



Scientific Note

Report of erucism caused by *Automeris egeus* Cramer (Lepidoptera: Saturniidae) and a brief update on caterpillar envenomation in Brazil

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Abstract. We report a case of erucism provoked by the *Automeris egeus* Cramer caterpillar and update the distribution of caterpillar poisoning in Brazil, showing the regions with the highest incidence rates. We also correlated the incidence rate with anthropic impact rates in all Brazilian municipalities, taking as a reference the Human Footprint Index. The victim presented erucism, burning pain, itching, and local hyperthermia. The highest incidence rates were in southern Brazil. We suggest including *A. egeus* in the Brazilian list of animals with medical importance, and that Brazilian Ministry of Health indicates the genus of the animals involved in envenomation events on its platform.

Keywords. Accidental Injuries; Medical entomology; Poisoning.

Erucism is the term used to define envenomation by dermal contact with larval forms of Lepidoptera (or caterpillars). The first records of envenomation by caterpillars in Brazil date from the 1940s and 60s (CARDOSO & HADDAD JR 2005). About 150,000 species of living Lepidoptera have been described, in approximately 124 families (KRISTENSEN *et al.* 2007). Despite the large number of species that the order presents, only a few are considered of medical interest. Currently, the most expressive families in terms of medical importance in Brazil, including representatives endowed with arrows, bristles or tegumentary expansions, capable of presenting urticating properties, are Aididae, Megalopygidae, Limacodidae, Lasiocampidae, Saturniidae (CARDOSO & HADDAD JR 2005; SPECHT *et al.* 2005; SPECHT *et al.* 2008).

Saturniidae is known for its bristles similar to small pine trees, corresponding to three important genera: *Automeris* Hübner, *Dirphia* Hübner, and *Lonomia* Walker (CARDOSO & HADDAD JR 2005; SPECHT *et al.* 2008). Most accidents with caterpillars in Brazil reported in literature involve the genus *Lonomia*, due to severe hemorrhagic syndromes caused by contact with the bristles (CARDOSO & HADDAD JR 2005). Hence the only available serum in Brazil for accidents with caterpillars, produced only since 1996, is for treating accidents caused by *Lonomia* (DA SILVA *et al.* 1996).

Reactions to contact with other Saturnidae caterpillars such as *Dirphia* or *Automeris* (usually affecting children) can be also serious, but there are still few records (CARDOSO & HADDAD JR 2005). Symptoms of poisoning caused by these genera are usually dermatological and can be aggravated by the contact intensity, including burning pain that can radiate to

the affected limb, as well as edema and erythema (CARDOSO & HADDAD JR 2005; CARDOSO *et al.* 2009). *Automeris* species of medical importance in Brazil are *Automeris illustris* (Walker), and *Automeris naranja* Schaus (CARDOSO & HADDAD JR 2005; CARDOSO *et al.* 2009).

Here, we report an accident caused by the caterpillar *Automeris egeus* (Cramer) (Saturniidae, Hemileucinae) and describe its symptoms. Also, we mapped the incidence rate of envenomation by caterpillars in Brazil and verified whether incidence rates correlate to anthropic impacts.

The event occurred at 12:32 a.m. on January 11, 2019. During fieldwork at Fazenda Água Limpa, Brasília, DF, Brazil (15°55 S and 47°55 W ~1050m), an undergraduate student (27-year-old male, 1,73 m, 70 kg) accidentally touched the poisonous bristles of a *A. egeus* caterpillar hidden under leaves in a branch, with the back of his right hand. In the moment of contact, he immediately felt severe pain, followed by itching and the development of several local urticating dermatitis (Figure 1A, B and C). After about five minutes, irradiated pain began on his right arm (until the end of the forearm). He washed his hand with water, and in about 15 minutes the symptoms started to fade away, with good evolution and no evidence of systemic reactions, and after 20 minutes of the initial contact, the symptoms had completely disappeared. No medication was used during the event.

