

Occurrence of cannibalism in *Mastigoproctus pelegri* Armas, 2000 (Thelyphonida: Thelyphonidae)

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Abstract: Herein we record for the first time the occurrence of cannibalism in the Cuban endemic whipscorpion *Mastigoproctus pelegri* Armas, 2000. We observed one actual case plus evidence of at least another 14, all inside a single cave in the Guanahacabibes peninsula, at the western end of Cuba. Some of these cases apparently involve intersexual cannibalism, as the killed specimens were adult males (including the first one mentioned above), but the other remains belong to adult females and juveniles.

Key words: Thelyphonida, Thelyphonidae, *Mastigoproctus*, ecology, cannibalism, Cuba.

Ocurrencia de canibalismo en *Mastigoproctus pelegri* Armas, 2000 (Thelyphonida: Thelyphonidae).

Resumen: Se registra por primera vez la ocurrencia de canibalismo en el vinagrillo endémico cubano *Mastigoproctus pelegri* Armas, 2000. Se observó un caso y evidencias de otros 14, todos en el interior de una caverna situada en la Península de Guanahacabibes, en el extremo occidental de Cuba. Algunos de estos casos parecen implicar canibalismo intersexual pues los individuos muertos son machos adultos (incluido el primero mencionado arriba), pero los otros restos corresponden a hembras adultas y juveniles.

Palabras clave: Thelyphonida, Thelyphonidae, *Mastigoproctus*, ecología, canibalismo, Cuba.

The Cuban whipscorpion *Mastigoproctus pelegri* Armas, 2000 is endemic from the western region, in the provinces of Pinar del Río, Artemisa, and Isla de Pinos (Armas, 2000, 2013), but there is also an unpublished record from Mayabeque province that requires confirmation (L. F. de Armas, pers. comm.). First recorded by Franganillo (1930a–b) twice erroneously under the names *Mastigoproctus giganteus* (Lucas, 1835) and *Mastigoproctus liochirus* Pocock, 1900, it is the single representative of the order known so far from this part of the archipelago.

Some information has been published on its ecology (Moreno, 1930; Armas, 2000, 2013), including one case recorded as necrophagy by Armas & García Rivera (2009); it was observed at Cueva La Barca, a cave situated in extreme western Pinar del Río province.

The present authors visited this same cave on December 20th, 2013. It is located in the extensive karstic limestone plain of Guanahacabibes peninsula (Sandino municipality), in the coordinates 21°50'34.8"N - 84°45'58.2"W, less than 1 km inland from the seashore and roughly 20 km east of the westernmost tip of the peninsula (fig. 1). It is a humid, medium-sized, winding cave, which has two superimposed levels interconnected by a collapsed section of the upper floor. This level is cold and has a muddy clay soil, but the lower level is hot due to a dense community of bats and the ground is covered by guano.

In the one of the dark chambers of the upper level, we turned a small rock and found an adult female *M. pelegri* eating a just-killed adult male, which was still bleeding haemolymph from its injuries; we took color photos *ad hoc* and collected both specimens. They are about the same size and at that moment the female had partially dismembered the male: its right legs III–IV were almost detached from the body, the abdomen was completely severed and its anterior part was being chewed, especially ventrally (fig. 2). Beside we also noted a second, larger abdomen and parts of legs corresponding to an adult female about the same size as the killer, which had evident signs of having been eaten long before and in the same way as the male. This second finding suggests that the female had been living for some time under the same rock, and that cannibalism was a behavior usual to her.

After collecting the specimens, we resume sampling and immediately started to find more and more whipscorpion carcass remains up to a count of 13, all in the same chamber. All had exactly the same appearance of those recovered with the first female, i.e., dismembered specimens with the abdomen much more damaged on its ventral side. Also, all were located under small flat rocks directly lying on the muddy clay soil, inside the typical scrapes and short burrows constructed by *M. pelegri* as shelter, and usually accompanied by or near a live juvenile or adult female. A few of those carcass remains were recent as evidenced by their clean and perfectly preserved cuticle (fig. 3), but others showed different degrees of aging and even some were old, entirely covered by mud and largely decomposed. Based on the perfect match to the actual case we observed, all those cases are here regarded too as events of cannibalism.

We noticed a curious pattern in common to all carcass remains: the abdomen was invariably detached from the prosoma and had its dorsal side essentially intact (only the 1–2 most anterior tergites were damaged), but the ventral side was severely chewed along midline down to sternites VI–VIII. It clearly represents a fixed behavior and we deduce it is a fast-killing strategy: it effectively disconnects the main ganglions and all appendages from their haemolymph and oxygen supply, as the heart chambers and book lungs are located ventrally in the abdomen. This strategy could have evolved in this species specifically for predation upon other arachnids, even conspecifics.

