



Notes on the Diagnosis of the Species of the Genus *Prisopus* Le Peletier & Audinet-Serville, 1828 (Phasmida: Prisopidae: Prisopini) Present in Costa Rica

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Abstract

The genus *Prisopus* previously only recorded three species for Costa Rica: *P. ariadne*, *P. bioley* and *P. berosus*. This article reports two more species for Costa Rica: *P. horstokkii* and *P. ohrtmanni*, previously only recorded in South America. An identification key and several important aspects of the diagnosis of the species are also provided.

Keywords: Identification Key; Lichen Camouflage; Stick Insects

Introduction

The genus *Prisopus* Le Peletier & Audinet-Serville, 1828 is a rather interesting group due to its great specialization to simulate lichens with its camouflage, which not only involves the simulation of chromatic patterns, but its entire body has projections, warts and structures dedicated to this purpose [1].

This genus is present mainly in America, with a distribution ranging from southern Mexico to Brazil, the species *P. apteros* Camousseight, 2010 reported for the Talca area in Chile [2] and there are still no reports of this genus for Argentina and Uruguay [1,2].

In 2020, a new genus within Prisopodini called *Prisopoides* Heleodoro [3] was described, which included four new species and the relocation of the species *Prisopus villosipes*; however, it was quickly synonymized with *Prisopus* [1,3,4]. In Costa Rica only five species are reported: *P. ariadne* Hebard, 1923, *P. berosus* Westwood, 1859, *P. bioleyi* Carl, 1913, *P. hortokki* Haan, 1842 and *P. ohrtmanni* (Lichtenstein, 1802).

Due to their habits of inhabiting the forest canopy and the little study that is given to them in the country, a sufficiently exhaustive sampling effort has not been made to rule out the presence of other species, but even so, the collection of the National Museum of Costa Rica (MNCR) has well-preserved specimens from different parts of the territory, which were used to generate the present rapid study on the most important diagnostic characters of the national species.

Methodology

Review

The species of the genus *Prisopus* are quite similar to each other, and in the first instance, the collection was found separated considering only the color and size of the specimens, so it was decided to review it based on the following diagnostic characters that are easy to recognize with the naked eye:

- Dark markings on the venation of the hind wings.
- Presence and shape of horns on the vertex.

- Presence of irregular warts on the tegmen.
- Dark ventral markings on the abdominal segments.

Reviewed Specimens

***Prisopus ariadne*:** MNCR-A 2350270, MNCR-A 1205506, MNCR-A 2212945, MNCR-A 4132104, MNCR-A 1205505, MNCR-A 252514, MNCR-A 410242, MNCR-A 1869886, MNCR-A 1255068, MNCR-A 445301, MNCR-A 875958, MNCR-A 1755921, MNCR-A 4298364, MNCR-A 1308375, MNCR-A 2168526, MNCR-A 1137337, MNCR-A 2547466.

***Prisopus berosus*:** MNCR-A 3353590, MNCR-A 4317565, MNCR-A 4317559, MNCR-A 825703, MNCR-A 4138179, MNCR-A 629672, MNCR-A 3076087, MNCR-A 427770, MNCR-A 1875492, MNCR-A 3353591, MNCR-A 3354991, MNCR-A 4225243, MNCR-A 3358472, MNCR-A 790036, MNCR-A 1817152, MNCR-A 1955264, MNCR-A 4317555, MNCR-A 4317566, MNCR-A 4317557, MNCR-A 734818, MNCR-A 2329579, MNCR-A 1723267, MNCR-A 150967, MNCR-A 2298906, MNCR-A 427733, MNCR-A 4317567, MNCR-A 2169451, MNCR-A 4163463, MNCR-A 1341900, MNCR-A 4317558, MNCR-A 1793125, MNCR-A 3959694, MNCR-A 1261379, MNCR-A 1984352, MNCR-A 4317561, MNCR-A 2236668, MNCR-A 2364600, MNCR-A 4317554, MNCR-A 4317560, MNCR-A 4317562, MNCR-A 138626, MNCR-A 94114, MNCR-A 1292177, MNCR-A 1363735, MNCR-A 1875277, MNCR-A 834018, MNCR-A 1930342, MNCR-A 4138176, MNCR-A 4138177, MNCR-A 3358756, MNCR-A 3718340, MNCR-A 3959692, MNCR-A 3328772, MNCR-A 3355303, MNCR-A 4157876, MNCR-A 4138175,

MNCR-A 4138178, MNCR-A 2039910, MNCR-A 4138174, MNCR-A 629673, MNCR-A 1255077, MNCR-A 1213201, MNCR-A 709165.