For mapping caterpillar envenomation in Brazil, we used a platform of the Brazilian Ministry of Health called Sistema de Nacional de Agravos e Notificação (SINAN) (SECRETARIA DE VIGILÂNCIA À SAÚDE 2020) to capture reports of caterpillar

envenomation in Brazil, searching the term "caterpillar". We considered the entire available period (2007 to 2019) and calculated the incidence rate on the total number of people injured, divided by the total population exposed in the same period, expressed per 100,000 inhabitants. To identify the regions with the highest incidence rates in the country, we performed a Kernel estimate using the Quantum Gis program (QGIS DEVELOPMENT TEAM 2014). Finally, to identify whether the municipalities with the highest incidence had high or low anthropic impact, we used the Human Footprint Index - HFI, an anthropic impact metric where 0 is no impact and 50 is completely impacted (VENTER et al. 2016). We calculated the median of HFI values in each municipality and did a correlation test with the incidence rates. All statistical analyzes were performed in R environment (R CORE TEAM 2019).

Between 2007 and 2019, 54,855 caterpillar accidents in Brazil were recorded, 29 evolving to death, and in 3,160 cases the result (cure or death) was ignored. The total incidence rate reported for the period was 2.21 per 100,000 inhabitants. The highest number of reported accidents is in Southern Brazil, and few found records in all Brazilian regions (Figure 1D). There is no correlation between anthropic impacts and incidence rate (Pearson's $r = -0.005$, $p = 0.72$), but, notably, the municipalities with the highest incidence show intermediate values of anthropic impacts, between eight and 15 (Figure 1E).

Automeris egeus envenomation is similar to that registered

for other species of the genus, presenting dermatological symptoms, such as urticating dermatitis, burning pain, itching, local and radiating pain (CARDOSO et al. 2009). For this reason and considering its wide presence in South America (KRISTENSEN et al. 2007), we suggest that *A. egeus* be considered in the Brazilian list of species of medical importance.

The total number of accidents caused by all caterpillars according to SINAN is eight times greater than the total number of accidents caused by *Lonomia* spp., found in practically the same period (54,855 in the present study and 6,636 in FAVALESSO et al. 2020). This discrepancy in values indicates a high number of accidents with caterpillars probably of different genus or species in Brazil. For this reason, we suggest that the SINAN form includes a flap to fill in the genus of the caterpillar that caused the accident. Currently, there is only the option "*Lonomia*" and "another caterpillar" on SINAN database (SECRETARIA DE VIGILÂNCIA À SAÚDE 2020). In view of the difficulty of accurately identifying the species that caused the accident, a caterpillar image bank available on SINAN may assist health professionals in their search. Also, we suggest SINAN makes the genus causing the accident available on its platform. Since species have distinct ecological characteristics, identifying species associated with epidemiological profiles is essential to developing specific and effective public policies.

The higher number of accidents in Southern Brazil, especially Santa Catarina and Rio Grande do Sul states, historically places this region as an important spot for caterpillar

