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Artículo Original

Characterization of urticating scoli of Hemileucinae caterpillars (Lepidoptera : Saturniidae) in Chiriquí, Panamá

Caracterización de Scolis urticantes de orugas Hemileucinae (Lepidoptera: Saturniidae) en Chiriquí, Panamá

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Abstract

Objective: To characterize the stinging *scoli* of Hemileucinae caterpillars (Lepidoptera: Saturniidae), from the province of Chiriquí, Panamá. **Methodology:** Eight species were selected: *Automeris io*, *A. metzli*, *A. pallidior*, *A. zozine*, *Dirphia avia*, *D. horcana*, *Leucanella hosmera* and *Periphoba hircia*; which were found in various agroecosystems of Chiriquí. The *habitus* of each species of caterpillar was illustrated and preserved specimens were reviewed in the laboratory to observe in detail morphological characters: height of the *scolus*, length of evaginations and presence of apical setae; with which a hierarchical cluster analysis with Euclidean distance was carried out to form 5 groups. **Results:** The four species of *Automeris* have erect *scoli*, but in *A. metzli* they are up to four times taller than the length of the evaginations; In both species of *Dirphia* the *scoli* are inclined backwards and with a distal projection in the evaginations like fine setae, sharing this last attribute with *L. hosmera*, with erect *scoli*; and in the case of *P. hircia*, the *scoli* have a short trunk and the evaginations are as long as or longer than its height. The hierarchical cluster analysis reflected that the first group is made up of *A. io*, *A. zozine* and *D. avia*; the second by *A. pallidior* and *D. horcana*; the third by *L. hosmera*; the fourth, by *P. hircia* and *A. metzli* remained as a comparison group. **Conclusion:** The morphological characteristics of the *scoli* serve to identify Hemileucinae genera, in complement with other characters.

Keywords: Characteristics, cluster analysis, genera, identification, morphologie.

Resumen

Objetivo: Caracterizar los *scoli* urticantes de orugas Hemileucinae (Lepidoptera: Saturniidae), de la provincia de Chiriquí, Panamá. **Metodología:** Se seleccionaron ocho especies: *Automeris io*, *A. metzli*, *A. pallidior*, *A. zozine*, *Dirphia avia*, *D. horcana*, *Leucanella hosmera* y *Periphoba hircia*; las cuales fueron encontradas en diversos agroecosistemas de Chiriquí. Se ilustró el hábito de cada especie de oruga y en el laboratorio se revisaron especímenes preservados para observar en detalle caracteres morfológicos: altura del *scolus*, longitud de evaginaciones y presencia de setas apicales; con lo cual se realizó un análisis de conglomerados jerárquico con distancia euclidiana para conformar 5 grupos. **Resultados:** Las cuatro especies de *Automeris* tienen *scoli* erectos, pero en *A. metzli* son hasta cuatro veces más altos que la longitud de las evaginaciones; en ambas especies de *Dirphia* los *scoli* están inclinados hacia atrás y con una proyección distal en las evaginaciones a modo de setas finas, compartiendo este último atributo con *L. hosmera*, de *scoli* erectos; y en el caso de *P. hircia*, los *scoli* son de tronco corto y las evaginaciones son tanto o más largas que la altura del mismo. El análisis de conglomerados jerárquico reflejó que, el primer grupo está constituido por *A. io*, *A. zozine* y *D. avia*; el segundo por *A. pallidior* y *D. horcana*; el tercero por *L. hosmera*; el cuarto por *P. hircia* y *A. metzli* quedó como grupo de comparación. **Conclusión:** Las características morfológicas de los *scoli* sirven para la identificación de géneros de Hemileucinae, en complemento con otros caracteres.

Palabras clave: Análisis de conglomerados, caracteres, géneros, identificación, morfología.

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Introduction

The subfamily Hemileucinae (Lepidoptera: Saturniidae), present in many neotropical countries like Panama, comprehends stinging caterpillars' species armed with *scoli* (*scolus* in singular) connected to venom glands, which when in contact with people can cause pain, burning, itching, allergic reactions and in extreme situations, death (Collantes et al., 2022; Santos-Murgas et al., 2022; Jerkovic et al., 2023).

