

## Sociable widow spiders? Evidence of subsociality in *Latrodectus Walckenaer, 1805* (Araneae, Theridiidae)

Rogério Bertani · Caroline Sayuri Fukushima ·  
Rosana Martins

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**Abstract** A first case of subsociality is reported for the genus *Latrodectus*. Individuals were found sharing the same web and feeding together. In captivity they showed mutual tolerance and communal feeding. This finding is remarkable for two reasons. First, widow spiders, even compared with other spiders, are famously aggressive and cannibalistic so that social behavior in the genus was unexpected. Second, the genus nests outside the “*Anelosimus* + lost colulus” clade where all the other social theridiids are found.

**Keywords** Brazil · *Latrodectus* cf. *curacaviensis* · Neotropics · Social behavior

### Introduction

Subsociality consists of extended maternal care, mutual tolerance, and cooperation between individuals within a colony (Agnarsson et al. 2006). This behavior is rare in spiders and it has been proposed by many authors that it is a necessary step towards sociality (Avilés 1997; Agnarsson et al. 2006). Despite being phylogenetically scattered in spiders (Coddington and Agnarsson 2006), subsociality is concentrated in the family Theridiidae, occurring in species

of four genera: *Achaearanea* Strand, *Anelosimus* Simon, *Theridion* Walckenaer, and *Helvibis* Keyserling (Agnarsson 2002; Coddington and Agnarsson 2006). Recent cladistic analysis suggests that this behavior evolved independently in each of these genera, all belonging to the “lost colulus + *Anelosimus* clade” (Agnarsson 2004). Discovery of additional subsocial species inside this clade was also predicted (Agnarsson 2006; Avilés et al. 2006; Coddington and Agnarsson 2006).

Herein we report a remarkable case of subsociality outside the “lost colulus” clade in a Brazilian *Latrodectus* species, a genus otherwise better known for potent venom (Ushkaryov et al. 2004), aggressiveness, and frequent cannibalism (Buskirk et al. 1984; Forster 1992; Andrade 1996).

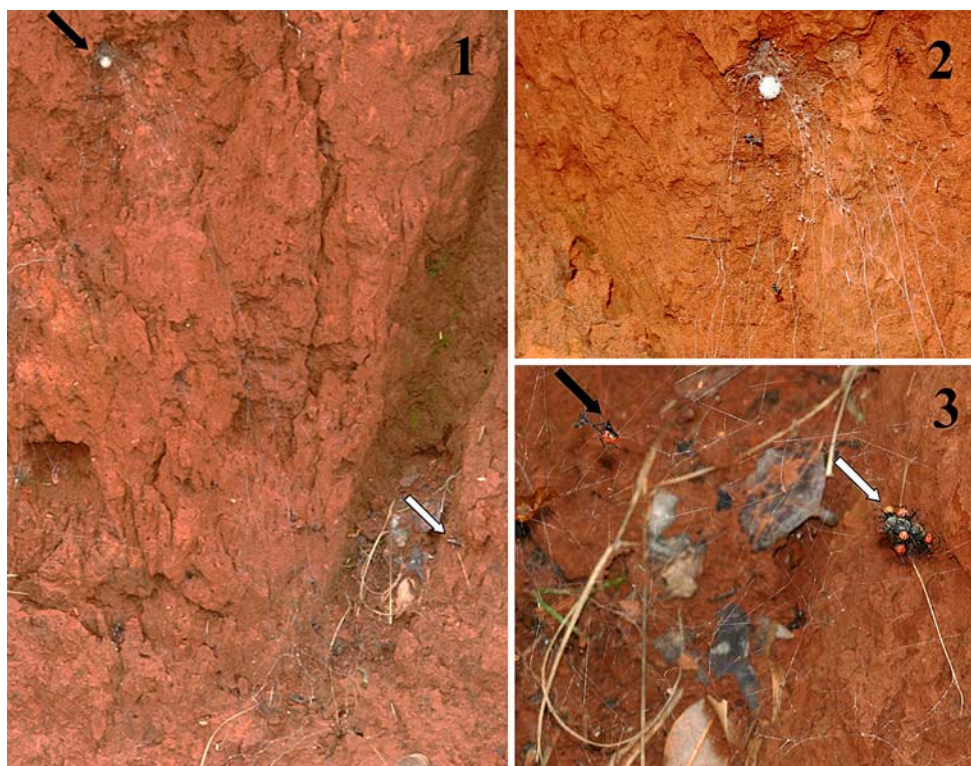
### Materials and methods

The present taxonomic knowledge of Brazilian *Latrodectus* does not allow a secure species identification (Garb et al. 2004). Some authors consider the Brazilian species (except *L. geometricus*) near to *L. curacaviensis* (Bücherl 1968), whereas recent works consider the species only as *Latrodectus* sp. (Garb et al. 2004). Thus, we preferred to refer to this species as *Latrodectus* cf. *curacaviensis* until the taxonomy of the group is clarified.

