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Long time no see: New reports of
Legua rosea Amédégnato and Poulain, 1986
(Orthoptera: Caelifera: Romaleidae: Romaleinae: Leguini),
a rare arboreal grasshopper from Brazil

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Abstract. The genus *Legua* Walker, 1870 comprises only two known species from Central America and Brazil, with a notable scarcity of collected specimens. Herein, we provide a new contribution to our knowledge of the distribution of *Legua rosea* Amédégnato and Poulain, 1986 (Romaleinae: Leguini), that has a restricted distribution in Brazil, based on entomological collection data and social media information. Our records emphasize the importance of natural history collections and new tools for biodiversity studies.

Key words. Canopy grasshoppers, Cerrado, horn morphology, iNaturalist, Instagram.

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Introduction

The Leguini include some of the rarest grasshoppers from Central and South America, with only a few reports. This tribe comprises three South American genera (*Ampiacris* Amédégno and Poulain, 1986; *Legua* Walker, 1870; and *Proracris* Uvarov, 1940), of which only *Legua crenulata* (Stoll, 1813) (Fig. 1) extends into Central America

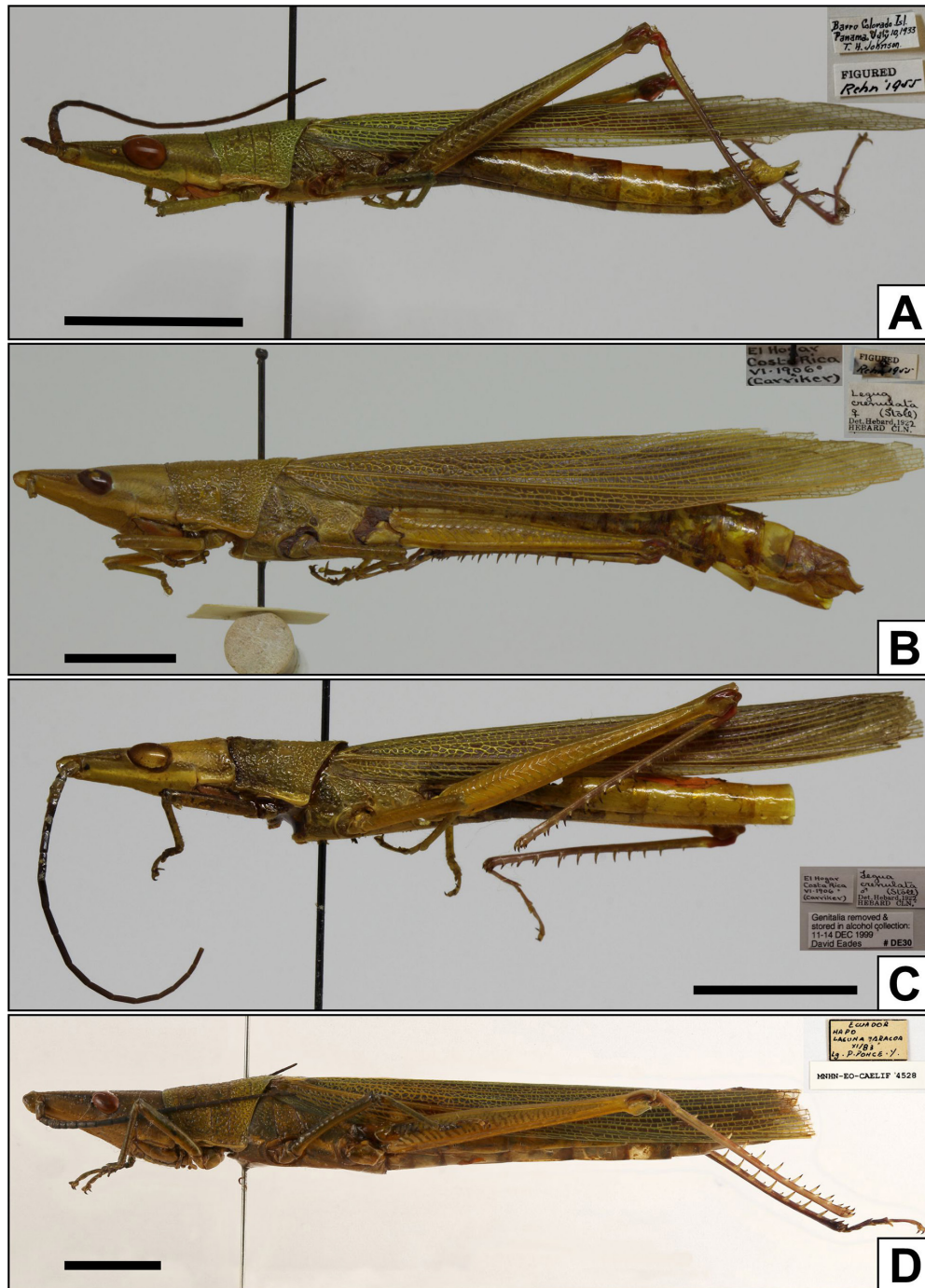


Figure 1. *Legua crenulata* (Stoll, 1813) specimens. A) Male, lateral view with labels from ANSP. B) Female, lateral view with labels from ANSP. C) Male dissected, lateral view with labels from ANSP. D) Female, lateral view with labels from MNHN. Scale bar = 1 cm.

(Rowell 2013; Cigliano et al. 2024). These Romaleinae are recognized by their elongated body; head equal to or longer than pronotum; elongate fastigium, equal to or exceeding the length of the head behind the eyes; small eyes; interocular space wider than the antennal scape, inserted near the tip of the fastigium; very specialized mouthparts, with the galea of the maxillae prolonged forward, reaching halfway to the clypeal suture; prosternal process moderately flattened at its apex and bilobed; narrow and closed mesosternal space; stridulatory apparatus present but not strongly developed; posterior femora rather slender, with smooth carinae; elongate second metatarsomere; triangular supra-anal plate; subgenital plate elongate, considerably longer than the supra-anal plate, laterally compressed; conical male cerci, slightly curved inward; unspecialized ovipositor valves (Amédégnato and Poulain 1986; Rowell 2013).