***Prisopus biolleyi*:** MNCR-A 767905, MNCR-A 623591, MNCR-A 627110, MNCR-A 4317595, MNCR-A 2476873, MNCR-A 1309562, MNCR-A 145007, MNCR-A 4317594, MNCR-A 1357839, MNCR-A 1636460, MNCR-A 2248526, MNCR-A 793863, MNCR-A 2113122, MNCR-A 43175993, MNCR-A 3739948, MNCR-A 445904, MNCR-A 1756274.

***Prisopus horstokki*:** MNCR-A 964994, MNCR-A 37089, MNCR-A.

***Prisopus ohrtmanni*:** MNCR-A 613287, MNCR-A 203404, MNCR-A 4181565.

Results

Abdominal markings were found to be the quickest and easiest way to separate species even in the field, as the markings are quite distinctive (Figure 1). Lateral projections were also found to be an important character to observe (Figure 2), but since in some cases they have a very similar shape, it is necessary to complement this feature with others to avoid confusion. However, other important features were also considered and an identification key was developed; in order to use it, specimens must be mounted with at least one pair of wings open.

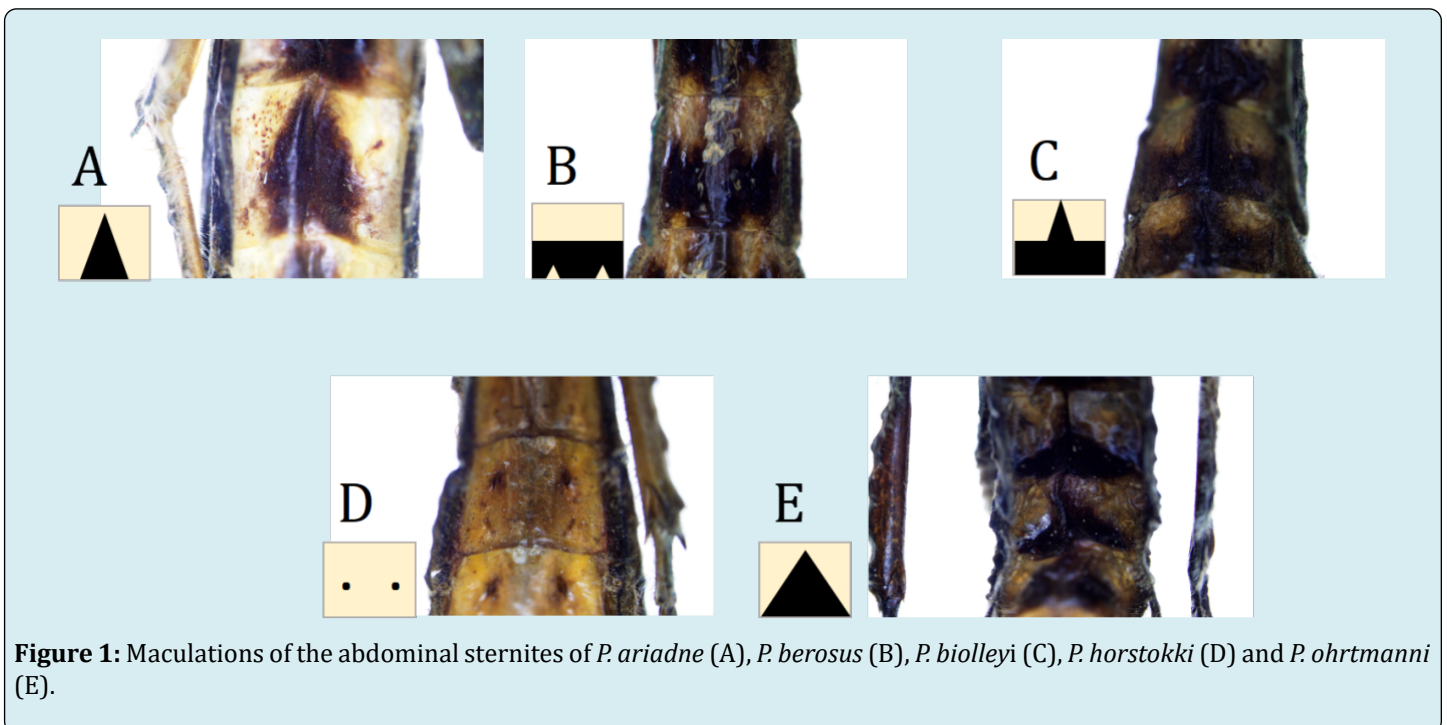


Figure 1: Maculations of the abdominal sternites of *P. ariadne* (A), *P. berosus* (B), *P. biolleyi* (C), *P. horstokki* (D) and *P. ohrtmanni* (E).

