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Predation on the gecko *Phyllodactylus gerrhopygus* (Wiegmann) (Squamata: Gekkonidae) by the six-eyed sand spider *Sicarius thomisoides* (Walckenaer) (Araneae: Sicariidae)

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Depredación sobre el geco *Phyllodactylus gerrhopygus* (Wiegmann) (Squamata: Gekkonidae) por la araña de arena de seis ojos *Sicarius thomisoides* (Walckenaer) (Araneae: Sicariidae)

RESUMEN. Durante el atardecer del 9 de Enero de 2020, una hembra adulta de *Sicarius thomisoides* fue hallada bajo una roca consumiendo un geco de la especie *Phyllodactylus gerrhopygus*. La observación se realizó en Mamiña, provincia del Tamarugal, en el norte de Chile. Este hallazgo constituye el primer caso documentado en el que un sicárido depreda sobre un vertebrado. Específicamente, este evento corresponde a un caso particular de depredación intragremio, ya que ambas especies son insectívoras y comparten microhábitats similares en el norte de Chile.

PALABRAS CLAVE. Desierto. Microhabitat. Veneno.

ABSTRACT. During the evening of January 9th, 2020, an adult female of *Sicarius thomisoides* was found under a rock feeding on a gecko *Phyllodactylus gerrhopygus*. The observation was made at Mamiña, Tamarugal province in northern Chile. This find is the first documented case of a sicariid preying on a vertebrate. Specifically, this event corresponds to a particular case of intraguild predation, since these species are insectivorous and use similar microhabitats in northern Chile.

KEYWORDS. Desert. Microhabitat. Venom.

All spider species in the family Sicariidae are generally considered potentially harmful to humans (Dos-Santos & Cardoso, 1992; Binford et al., 2009) and by extension are likely dangerous to most small vertebrates. In America, the family consists of two genera, *Loxosceles* Heineken & Lowe and *Sicarius* Keyserling. Both have potent necrotizing venoms that contain the dermonecrotic agent sphingomyelinase D (SMase D) (Binford & Wells, 2003). Bites in the Neotropical region have been attributed to *Loxosceles*, and thus far, there is no specific evidence that envenomation by new world *Sicarius* kills vertebrates. However, the *Sicarius* venom is particularly potent, with powerful hemolytic and necrotic effect as toxicology studies have demonstrated (Binford & Wells, 2003; Binford et al., 2009; Magalhães et al., 2013). In the absence of direct evidence of vertebrate predation by sicariids, Zobel-Thropp et al. (2012) attributed the dermonecrotic effects of SMase D on humans as "an accidental evolutionary by product," due to the fact that the primary function of this enzyme is purely to help with invertebrate prey immobilization.

Sicarius species are commonly called six-eyed sand spiders or "arañas blancas de la arena" in reference to

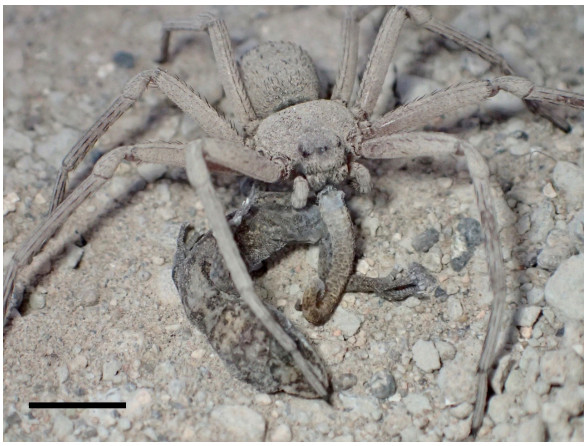

Fig. 1. Female of *Sicarius thomisoides* preying on *Phyllodactylus gerrhopygus* in Mamiña, northern Chile. Photograph: William H. Piel. Scale: 10 mm.

their habits of covering up and burying themselves with fine particles of sand. This genus includes 21 species found in the xeric environments of South and Central America, mostly in deserts and seasonally dry tropical forests (Binford et al., 2009; Magalhães et al., 2013, 2017; WSC, 2020).

Sicarius thomisoides (Walckenaer) is a large spider in relation to other species of the same genus in Chile, measuring between 12 and 20 mm in body length. It inhabits mainly desert and arid areas in northern and central Chile and is active at night. It generally builds shelters under rocks over a sandy substrate, and is extremely common in urban areas with a lot of household waste in northern regions of the country (Magalhaes et al., 2017; Taucare-Ríos et al., 2017). The information on the natural prey of *Sicarius* is limited. In the field, these spiders have been observed eating small insects, scorpions, and other spiders, but thus far no consumption of vertebrates has ever been reported (Reiskind, 1966, 1969; Levi, 1968; Magalhães et al., 2013, 2017).

The gecko *Phyllodactylus gerrhopygus* (Wiegmann) is small in size and widely distributed in northern Chile and southern Peru, which includes records within the Coastal Desert, and locations up to 2,750 m altitude (Donoso-Barros, 1966;Pérez & Balta, 2011). This reptile has nocturnal habits, staying hidden under rocks during daylight hours. It has a general diet, but feeds mainly on insects (Dixon & Huey, 1970; Pérez & Balta, 2011). Spiders and geckos occupy similar microhabitats in these desert environments. It is common to find them both under large rocks during the day.