As most Leguini are forest dwelling and all genera are known to be arboreal, associated with canopy palm trees in wet forests (Rowell 2013), they are challenging to observe, study, and collect, contributing to the scarcity of knowledge on the tribe (Amédégnato and Poulain 1986; Rowell 2013). Not surprisingly, very few studies have been published regarding this tribe. Among them, we highlight the studies of Amédégnato and Poulain (1986) that provided a diagnosis for several arboreal species, and Cadena-Castañeda and Cardona-Granda (2015), which described the last species to be discovered: *Ampiacris rowelli* Cadena-Castañeda & Cardona, 2015.

The genus *Legua* Walker, 1870 has a generic denomination derived from the French town in Saintonge, “three leagues SE of Marennes” (Carbonell 2000). Among the Brazilian species, *Legua rosea* Amédégnato and Poulain, 1986 (Fig. 2–4) is easily recognized by the length of the subgenital plate, which is long, twice the length of the supraanal plate of the male (the female is unknown) (Amédégnato and Poulain 1986). Likewise, there is a tremendous scarcity of preserved specimens of *L. rosea*; only 23 specimens are reported in literature (males of the type series), and the geographical distribution of this species is poorly known, apparently restricted to three regions in Brazil: Rio Verde de Mato Grosso in Mato Grosso do Sul state, Rosário Oeste in Mato Grosso state and Maranhão state (without specific location) (Amédégnato and Poulain 1986) (Table 1).

In this report, a new record of *Legua rosea* Amédégnato and Poulain, 1986 based on a specimen from Goiás, Brazil is provided. Additionally, a second specimen, collected at Mato Grosso do Sul state, and the iNaturalist observations were included in this study, increasing the known distribution of the species to Brasília, Goiás, Minas Gerais, and São Paulo states. Specimen photos, a table with relevant information, and a distribution map are included.

