Arachnids that feed on vertebrate carrion: necrophagy by the whip spider Paraphrynus raptator (Amblypygi: Phrynidae) and its relation to the feeding behavior of the woolly false vampire bat Chrotopterus auritus (Chiroptera: Phyllostomidae).

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SHORT COMMUNICATION

Arachnids that feed on vertebrate carrion: necrophagy by the whip spider *Paraphrynus raptator* (Amblypygi: Phrynidae) and its relation to the feeding behavior of the woolly false vampire bat *Chrotopterus auritus* (Chiroptera: Phyllostomidae).

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Abstract. Necrophagy is a feeding strategy in which animals feed on carrion; most scavengers are facultative and can also be predators or consumers. For amblypygids, necrophagy is a poorly documented phenomenon and there are literature records of individuals of three different species feeding on dead bats inside caves. In the present note, we document for the first time a necrophagic behavior in the whip spider *Paraphrynus raptator* (Pocock, 1902) which was observed feeding on *Otonyctomys hatti* Anthony, 1932 (Rodentia: Cricetidae) and a yucatan poorwill, *Nyctiphrynus yucatanicus* Hartert, 1892 (Caprimulgiformes: Caprimulgidae) carrion. We made the observations inside a small chamber in an ancient Mayan temple inhabited by a group of woolly false vampire bats (*Chrotopterus auritus* Peters, 1856) in southeastern Mexico. Carrion consumption in *P. raptator* is directly related with the carnivorous feeding behavior of the *C. auritus* group with which they coexist.

Keywords: Amblypygid, carrion, facultative, scavenger.

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Necrophagy is a feeding strategy that allows access to high-quality food resources and it is defined as the consumption of carrion by animals. Only a few species feed exclusively on carrion; most of them are facultative and can also be predators or consumers (Wilson & Wolkovich 2011). Amblypygids are mainly predators of other arthropods, although there are some records of them preying on vertebrates (e.g., Owen & Cokendolpher 2006). In general, the diet and feeding behavior of amblypygids are poorly documented in nature (Weygoldt 2000; Chapin & Hebets 2016). There are only four published records of necrophagy by three different species of amblypygids (Table 1), all belonging to the family Phrynidae, feeding on dead bats (Peck 1974; Armas & Abreu-Collado 1999; García-Rivera et al. 2009; Prous et al. 2017).

In this note, we document the first observation of necrophagy by a fourth species of whip spider, and the first time this behavior is observed north of the Isthmus of Panama, in southeastern Mexico. We made our observations at the "El Hormiguero" archaeological site, in Ejido Eugenio Echeverría Castellot II, south of Xpujil, Campeche, Mexico (18.408577°N, 89.490250°W), specifically, inside a small chamber in an ancient Mayan temple inhabited by a group of six woolly false vampire bats *Chrotopterus auritus* (Peters, 1856). *Chrotopterus auritus* is a large carnivorous bat that feeds on a great variety of small vertebrates, such as doves, tanagers, warblers, gekkonid lizards, rodents, shrews, mouse opossums, frogs and small bats (Medellín 1988, 1989; Bonato et al. 2004; Witt & Fabián 2010). Frequently, individuals carry prey to their roost to consume it later or share it with other group members. The prey are eaten from the head down and during the process some parts are discarded (Medellín 1988, 1989). The discarded parts, along with feces, accumulate on the roost floor, creating a suitable microhabitat for arthropods and microorganisms that decompose the carrion and other organic matter.

On April 26, 2019, we observed a whip spider feeding on a rodent skin with muscle and fat attached. After being photographed, the individual ran away, carrying the remains with it and hiding inside a wall-cavity. Later, on July 11, 2019, we observed some bird remains jammed inside the same wall-cavity. We collected both bird and rodent remains that were being consumed by amblypygids in order to identify the species. Based on fur characteristics and size and feather patterns, Fernando Gual-Suárez identified the rodent remains as belonging to *Otonyctomys hatti* Anthony, 1932 (Cricetidae) (Pardiñas et al., 2017) and the bird remains as belonging to *Nyctiphrynus yucatanicus* (Hartert, 1892) (Caprimulgidae) (Cleere, 1999). We have found these and around 60 other species of vertebrates as part of the diet of *C. auritus*, as well as some large invertebrates; however, we have not found evidence of *C. auritus* feeding on *P. raptator*.

This is the first time that bird and rodent necrophagy has been documented for wild amblypygids. Before these records, dead bats inside caves had been the only group of vertebrates documented unequivocally in the necrophagic diet of whip spiders (Peck 1974; Armas & Abreu-Collado 1999; García-Rivera et al. 2009; Prous et al. 2017). However, there are other groups of vertebrates such as amphibians and reptiles documented in the diet of amblypygids, but in most cases, it is not known if these records correspond to predation events or necrophagy (Chapin & Hebets 2016; Torres et al. 2019). This issue is discussed by Owen and Cokendolpher (2006) in their report of an amblypygid feeding on a hummingbird in which they argue about the fact that they are not able to determine if the amblypygid had actually hunted the hummingbird.

On July 13, 2019, one of the amblypygids inhabiting the chamber was collected near the aforementioned wall-cavity. Usually, two or three individuals can be seen on the walls upon entering the chamber. We transported the individual to the Institute of Ecology, UNAM; Rony E. Trujillo identified the specimen as an adult female of

Table 1.—Records of necrophagy by amblypygids around the world.