The larval *scoli* of some Hemileucinae and Saturniinae were studied in more detail using scanning electron microscopy (SEM), resulting in the modification of the former *scoli* classification (two *scolus* types are united, a new one [blunt-bristly *scolus*] is proposed, and another one is subdivided); However, in the case of Hemileucinae caterpillars *Automeris hamata* Schaus, 1906 and *Molippa sabina* Walker, 1855, the *scaly* remains as tree-shaped urticating, but with some differences between the genera, which is of potential interest for the systematics and phylogeny of Saturniidae (Deml & Dettner, 2002).

In the case of the genus *Lonomia*, of greatest concern for human health, the average growth ratio, behavior and *scoli* distribution were similar among the species, but the *scoli* length and color patterns of the cephalic capsules, body and *scoli* differed (Toro-Vargas et al., 2023). For all the above, this study aimed to characterize the stinging *scoli* of Hemileucinae caterpillars present in the province of Chiriquí, Panama.

Methodology

The study was descriptive. Eight caterpillar species of Hemileucinae were selected: *Automeris io* Fabricius, 1775, *Automeris metzli*

Sallé, 1853, *Automeris pallidior* Draudt, 1929, *Automeris zozine* Druce, 1886, *Dirphia avia* (Stoll, 1780), *Dirphia horcana* Schaus, 1911, *Leucanella hosmera* (Schaus, 1941) and *Periphoba hircia* (Cramer, 1775); which were found in various agroecosystems of Chiriquí. The *habitus* of each species of caterpillar was illustrated and preserved specimens were reviewed in the laboratory to observe in detail morphological characters: *scolus* height (mm), evaginations length (mm) (measured using a microscale) and presence of apical setae; with which a hierarchical cluster analysis with Euclidean distance was carried out to form 5 groups, using an online app (DATAtab Team, 2024).

Results and discussion

According to the results (Table 1), the caterpillars of the four *Automeris* species have erect *scoli* (Figure 1), but in *A. metzli* they are up to four times taller than the length of the evaginations (Figure 1C-D); In both species of *Dirphia* (Figure 2A-D), the *scoli* are inclined backwards and with a distal projection in the evaginations like fine setae, sharing this last attribute with *Leucanella hosmera* (but this species has erect *scoli*) (Figure 2E-F); and in the case of *Periphoba hircia*, the *scoli* have a short trunk and the evaginations are as long as or longer than its height (Figure 2G-H).

The hierarchical cluster analysis reflected that the first group is made up of *Automeris io*, *Automeris zozine* and *Dirphia avia*; the second by *Automeris pallidior* and *Dirphia horcana*; the third by *Leucanella hosmera*; the fourth, by *Periphoba hircia* and *Automeris metzli* remained as a comparison group (Figure 3).

Table 1

Details of the scoli of Hemileucinae (Lepidoptera: Saturniidae) from Chiriquí

Species	Scolus orientation	Scolus height (mm)	Evagination length (mm)	Apical setae
<i>Automeris io</i>	erect	2.5	4.5	Absent
<i>Automeris metzli</i>	erect	3.5	12.0	Absent
<i>Automeris pallidior</i>	erect	1.5	2.0	Absent
<i>Automeris zozine</i>	erect	2.0	4.0	Absent
<i>Dirphia avia</i>	inclined	3.0	5.0	Present
<i>Dirphia horcana</i>	inclined	1.0	3.0	Present
<i>Leucanella hosmera</i>	rect	4.0	4.0	Present
<i>Periphoba hircia</i>	rect	3.0	3.0	Absent

Figure 1

Automeris caterpillars: *A. io* habitus (A) and scolus (B); *A. metzli* habitus (C) and scolus (D); *A. pallidior* habitus (E) and scolus (F); *A. zozine* habitus (G) and scolus (H).