The specimens of *Latrodectus* cf. *curacaviensis* studied were found on 17 January 2005 in a single web of  $1 \times 0.3 \times 0.2$  (height/width/depth) meters, having roughly twenty individuals, on a road bank in the vicinity of Serra do Cipó National Park, Minas Gerais, Brazil ( $19^{\circ}20'162''S$ ,  $43^{\circ}37'666''W$ ), 857 m above sea level, local temperature  $26.9^{\circ}C$ , relative humidity 90%. The spiders were photographed, collected, and kept by three months in a

R. Bertani (✉) · C. S. Fukushima · R. Martins  
Instituto Butantan, Av. Vital Brazil, 1500,  
05503-900 São Paulo, SP, Brazil  
e-mail: rbert@butantan.gov.br

C. S. Fukushima  
Departamento de Zoologia, Instituto de Biociências,  
Universidade de São Paulo, Rua do Matão, Travessa 14, 321,  
05422-970 São Paulo, SP, Brazil



**Figs. 1–3** **Fig. 1.** Colony general view. *Black arrow* indicates empty egg sac. *White arrow* indicates prey being eaten by several male and female immatures. **Fig. 2.** Initial stages shedding skins around the egg

sac. **Fig. 3.** Web detail. *Black arrow* indicates the largest female in the colony. *White arrow* indicates a beetle surrounded by many immature individuals (Photo: R. Bertani)

laboratory in a 26.5 × 28.0 (diameter/height) centimeters glass jar with sticks inside.

There they were offered adult *Tenebrio molitor* beetles in alternate weeks and their behavior in captivity was observed.

## Results

### Field observations

An old egg sac with several small shedding skins was noted in the left upper web corner (Figs. 1, 2). In the right center margin an adult beetle was being communally eaten by seven spiders (Figs. 3, 4). Among these were some subadult males. In another part of the web was another prey being wrapped by a subadult male and a small female (Fig. 5). A wrapped ant was observed in one side of web. There were several *Ischnothele annulata* Tullgren (Araneae, Dipluridae) webs around the *Latrodectus* colony, but no other aggregation of this species was observed on the same road bank and in its proximities. There was a female in the colony which seems to be the mother, since she was much bigger than the other individuals of the colony (Figs. 3, 6).



**Fig. 4** Several immatures eating a beetle. *White arrow* indicates a penultimate male, note the enlarged palps (Photo: R. Bertani)

### Captivity observations

Adult beetles were offered as food to the spiders. After touching the sticky “gumfoot” line of the web, they were attacked by the only adult female, which wrapped them. The other individuals near were them attracted by the vibrations of the web and began to feed on the beetle. No



**Figs. 5, 6** **Fig. 5.** Two immature individuals capturing a prey. *Above* a juvenile female. *Below* a penultimate male. **Fig. 6.** Detail of the colony's largest female (Photo: R. Bertani)

aggression by the individuals was seen. The behavior was repeated again after the introduction of additional beetles. After maturing to adulthood males and females continued to co-occupy the web eating together in the same way. The prey was eaten in the place of capture.

## Discussion

Theridiids behavior is very diverse—it ranges from solitary to species with many individuals cooperating in a giant web (Agnarsson 2004). Most of the known social spider species belong to this family (Avilés 1997). All the other social theridiids occur inside the *Anelosimus* plus “lost colulus clade” on the most recent cladograms (Agnarsson 2004, 2006; Arnedo et al. 2001). Here, however, we document social behavior in a genus outside this node. This finding is remarkable for that reason, and as widow spiders are famously aggressive and cannibalistic even compared with other spiders (Buskirk et al. 1984; Forster 1992; Andrade 1996). Nevertheless, the species presents some characteristics considered as prerequisites to the development of social behavior—retention of juvenile peer tolerance (Agnarsson 2002) and three-dimensional webs (Kraft 1979; Agnarsson 2002). Maternal care, considered one of the precursors of social behavior (Agnarsson 2002), has not previously been described for this species, but we believe that *Latrodectus* cf. *curacaviensis* presents this behavior to some extent.

The subsocial *Latrodectus* colony probably contained individuals from the same clutch. Peer tolerance among juvenile spiders is very widespread phylogenetically (Agnarsson 2002) and was also recorded in *Latrodectus*—on the web analyzed we noted many immature females and males (with palpal tarsus expanded, indicating that they need only one molt to become adults). An adult female was also present.

Subsociality has evolved independently several times in spiders. Here we document yet another probable

independent origin in theridiid spiders. Given that sociality is concentrated in theridiid spiders this is perhaps not a particularly surprising find, however it is remarkable as it is in a clade outside of the clade where other social theridiids occur (“*Anelosimus* + lost colulus”), and because in widow spiders, in general, cannibalism seems particularly common.

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