Materials and Methods

Grasshopper sampling and study areas. Two specimens were collected in different localities and months of the year (Fig. 4, Table 1). The new report, a specimen from Goiás, was collected lying on a fern, in the backyard of the collector’s house (Guilherme Rabelo D’Angelis) on 23 January 2023. This specimen was collected manually in the Catalão municipality countryside, an agricultural area near a preservation Cerrado area (Fig. 3B). We recognized it from an Instagram posting by the Forest Entomology Laboratory of the Universidade Federal de Uberlândia. The specimen from Mato Grosso do Sul comes from the municipality of Coxim, in a region where the Cerrado domain is predominant. The specimen was collected in a high riparian forest with the remarkable presence of the babassu palm tree, on the edge of the Taquari River. The specimen was collected on 15 November 2015, during the hottest and most humid period in the region, when the vegetation is typically at its most profuse form (Fig. 3C). Both specimens were collected after an intense windstorm.

Specimens’ study and imaging. External morphological characteristics were analyzed using a Zeiss Stemi 2000 stereomicroscope and photographed with a Canon EOS T3i digital camera equipped with a macro lens EF 100mm f/2.8 L and MT24EX flash. The image plates were prepared in image editing software (CorelDraw). After being shipped by mail, the Goiás specimen arrived severely damaged (Fig. 4A). The specimens were identified using the related literature (Amédégnato and Poulain 1986) and compared with type specimens. Photos and information from iNaturalist were utilized, and the traits of living specimens were observed.

Specimens’ depository. We analyzed *L. rosea* specimens housed at the Universidade Federal de Viçosa (UFV), Rio Paranaíba, Minas Gerais, Brazil (Fig. 4A–C); the Zoological Collection of the Universidade Federal de Mato