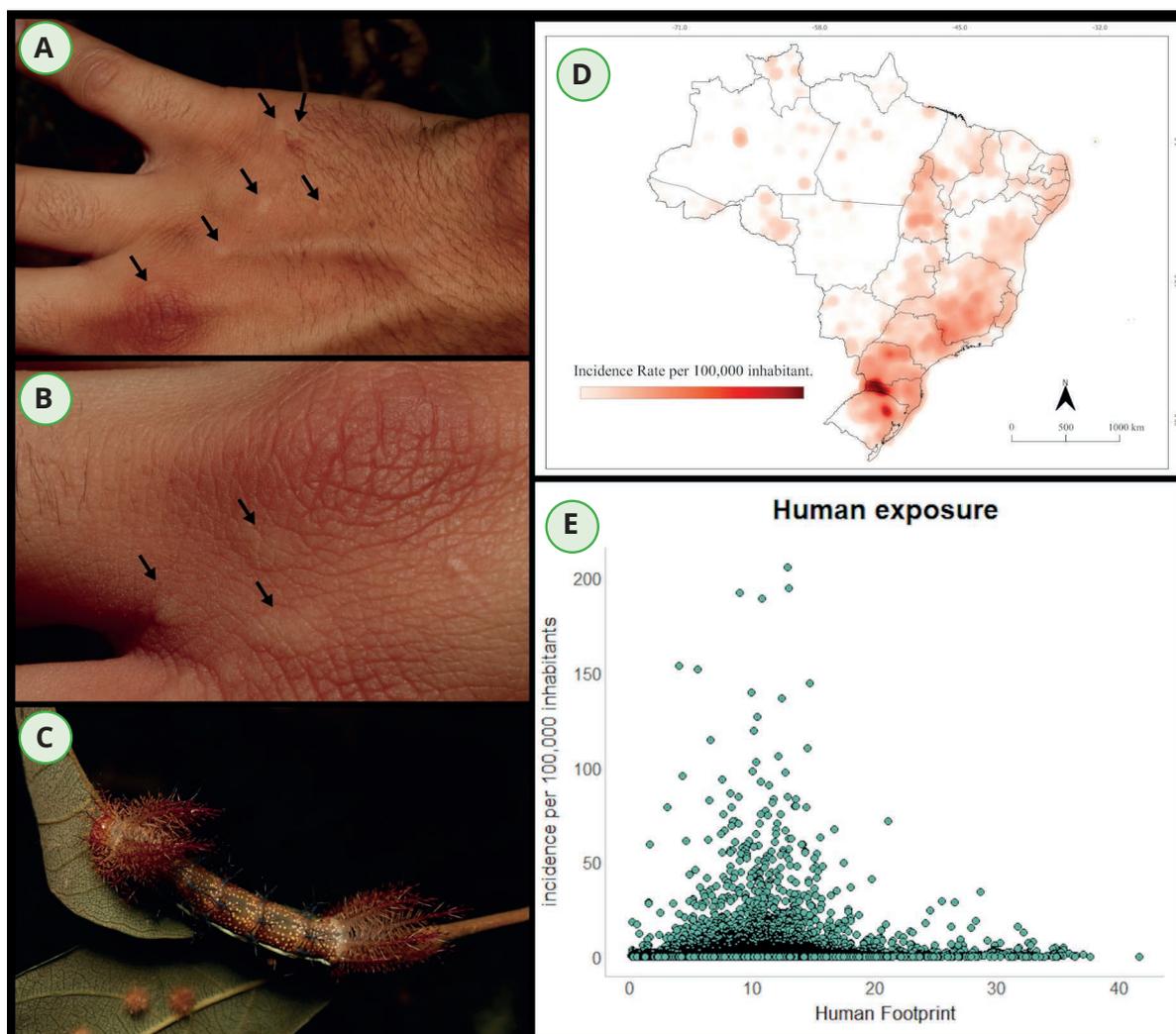


Figure 1. Erucism after contact with the specimen (A), detail of the blisters (B), and the *Automeris egeus* caterpillar that caused the accident (C), Kernel estimate for accidents reported by caterpillar poisoning in Brazil between 2007 and 2019, darker regions show higher incidence rates (D), Correlation between anthropic impacts and incidence rate, municipalities with the highest incidence show intermediate values of anthropic impacts (E). The author of the photos is ASO Meneses.

envenomation (CARDOSO & HADDAD JR 2005). Unlike that, other regions such as the Southeast, Midwest, and Northeast have also shown high rates of accidents with caterpillars in recent years: Minas Gerais (Southeast) and Tocantins (Midwest) have recently been identified as new *Lonomia* poisoning clusters (FAVALESSO *et al.* 2020). It is important to note that the combination of different caterpillar genus to compose a single epidemiological profile can make it difficult to identify the regions that suffer the most from certain species.

Although we did not find a correlation between incidence rates and levels of anthropic impact, municipalities with intermediate anthropic impact rates show higher incidence rates. This pattern may indicate that caterpillars tolerate a specific rate of urbanization, managing to survive it to a certain extent, including the factor of the extinction of natural caterpillar predators (VILLAS-BOAS *et al.* 2018). Also, these urbanized regions have more people than conserved regions, increasing the chances of contact with caterpillars. Moreover, the regions with moderate impacts (between eight and 15 HFP index), should be the target of public policies to minimize caterpillar accidents.

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