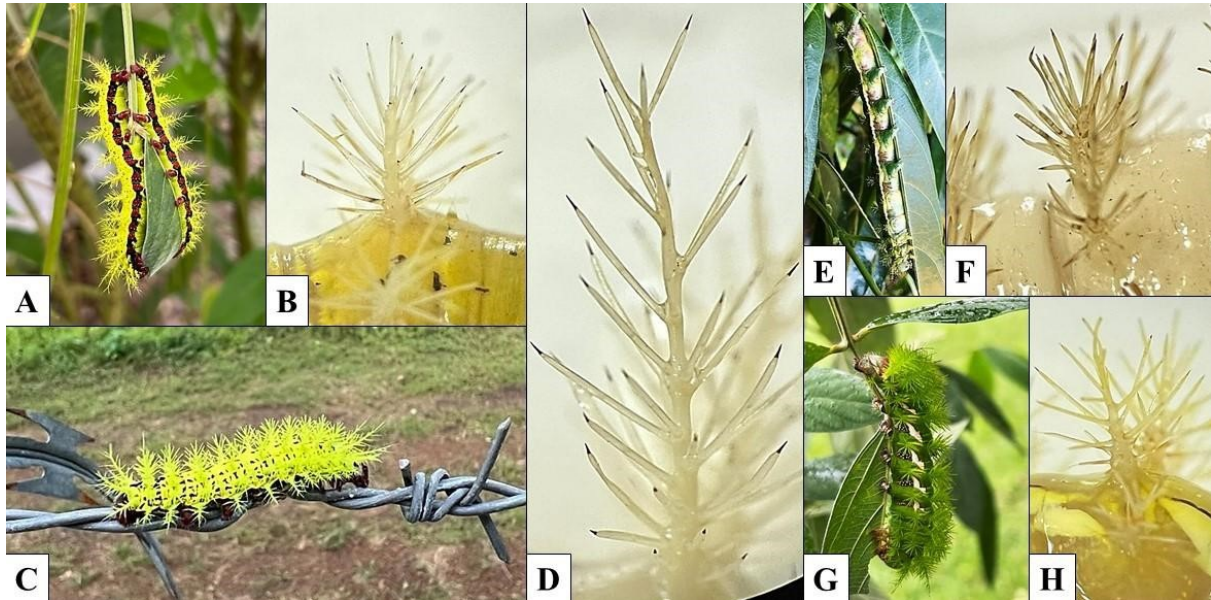
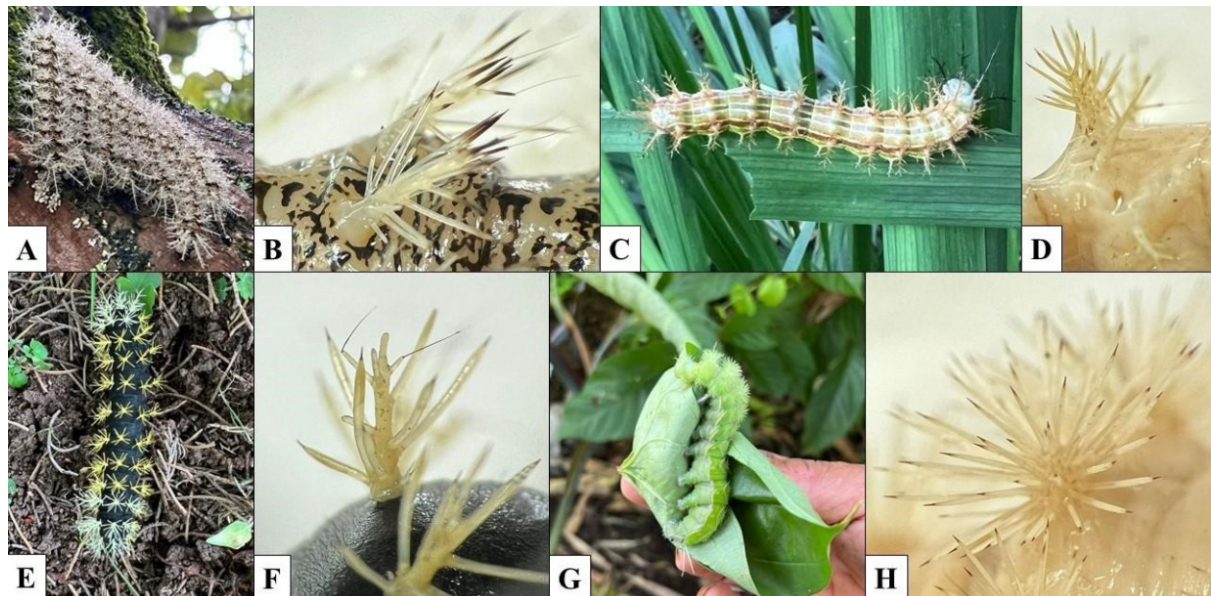


