

A small homage to Maria Sibylla Merian, and new records of spiders (Araneae: Theraphosidae) preying on birds

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ABSTRACT: Spiders have a great potential to prey on small vertebrates. However, detailed events are sparse in the literature. In the current work, two detailed records of Tarantula predation in the Brazilian Amazon are documented. Preying begins by bird's eyes, which eases the inoculation and spread of the digestive enzymes. Maria Sibylla Merian described the predation of a bird by a Tarantula in a scientific illustration, though her descriptions were labeled as fanciful. The current work makes a small homage to this 17th Century naturalist that challenged the prejudice of her time with her artistic and scientific production.

KEY-WORDS: Bird predated, Tarantula

Reports involving the predation of vertebrates by invertebrates have been known for a long time in the scientific literature. Spiders are the main predators, while crustaceans, centipedes and insects have also been recorded as predators of small vertebrates (Teixeira *et al.* 1991). In the case of birds and spiders, predation has been a strong link between the two groups: spiders are eaten in great quantity by insectivore birds (Sick 1997, Gunnarsson 2007) and, less frequently, birds become a part of the diet of some species of spider (Teixeira *et al.* 1991, Peloso & Souza 2007). Humingbirds, such as *Phaetornis petrei* (Lesson & Delattre, 1839), *Phaetornis ruber* (Linnaeus, 1758) and *Cloristibon* sp., and even some passerine birds such as *Sporophila caerulescens* (Vieillot, 1823), *Poliophtila plumbea* (Gmelin, 1788) and *Todirostrum cinereum* (Linnaeus, 1766) have been captured by the effective webs woven by spiders of the genus *Nephila*. However, in most cases the spider does not attack and actually recoils until the bird can free itself (Teixeira *et al.* 1991, Duca & Modesto 2007, Peloso & Sousa 2007), because the web is a low selection trap that ends up trapping undesired prey (Ludy 2007).

It is also important to notice that in some cases the birds inspect the webs in search for food or material for nest construction, and occasionally get stuck (Waide & Hailman 1977). There are few reports that confirm the predation of birds by *Nephila* spiders (Peloso & Sousa 2007), though some of these vertebrates may perish

later due to web stuck on their bodies (Duca & Modesto 2007).

Most cases involving spiders preying on birds are from spiders of the family Theraphosidae (Gallon 2000), commonly known as “caranguejeiras” in Brazil, babbon spiders in South Africa and tarantulas in North America. Although these reports have been present in the scientific literature for centuries, the descriptions are problematic, since they lack reliable examples and do not detail the predation event (Bates 1864). This theme has sparked a peculiar case in the academic world, led by Maria Sibylla Merian, a Frankfurt-born naturalist in 1647. Merian was a scientific illustrator and drew more than a hundred species of animals and plants, contributing significantly to the area of systematics, especially insects (Etheridge 2010). Between the years 1699 and 1701, Merian went on an expedition to Surinam, then a Dutch colony. In the year 1705 she published her best known work *Metamorphosis Insectorum Surinamesium* and, among 60 plates, she recorded the moment in which a tarantula consumed a hummingbird (Figure 1). That record in particular was fiercely criticized by scientists, including Langsdorf, whom in 1812 returned from an expedition to the Brazilian Amazon. Langsdorf argued that it was unlikely that a spider with nocturnal habits would attack a diurnal bird and criticized Merian's records as fanciful and nothing more than “childhood fear” reproductions from the author (Smith 2000).



FIGURE 1. Detail from plate 18 of the book *Metamorphosis Insectorum Surinamensium, in qua Erucae ac Vermes Surinamenses, cum omnibus suis transformationibus* by Maria Sibylla Merian (Amsterdam 1705).

Here we describe two records of theraphosid spiders preying on birds in the Brazilian Amazon, thus making our small homage to Maria Sybilla Merian. This is the first detailed description of this kind of predation.

