaticus* L., 1758) (Constant 2007), deer (*Cervus elaphus* L., 1758) (Gu, 2014), and red squirrel (*Sciurus vulgaris* L., 1758)

(Massee, 1955). Additionally, *C. scabricornis* has been observed scavenging on deer (*C. elaphus*) and wild boar (*Sus scrofa* L., 1758) (Gu 2014). Baz et al. (2010) also recorded *C. denticulatus* and *C. affinis* individuals in traps baited with squid carrion.

However, no scavenging behavior has been documented in *Coriomeris hirticornis*, which was previously known as a polyphagous herbivore, primarily feeding on plants such as *Onopordum tauricum* (Willd 1803) and *Medicago minima* (L., 1776) (Moulet 1995). Nonetheless, under conditions of resource scarcity, this species may turn into alternative trophic resources, such as carrion. This study presents the first recorded instance of scavenging behavior in *C. hirticornis*, specifically on a rabbit carcass (*Oryctolagus cuniculus* Linnaeus, 1758*)*.

Material and methods

The study area was located at Cerro Milano (Fig. 1) in Madrid, Spain (40.21.28.2N, 3.36.12.9W), a peri-urban meadow of approximately 6.5 km², with a maximum elevation of 645 m. Historically, the land was used for dryland agriculture (IGME, 1988). Currently, the field is abandoned, though some areas are subject to mining and active urban development. Depending on the climatic conditions of the year, summer vegetation can be sparse or consist mainly of Mediterranean grasses and Asteraceae, with the thistle *Centaurea solstitialis* (L., 1753) being predominant (Fig. 1). Additionally, *Medicago minima* and several species of the genus *Onopordum*, including *O. nervosum* (Boiss, 1841), can also be found. Vegetation during the summer varies depending on climatic conditions, ranging from sparse coverage to a predominance of Mediterranean grasses and Asteraceae, with *Centaurea solstitialis* (L., 1753) being particularly abundant (Fig. 1).

Specimens were identified to the species level both in the field and from photographs. Coreid identification was executed according to the key of Moulet (1995). Photographs were taken with a Canon Powershot SX70 HS digital camera.

Results

The observation occurred at 12:35 PM on 20 June 2024. The weather conditions were partially cloudy, with a temperature of 24°C and approximately 50% humidity (AEMET, 2024).

One individual of *Coriomeris hirticornis* was found on the rabbit's hind legs (Fig. 2), while the other was positioned

Fig. 1 – Cerro Milano (Madrid, Spain) at the beginning of summer (27 June 2024). The landscape is dominated by yellow star-thistle (*Centaurea solstitialis*). Photo: Juan Cepeda

Fig. 2 – Individual 1 of *Coriomeris hirticornis* feeding on the carcass of a rabbit (*Oryctolagus cuniculus*). Photo: Juan Cepeda