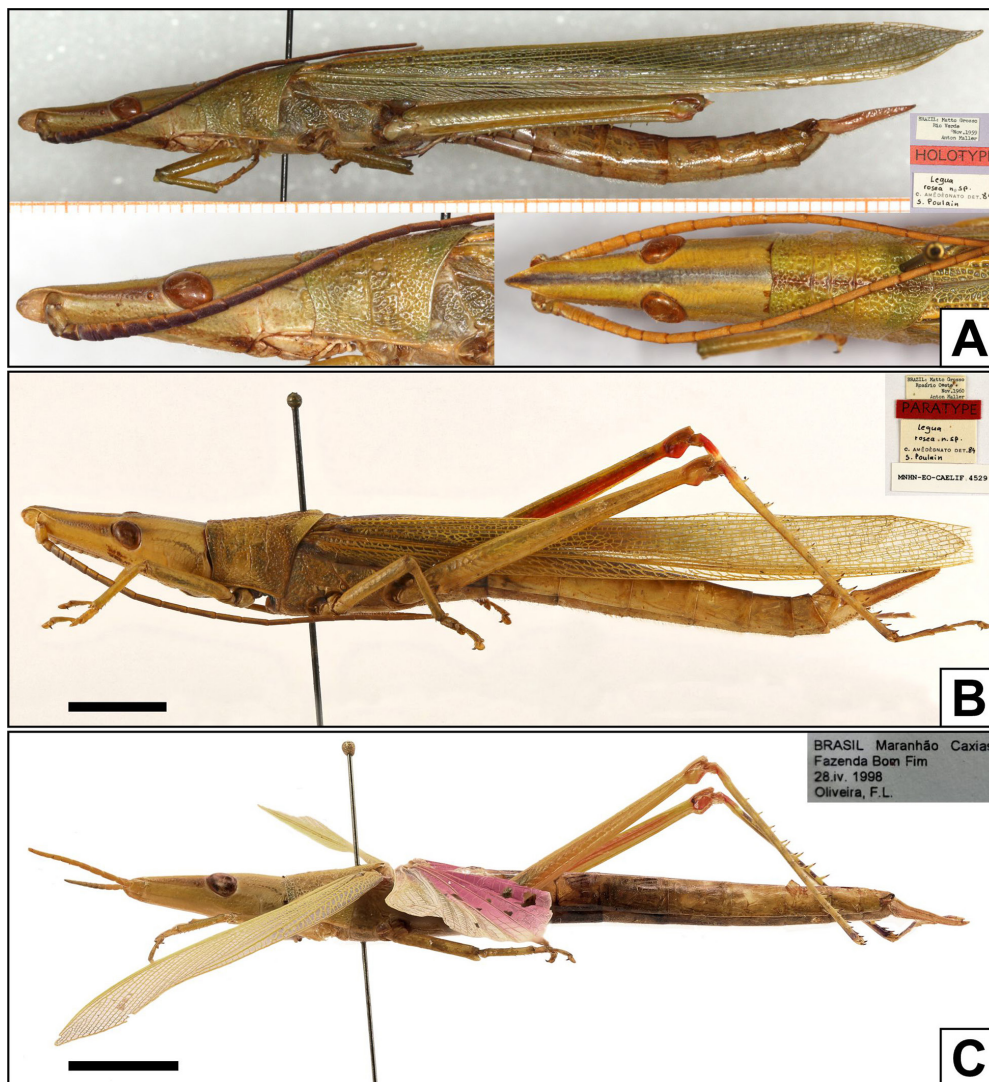


Figure 2. *Legua rosea* Amédégnato and Poulain, 1986 specimens. **A)** Male holotype, lateral view with lateral and dorsal head details (photos by Holger Braun from UMMZ). **B)** Male paratype, lateral view with labels (photo by Muséum national d'Histoire naturelle, Paris (France) MNHN-EO-CAELIF4529). **C)** Male, lateral view from INPA. Scale bar = 1 cm.

Grosso do Sul (ZUFMS), Campo Grande, Brazil (4D–E), and Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil (Fig. 2C). Photos of the holotype from the University of Michigan Museum of Zoology (UMMZ), Ann Arbor, Michigan, United States of America (Fig. 2A), and a male specimen from Muséum national d'Histoire naturelle (MNHN), Paris, France (Fig. 2B) were included in our study. We also examined *L. crenulata* specimens from the Academy of Natural Sciences of Drexel University (ANSP), Philadelphia, United States of America (Fig. 1A–C) and compared their photos with the specimen of the MNHN (Fig. 1D).

Measurements (in millimeters). Head (h), fastigium (f), pronotum (p), tegmen (t), hind femur (hf), hind tibia (ht), subgenital plate (sgp).

Distribution map. The distribution map of *L. rosea* (Fig. 3) was produced with all available distribution records from literature, specimen labels, and iNaturalist observations. Only the exact geographic coordinates were added to the map (red and black circles), the other known records were indicated by the different colors of the map. The program QGIS 3.34 was used to draw the map. CorelDraw was used to generate the final images.