The objective of this contribution is to record a case of predation by *S. thomisoides* on *P. gerrhopygus*. The observations were made outside the town of Mamiña, province of Tamarugal, Tarapaca region. We followed Magalhães et al. (2017) for spider identification, and Capetillo et al. (1992) for the gecko. The collected gecko

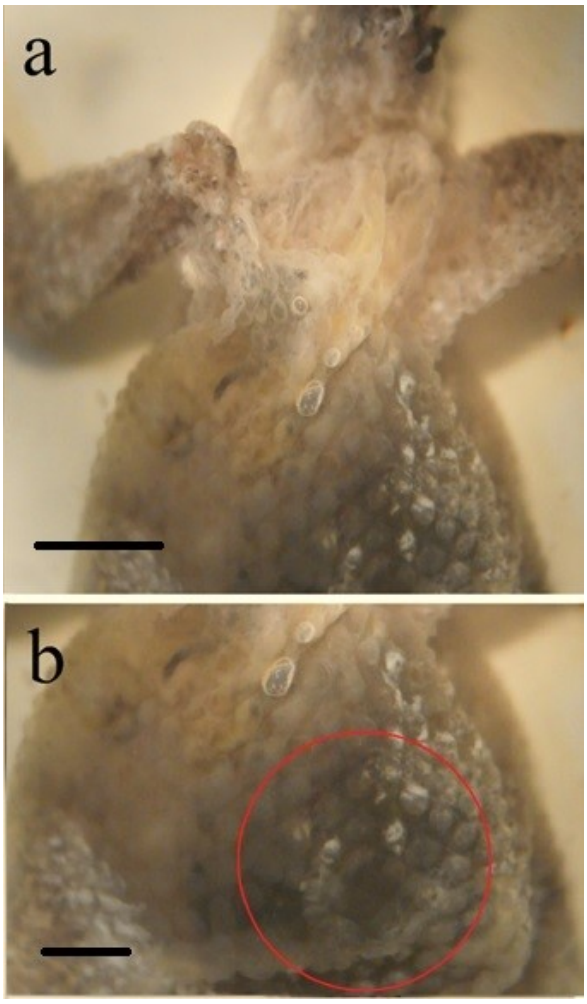

Fig. 2. Spider bite to the gecko. a. Possible dermonecrotic effects of *Sicarius thomisoides* venom on gecko tissue. b. Enlarged view of the bite area. Photograph: Andrés Taucare-Ríos. Scales: a. 5 mm; b. 1 mm.

(see below) was deposited in the herpetological collection of the National Museum of Natural History, Santiago, Chile (Curator: Jhoann Canto).

In the evening of January 9th, 2020 (7:30 pm) an adult female of *S. thomisoides* was found under a rock biting and feeding on a *P. gerrhopygus* individual on the lower part of its abdomen, near the base of the tail (Fig. 1). The spider measured approximately 20 mm, whereas the gecko measured 28 mm in body length. The gecko was already dead when the observation was made and it is unknown how long it had been diseased. The spider was immobile, already feeding on the fluids from the partially digested body of *P. gerrhopygus*. When captured in a dry vial, the spider refused to release the prey, only eventually abandoning the prey after returning it to its habitus to be photographed and then recapturing it.

The area damaged by the bite shows dark tissue, possibly due to the dermonecrotic effects of the venom (Fig. 2). In this regard, Binford et al. (2009) have already

Spiders	Geckos	Country	Source
Trichopelma sp.	*Lepidoblepharis xanthostigma*	Colombia	Quintero-Ángel & Carr (2010)
Nephila clavipes	*Gonatodes albogularis*	Costa Rica	Filipiak & Lewis (2012)
Ctenidae	*Hemidactylus mabouia*	Brazil	Lanschi & Ferreira (2012)
Lycosidae	*Hemidactylus mabouia*	Brazil	Koski et al. (2013)
Ctenidae	*Chatogekko amazonicus*	Brazil	Hernández-Ruz et al. (2014)
Parabatinga brevipes	*Coleodactylus meridionalis*	Brazil	Almeida et al. (2015)
Nephilengys cruentata	*Hemidactylus mabouia*	Brazil	Diniz (2011)
Sicarius thomisoides	*Phyllodactylus gerrhopygus*	Chile	This study

Table I. Studies showing similar predatory interaction between spiders and geckos in the Neotropical region.

identified enzymes with hemolytic and dermonecrotic activity in *Sicarius*, quite similar to those present in *Loxosceles*.

This finding is interesting from an ecological point of view. These spiders are territorial in the occupation of rocks, eating arthropods that interact with them, including other conspecifics (Taucare-Ríos et al., 2017). Both spider and gecko likely compete for space and food. The nocturnal activity and the insectivorous diet of both species, together with the low availability of thermally optimal rocks (Pérez & Balta, 2011; Magalhães et al., 2017; Taucare-Ríos et al., 2017), would likely cause these two species to compete over suitable shelters. In this sense, intraguild predation is considered an extreme case of interference competition between predators. By eating a guild member, an individual not only directly gains nutrients, but also reduces potential competition, especially in desert ecosystems (Polis & McCormick, 1987; Polis & Holt, 1992).

Sicarius thomisoides usually preys on a large number of epigeal insects that inhabit desert environments (Reiskind, 1966, 1969; Magalhães et al., 2017). Based on available information, *S. thomisoides* is not considered to be a scavenger, so it is likely that the gecko was captured and killed by the spider. The present finding represents the first predation record on a vertebrate by any sicariid. This observation suggests that its bite could be adapted to affect vertebrates, including mammals, which may be why it is especially dangerous to humans. This observation offers an alternative hypothesis to the assertion that the potent effect of sphingomyelinase D on vertebrates is purely "an accidental evolutionary by product" (Zobel-Thropp et al., 2012).

Other authors have documented similar predatory interaction between spiders and geckos in the Neotropical region (Table I), but this is the first in Chile and the first with *Sicarius*. The record presented here increases the number of preys attributed to *S. thomisoides,* and provides new information about its role in an arid ecosystem where it serves as a dominant predator in this environment. Other observations of this interaction will tell if they occur regularly or if this finding was just occasional.

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