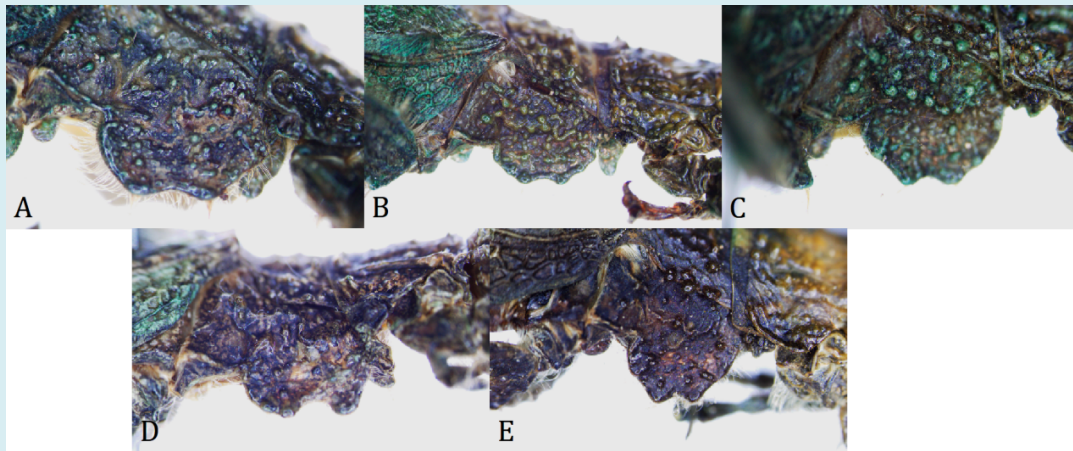


Figure 2: Lateral thoracic projection of *P. ariadne* (A), *P. berosus* (B), *P. biolleyi* (C), *P. horstokki* (D) and *P. ohrtmanni* (E). Photograph taken with the specimen's head positioned to the right.

Identification key for *Prisopus* from Costa Rica

- 1 Vertex with a pair of well-defined conical horns_____2
 1' Vertex without horns_____3
 2 Horns equal to or longer than eye diameter and hind wings one-third longer than wide_____ *P. biolleyi*
 2' Horns shorter than eye diameter and hind wings almost as long as wide_____ *P. ohrtmanni*
 3 Tegmen with well-defined irregular warts on proximal half and hind wings without black markings on venation_____ *P. ariadne*
 3' Tegmen without warts on proximal half and hind wings with black markings on venation_____4
 4 Hind wings almost twice as long as wide and ventral abdominal markings with in Figure 1D_____ *P. horstokki*

- 4' Hind wings less than one-third as long as wide and ventral abdominal spots as in Figure 1B_____ *P. berosus*

Prisopus ariadne (Hebard, 1923)

This is the only species that has small and irregular vesicles on the proximal third of the tegmen (Figure 3A). They can be seen as a slight relief on the intersections of the reticulated vein pattern. Another very important characteristic is that the hind wings do not have dark coloration on the veins, contrary to the rest of the species (Figure 3B). This species is restricted to the provinces of Guanacaste and Puntarenas, between 0 and 700 meters above sea level.



Figure 3: Irregular warts (A) and wings (B) of *P. ariadne*.

Prisopus berosus (Westwood, 1859)

=*Prisopus mexicanus* (Saussure, 1859)

It does not have horns or warts, but its body is more robust than the other species, generally with a reddish-

brown coloration throughout the body. Its wings, like *P. ohrtmanni*, are about two-thirds as wide as they are long, and are shorter compared to the other species (Figure 4). It is estimated that it is distributed throughout the country, from 100 to 1400 meters above sea level.



Figure 4: Wings of *P. berosus*.

***Prisopus biolleyi* (Carl, 1913)**

It is the only species that has two long, thin horns on the vertex (Figure 5A), which easily identifies it from the other species. Its wings have venation outlined in black and its

width corresponds to two thirds of its length (Figure 5B). It is present on the Pacific slope in the provinces of Guanacaste, Puntarenas and Cartago between 300 and 1550 meters above sea level.