Figure 2.

Other *Hemileucinae* caterpillars: *D. avia* habitus (A) and scolus (B); *D. horcana* habitus (C) and scolus (D); *L. hosmera* habitus (E) and scolus (F); *P. hircia* habitus (G) and scolus (H).

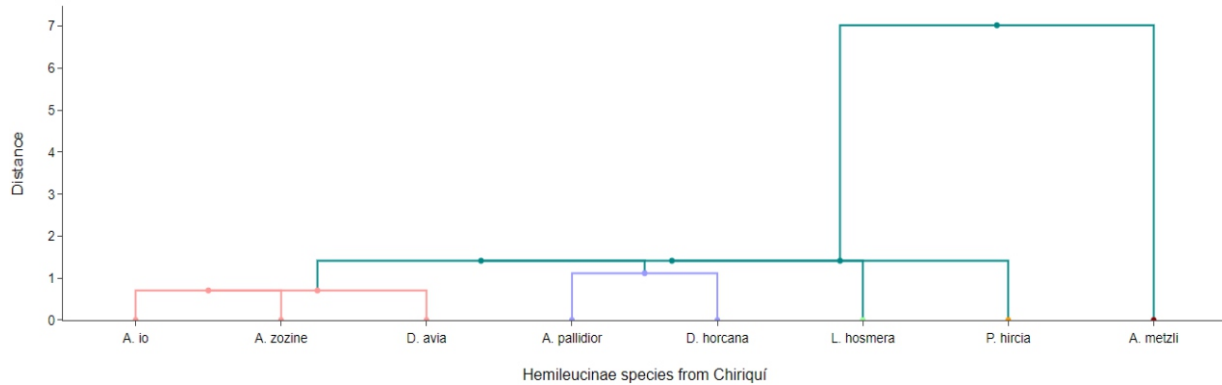


The inclination of the scoli observed in the species of the genus *Dirphia* is similar to that recorded in the genus *Lonomia* (Toro-Vargas et al., 2023); However, characters such as the coloration of the *scoli* can be lost depending on the time and preservation medium used, in addition to the fact that SEM images do not

provide coloration details (Deml & Dettner, 2002).

Figure 3

Tree diagram of the *scoli* analysis of Hemileucinae species from Chiriquí, using the online app by DATAtab Team (2024).



The above highlights the importance of illustrating the species' habits, given that in the natural environment, it is possible to appreciate their real colors. On the other hand, the presence of setae at the apex of the *scoli* did not prove to be a determining characteristic for separating genera, since they could be traces of molting or impurities (Deml & Dettner, 2002). The cluster analysis showed that all the Hemileucinae genera studied can be closely related to each other and the reason why *A. metzli* resulted as an outgroup due to the development of the *scoli*, which could be due to advanced larval stages in Saturniidae, because the first instars retain many primitive characteristics (Pease, 1960; Toro-Vargas et al., 2023).

Conclusion

The morphological characteristics of the *scoli* serve to identify Hemileucinae genera, in complement with other characters. However, it is necessary to continue developing similar research in the future that provides greater detail for the appropriate taxonomic classification based on this and other external morphological characters.

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