On the other hand, even though *M. pelegri* lives along the entire cave, we found all carcass remains exclusively in one of the upper cold chambers. This is the poorest in invertebrate life, and thus, this scarcity of potential prey could have represented the critical factor that triggered the cannibalistic behavior in this predator, as already observed in other species by Haupt (2000). Cannibalism has already been recorded in whipscorpions by Eisner *et al.* (1961) and Weygoldt (1970); Schmidt (2003) studied *M. giganteus* in detail and defined that cannibalism is quite unusual in nature, but becomes a common response to unsatisfactory laboratory rearing conditions such as insufficient food supply. It must be taken into account that captive behavior simply mirrors that normally developed in the

natural environment, thus, it is expected that the same conditions lead to similar reactions.

The total of 15 carcass remains found by us in the cave belonged to four adult males, two adult females, and nine juveniles of instars III–V. The adult female eating an adult male represents a case of intersexual cannibalism, but we cannot define whether this was post-mating (a fairly well known behavior in essentially all arachnid orders) or not. At least Weygoldt (1970) observed that unreceptive females of *M. giganteus* attack males that attempt mating.

And last, the supposed necrophagy event recorded by Armas & García Rivera (2009) from this same cave is actually yet another case of cannibalism. Thanks to the kind permission of these authors, we were able to study the original photographs on which that paper was based and found the same perfect match to our personal observations: an adult female eating an adult male (the well-developed secondary sexual dimorphism on pedipalps and abdomen leaves no doubt about the sex and maturity instar of both specimens) and exactly in the same way, i.e., abdomen detached from the body and eaten first, mostly through the middle axis of its ventral side. The interested reader can easily note the shocking similitude between the figure 1 of Armas & García Rivera (2009) and our figure 2 of the present paper.

Armas & García Rivera (2009) elaborated four main arguments to discard cannibalism and justify necrophagy in their case, literally: **1)** the legs and pedipalps of the carcass were rigid and bent inwards; **2)** the abdomen of the carcass was detached and a few centimeters away from the rest of the body that was being eaten, which is not supposed to happen in a recently dead specimen; **3)** both specimens were similarly sized, which turns an aggression unlikely; **4)** the population density of whipscorpion in this cave is low, because less than 10 individuals were observed in repeated previous samplings.

In fact, none of these conclusions by itself nor their sum discards cannibalism. Arguments # 1–3 match exactly the conditions of the actual case we witnessed, and # 4 is inaccurate: we have collected *M. pelegriini* in many localities across its entire distribution range and can assert that 10 individuals is actually one of the highest numbers ever found in a single sampling, what further concurs with the collection data available in the literature (Armas, 2000: 4–5).

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Fig. 1: Cuba (top) and close-up of the Guanahacabibes peninsula (bottom), showing location of Cueva La Barca cave.

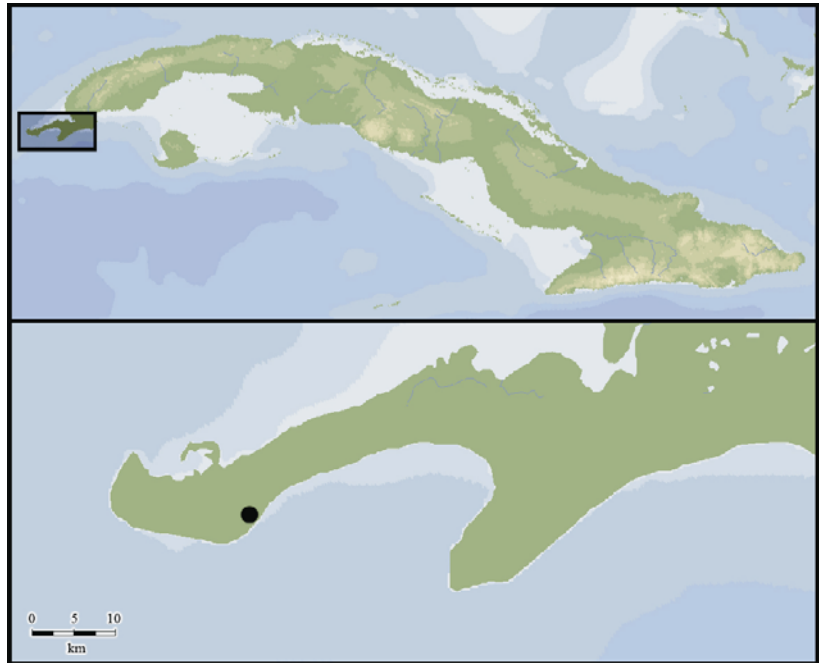


Fig. 2: Described case of intersexual cannibalism in *Mastigoproctus pelegrii*. The arrow points out the second abdomen remains of a female, presumably eaten long before; note the characteristic extensive damage all over its ventral side (sternites).



Fig. 3: Additional carcass remains of an adult female *Mastigoproctus pelegrii*, presumably also cannibalized. It was found less than 10 m away from the previous cases.