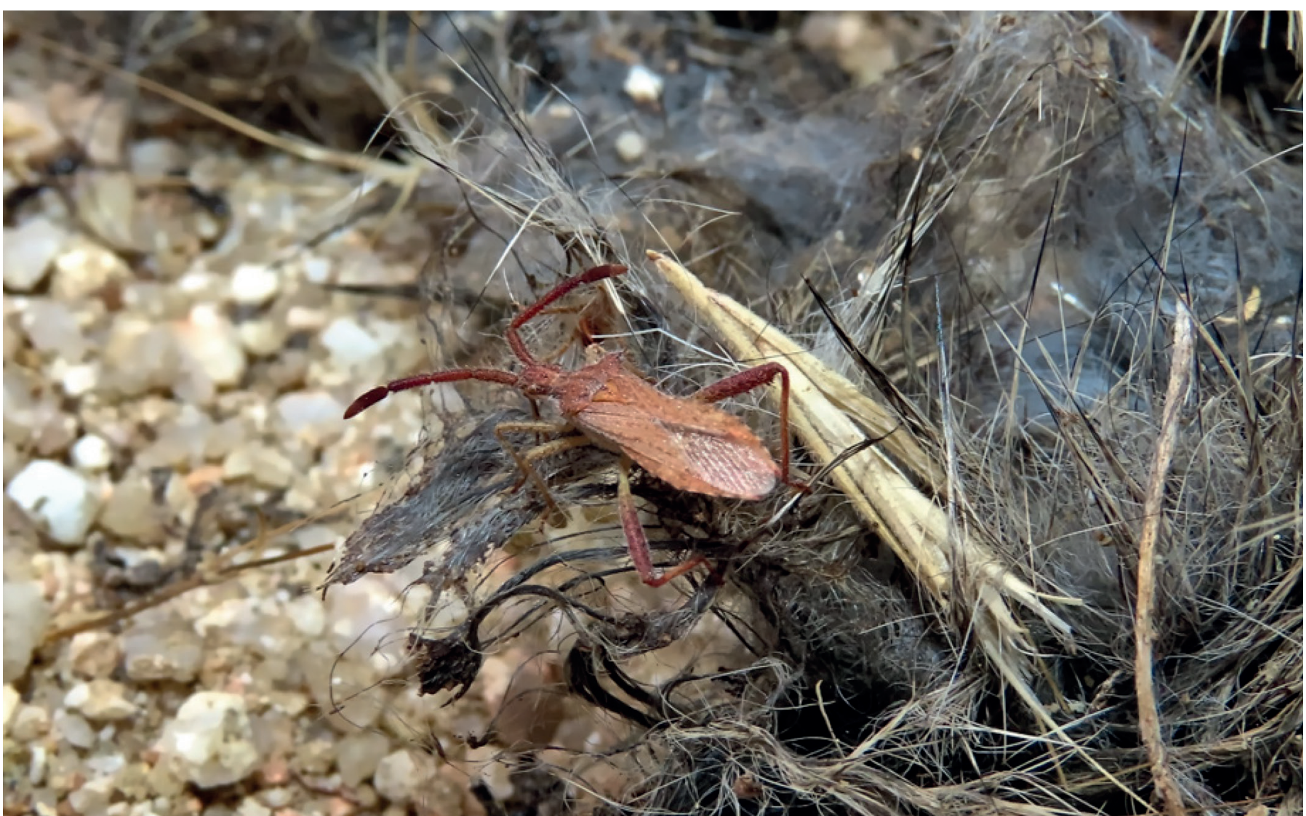

Fig. 3 – Individual 2 of *Coriomeris hirticornis* feeding on the carcass of a rabbit (*Oryctolagus cuniculus*). Photo: Juan Cepeda

near the cervical region (Fig. 3). Both individuals maneuvered their proboscises throughout the rabbit's fur and occasionally moved slowly a few centimeters along the carcass.

The rabbit carcass was in an advanced stage of decay as defined by Payne (1965). It appeared to be the remains of a predator's meal, largely unrecognizable, with minimal soft tissue remaining. The carcass was dry, with exposed skin displaying a grayish-dark hue, suggesting decomposition over several days. Notably, no flies (Diptera) were present; however, ants of the genus *Tapinoma* (Förster, 1850) were observed carrying fragments of the carcass.

Discussion

Necrophagy is an uncommon behavior within the suborder Heteroptera (Baena 2011). This study provides the first record of necrophagy in *Coriomeris hirticornis*, demonstrating that under conditions of scarcity, these insects are capable of exploiting trophic resources such as carrion.

Carrion is a nitrogen-rich resource, a key nutrient whose content diminishes as scavengers consume the soft tissues of corpses (Parmenter & MacMahon 2009). Nitrogen is crucial for the development of phytophagous insects, as its availability is often a limiting factor in their diet (Huberty & Denno 2006). Evolutionary adaptations that enable these insects to feed on nitrogen-rich plant sources, such as seeds and pollen, may also facilitate the exploitation of nitrogen-rich animal sources, like carrion (Eubanks & Denno 2003). For species in the subfamily Pseudophloeinae, which primarily feed on legumes (Fabaceae) plants (known for their high nitrogen content; Wink 2013), some, such as *Coriomeris denticulatus*, specialize in consuming their seeds (Schaefer & Mitchell 1983; Esenbekova et al. 2019). Therefore, it is not surprising that *C. hirticornis* might turn to alternative nitrogen sources such as carrion when legumes are scarce.

This opportunistic behavior could be influenced by the extreme climatic conditions that occur during Mediterranean summers, where the water deficit in July and August limits the availability of green plants (Flexas et al. 2014). During this period, seeds become the primary available trophic resource, potentially intensifying competition for this key nutrient (e.g., Santos et al. 2024). In this context, carrion might serve as an alternative nitrogen source, allowing *Coriomeris hirticornis* to reduce both interspecific and intraspecific competition.

The observation of necrophagy in *Coriomeris hirticornis* highlights the remarkable dietary flexibility of this species, enabling it to utilize carrion as an alternative nitrogen source during periods of plant resource scarcity. This unusual behavior in a phytophagous insect highlights the importance of carrion not only for specialized necrophages but also for other arthropods in Mediterranean environments, where extreme conditions can limit conventional food sources. This finding enhances our understanding of trophic networks in these ecosystems and underscores the need for further research into how species adapt to nutritional challenges in different ecological contexts.

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None conflicts to our knowledge, no special approval required

Contribution of authors
Juan C. Cepeda conducted the fieldwork and species identification. Juan C. Cepeda and Mario Alamo participated in the discussion and writing of the results.