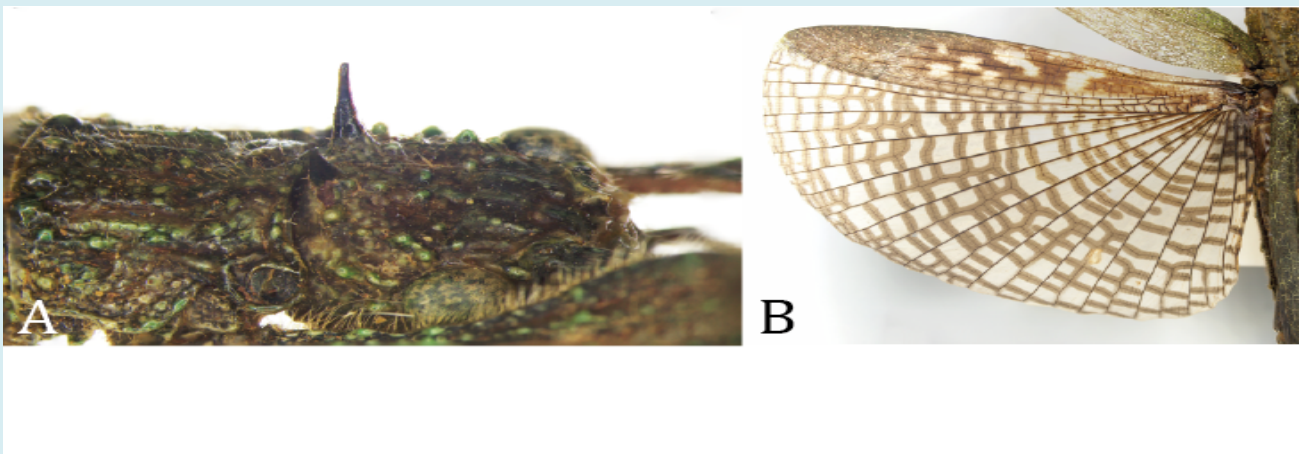


Figure 5: Horns (A) and wings (B) of *P. biolleyi*.

***Prisopus horstokki* (Haan, 1842)**

=*Prisopus fisheri* Gahan, 1912

This species has a very simple appearance without distinctive peculiar characters compared to the other species, even the outline of the venation of its wings is the

same as the other species (Figure 6), so to separate it quickly it is necessary to use the ventral maculations (Figure 1). This species is a little collected species, so far it has only been collected in the province of Punterenas, between 50 and 80 meters above sea level (masl).



Figure 6: Wings of *P. Horstokki*.

Prisopus ohrtmanni (Lichtenstein, 1802)

=*Prisopus cornutus* Gray, 1835

=*Prisopus spiniceps* Burmeister, 1838

=*Prisopus spinicollis* Burmeister, 1838

This species, like *P. biolley*, has two well-defined horns

on the vertex, but they are shorter and wider (Figure 7A). It has the shortest wings of the national species, with a width proportional to three-quarters of the length and a black outline on the venation that is denser than in the other species (Figure 7B). Its distribution is currently restricted to the province of Guanacaste between 1000 and 1600 masl.



Figure 7: Horns and wings of *P. ohrtmanni*.

Discussion

The Phasmida order has been very little studied in Costa Rica, and despite how striking the *Prisopus* species are, they are no exception. This is why the MNCR collection actually has few specimens, which, despite their good state of conservation, belong to a few sampling points restricted

to the Pacific slope.

Most of the specimens in this collection were collected by the former National Institute of Biodiversity (INBio), who, as part of their visionary project to inventory the biodiversity of Costa Rica, mainly used sampling methods such as malaise traps and snap nets, given that *Prisopus* are

strictly associated with the canopy zone, and considering that the national forests have canopies with altitudes exceeding 40m, it is very difficult to collect them in the forests of the Caribbean zone, but it is not ruled out that the genus may be present throughout the national territory, with the exception of highly urbanized areas.

Due to the above, the results presented should be considered preliminary and very early, since there is no sampling effort directed at this group and using specific sampling methods for the canopy area that is reflected in the collection. Another important aspect is that there is no record of the specimens that may have been deposited in private or foreign collections, so there is still a large information gap that represents a good potential for future research.

Conclusions

The genus *Prisopus* only records five species due to the little study it presents in the Costa Rican territory, but the presence of other species is not ruled out.

The ventral maculations of the abdominal segments are the easiest feature for a quick pre-identification in the field of the specimens, and not so much the lateral projections of the mesothorax, which although they are distinct and diagnostic require other features to make a correct identification.

For an accurate separation of the specimens the following characteristics are necessary: presence of horns, presence of warts on the wings, ventral maculations of the abdominal segments and characteristics of the membranous wings.

References

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