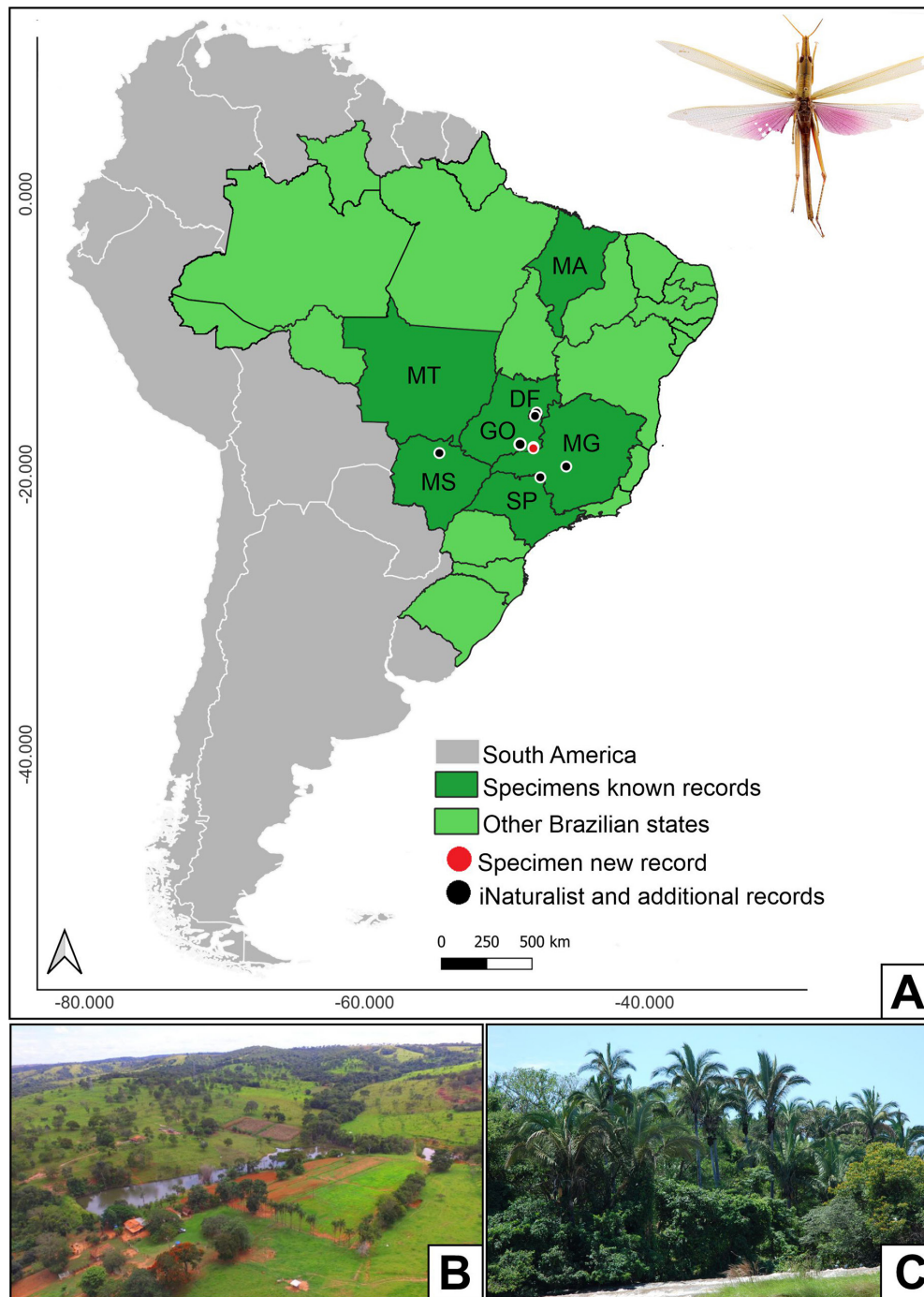


Figure 3. Distribution of *Legua rosea* Amédégnato and Poulain, 1986. **A)** Map of Brazil indicating the new specimen record (red circle), and iNaturalist and additional records (black circles), and a dorsal view of the Maranhão specimen. **B)** Area where the specimen from Goiás, Catalão municipality countryside was collected (photo by Guilherme Rabelo D'Angelis). **C)** Area where the specimen from Coxim, Mato Grosso do Sul was collected (photo by Urielton Martins Monteiro).

Results

Legua rosea Amédégnato and Poulain, 1986 (Fig. 2–4)

Correction on the type locality. The holotype of *L. rosea* has on its locality label the following information: “Brazil: Matto Grosso, Rio Verde. Nov.1959. Anton Maller” (Fig. 2A). However, the correct name of this municipality is “Rio Verde de Mato Grosso” and is located in the north region of the Mato Grosso do Sul state. The problem with this locality is recurrent mainly in works that use specimens collected in this place before 1977 when the division of the Mato Grosso state took place. This can be seen, for example, in Monné et al. (2023), where three species of Cerambycidae had their type localities corrected.

Examined material. BRAZIL. Goiás (**new record**): Catalão (18°04′10.6″S 47°55′59.7″W), 23.I.2023, D’Angelis G.R. col. 1 ♂ pinned (DSM 108) (Fig. 4A–C). Additional material: Mato Grosso do Sul: Coxim, Pesqueiro Cachoeira das Palmeiras II, near to the Taquari River (18°21′44.85″S 54°36′52.85″W), 06–07.XI.2015, Olivier, R.S. & Monteiro, U.M. col. 1 ♂ pinned (ZUFMS ORT02264) (Fig. 4D–E); Maranhão, Caxias, Fazenda Bom Fim, 28.IV.1998, Oliveira, F.L. col. 1 ♂ pinned (Fig. 2C).

Descriptive notes based on the examined specimens. Body generally yellow-green; head and pronotum with a well-marked median longitudinal stripe; the lower edge of the lateral lobes of the pronotum forming an acute angle at the front, entirely bordered by a narrow whitish stripe; wings colored at the base in purplish pink; length of the male subgenital plate, which is long, twice the length of the supraanal plate (Amédégnato and Poulain 1986) (Fig. 2, 4). This species is easily distinguished from *L. crenulata* (Fig. 1) by the head and pronotum without highlighted median longitudinal stripe; wings salmon pink or orange; male subgenital plate flattened laterally and prolonged into an upward curving point (Amédégnato and Poulain 1986; Rowell 2013). Whereas *L. rosea* is only known from Brazil, there are records for *L. crenulata* from Costa Rica, western Panama (Fig. 1A), and Ecuador (Fig. 1D). In our study, the iNaturalist records (Table 1) allowed us to verify details of the morphology and coloration of a living female, since there are neither female reports from literature, nor museum material. However, we were unable to confirm some details of the female morphology from the images.