Species	Number	Location	Habitat	Behavior	Food	Source
Phrynus longipes (Pocock1893) [identified by Peck as *Tarantula fuscimana*]	2	Puerto Rico (Aguas Buenas Cave)	Cave	Feeding on dead bats	Unidentified bats	Peck 1974
Phrynus longipes (Pocock 1893)	1	Dominican Republic	Cave	Feeding on hanging carcass	Unidentified bat	Armas & Abreu-Collado 1999
Paraphrynus robustus (Franganillo 1930)	3	Cuba	Cave	Lifting carcasses	*Phyllonycteris poeyi* (Gundlach 1860)	García-Rivera *et al*. 2009
Heterophrynus longicornis (Butler 1873)	1	Brazil (Amazon region)	Cave	Lifting carcass	Unidentified bat	Prous *et al*. 2017
Paraphrynus raptator (Pocock, 1902)	1	Mexico (Yucatan Peninsula)	Mayan temple chamber	Lifting and hiding carcass	*Otonyctomys hatti* (Anthony 1932)	This work
Paraphrynus raptator (Pocock, 1902)	-	Mexico (Yucatan Peninsula)	Mayan temple chamber	Lifting and hiding carcass (infered)	*Nyctiphrynus yucatanicus* (Hartert 1892)	This work

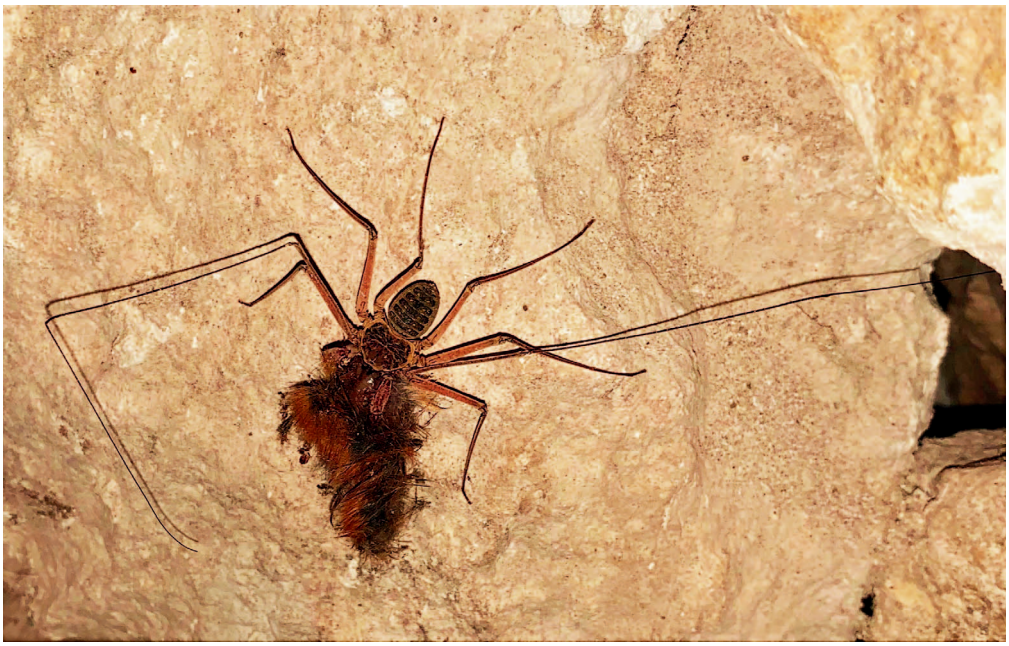

Figure 1.—*Paraphrynus raptator* feeding on *Otonyctomys hatti* remains. Photograph: Fernando Gual-Suárez. Low resolution (72 dpi) due to the opportunistic nature of the observation; shot with iPhone XR 4mm, 1/48s, f/1.8, ISO-25, handheld, auto-flash.

Paraphrynus raptator (Pocock, 1902). *Paraphrynus raptator* is a moderately large species (20–30 mm total length) distributed in the U.S. (Florida), Mexico, Guatemala (Petén), and Belize. This species is a troglophile, is synanthropic and is adapted to a wide variety of habitats, mainly in tropical humid to very humid forests, between 100 and 1500 m.a.s.l. (Armas 2006; Armas et al. 2018).

Necrophagy is a poorly documented phenomenon in amblypygids and appears to be an opportunistic behavior: under suitable conditions, individuals of some species can become facultative scavengers. Carrion is a high-quality, donor-controlled resource which depends on factors such as prey availability, hunting events and subsequent prey consumption behavior (Wilson & Wolkovich 2011). In this particular case, carrion availability for individuals of *P. raptator* depends completely on the predatory activity and prey consumption behavior of the *C. auritus* group with which they coexist. We hypothesize that *P. raptator* maintains a commensal relationship with *C. auritus*, in which the latter provides a high-quality resource on a regular basis. It is not known how frequently these individuals of *P. raptator* feed on carrion, but based on the knowledge that *C. auritus* takes food to their roost throughout the year (Medellín 1988), we suggest that carrion represents an important supplementary food resource for these amblypygids.

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