The first event occurred at 08:00 h of 13 August 2009 during a bird sampling in one of the areas of the *Projeto Dinâmica Biológica de Fragmentos Florestais* (PDBFF) (2°23'16.84"S; 59°54'7.83"W) located 70 km from Manaus, Amazonas state, Brazil. The second event occurred in the Sumaúma State Park (3°2'5.79"S; 59°58'55.25"W), in the city of Manaus, Amazonas state, Brazil.

In the first event a bird from the specie *Gymnopithys rufigula* (Boddaert, 1783) was stuck in a mist net, used to catch birds in ornithological studies. The bird was at about 30 cm from the ground and was preyed upon by a *Theraphosa blondi* (Latreille, 1804) (Figure 2). The spider pierced the eye of the bird with its fangs, which caused the death of the bird in a few seconds. Afterwards, with no human interference, the spider cut the net and took the bird to the entrance of its burrow, located at 1.5 m from the net. At 11:30 h, the bird had its head and a small portion of its body digested. The species *G. rufigula* has around 13.5 cm and mass between 26–32 g, lives in the understory of white-water floodplain and “terra firme”

forests of the Amazon rainforest, and it is a mandatory follower of army ants, feeding on the arthropods and insects that are scared away by the ants (Sick 1997).

The second event occurred in the morning of 15 April 2011. Around 10:00 h, an individual of *Troglodytes musculus* Naumann, 1823 was preyed upon by an *Avicularia avicularia variegata* (Fukushima, 2011) tarantula, inside a plant nursery of 10 x 6 m (Figure 3). As in the previous record, this species of spider introduced its fangs into the bird's eye and, after the action of the digestive enzymes, proceeded to feed on the head of the bird. At 15:00 h, about half the prey was digested. *Troglodytes musculus* has around 12 cm and body mass between 9.7–11.8 g, lives in several types of forest and is a common sight around houses and gardens while feeding on insects (Sick 1997).

Both events were carried out by Theraphosidae spiders, which include 940 species. The species of spiders recorded in this study were identified with the help of researchers from the University of São Paulo and the Butantan Institute. In tropical forests, species of these tarantulas build their burrows in rocky soils, natural cavities and even in the canopy (Gallon 2000, Yáñez & Floater 2000). *Caranguejeiras* are the largest spiders of



FIGURE 2. *Gymnophithys rufigula* being preyed upon by a *Theraphosa blondii* in one of the areas of the Biological Dynamics of Forest Fragments Project, Amazonas state, Brazil.



FIGURE 3. *Troglodytes musculus* preyed upon by *Avicularia avicularia variegatus* in Sumaúma State Park, Amazonas, Brazil.

the New World, usually solitary, territorial and generalist predators (Edwards & Hibbard 1999, Gallon 2000). They have two large fangs that inject the venom stored in the chelicerae (Gallon 2000). It is noteworthy that, although these spider species are nocturnal foragers (Gallon 2000), our records are from the morning period. Thus, although the peak activity of these tarantulas is during the night, their diurnal foraging activities should not be underestimated.

It is known that spiders have a substantial ecological impact on the populations of other invertebrates (Nyffeler 2000). However, there are no known studies that cover this effect over vertebrate populations. We emphasize that both events described were opportunistic, but environments occupied by these spiders are also inhabited by a wide range of bird species that build their nests and look for shelter in cavities in the forest ground (Sick 1997). Because in many localities the density of some of these theraphosid spiders is high (Shaw *et al.* 2011), this type of predation may have an impact over the bird population, especially the ones that live close to the forest ground.

An interesting and novel fact of the current study is that the predation events started by the eye of preyed bird. Eyes have softer tissues that may ease the venom injection and the spread of digestive enzymes, as it is a highly vascularized area (Curtis 1975). Furthermore, the first area to be digested would be the brain. Birds have large and well developed brains in comparison to the rest of their bodies, varying between 2–9% of the whole body mass, and are lipid-rich tissues (Curtis 1975). It is a highly nutritious organ, which justifies it being consumed first than other body parts. Moreover, with the attack starting with the eyes the prey dies quickly.

Documenting aspects of the natural history of organisms is paramount for the understanding of the ecological and evolutionary biology of the studied species. It is important that future studies cover the ecological impact of spiders preying on bird species as potential prey.

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