Measurements (mm). Type series (5 specimens). h: 15–16.5; f: ?; p: 9–10; t: 58–61; hf: 25–26.5; ht: ?; sgp: ? (in Amédégnato and Poulain 1986).

New record: Catalão, Goiás (1 specimen). h:15.7; f: 9.5; p: 11.1; t: 60; hf: 26.9; ht: 21.1; sgp: damaged.

Additional material: Coxim, Mato Grosso do Sul (1 specimen). h:15.8; f: 7.7; p: 10.4; t:61.8; hf: 26.0; ht: 21.3; sgp: 12.1 and Caxias, Maranhão (1 specimen). h: 15; f: 8.5; p: 10; t: 57.5; hf: 25; ht: 21.4; sgp: 8.5.

Additional reports from iNaturalist (Table 1). In addition to the two specimens collected, new occurrences in Brasília, Goiás, Minas Gerais, and São Paulo states were reported (Table 1).

Discussion

The Leguini grasshoppers are characterized by large, solitary, and macropterous species, with powerful stridulatory and visual communication (stridulation accompanied by displaying brightly colored wings). Members of this arboreal tribe are cryptic and homochromatic, and females oviposit in the soil (Amédégnato 1997). They present a remarkable morphological convergence with Copiocerini, including specialization of their oral apparatus (Amédégnato and Poulain 1986). They are also palm specialists and display one of the characteristics of palm feeders which consists of a cylindrical and elongated body and arboreal adaptations (Amédégnato and Poulain 1986; Amédégnato 1997).

Regarding adaptations to arboreal environments present in grasshoppers, although numerous characteristics have been reported or proposed, none are shared by all species. Many of the species have relatively long hind tarsi, which are generally one-half to two-thirds the length of the hind tibiae. The long tarsi with a pair of distal claws may allow the grasshopper to grab onto a leaf or other substrate efficiently. Some species have long

Table 1. Data for all records made for *Legua rosea* Amédégno and Poulain, 1986, including information presented in this study. Asterisks indicate new records.

Locality	Geographic coordinates	Specimen information	Date	Reference
Mato Grosso do Sul state (MS), Rio Verde de Mato Grosso	—	1♂ holotype	XI.1959	Amédégno and Poulain (1986)
Mato Grosso state (MT), Rosário Oeste	—	7♂ paratypes	XI.1959	Amédégno and Poulain (1986)
Mato Grosso state (MT), Rosário Oeste	—	6♂ paratypes	XII.1959	Amédégno and Poulain (1986)
Mato Grosso state (MT), Rosário Oeste	—	1♂ paratype	II.1960	Amédégno and Poulain (1986)
Mato Grosso state (MT), Rosário Oeste	—	5♂ paratypes	X.1960	Amédégno and Poulain (1986)
Mato Grosso state (MT), Rosário Oeste	—	2♂ paratypes	XI.1960	Amédégno and Poulain (1986)
Maranhão (MA)	—	1♂ paratype	I.1956	Amédégno and Poulain (1986)
Maranhão state (MA), Caxias, Fazenda Bom Fim	—	1♀	28.IV.1998	This study, housed at INPA
Mato Grosso do Sul state (MS), Coxim, Pesqueiro Cachoeira das Palmeiras II	18°21'44.85"S 54°36'52.85"W	1♂	06–07.XI.2015	This study, housed at ZUFMS
Goiás state (GO), Catalão*	18°04'10.6"S 47°55'59.7"W	1♂	23.I.2023	This study, housed at UFV
Distrito Federal state (DF), Brasília*	15°36'19.3"S 47°42'48.0"W	1♀	30.III.2023	Fischer (2023)
Distrito Federal state (DF), Brasília*	15°50'51.3"S 47°49'25.4"W	1♀	23.III.2023	Kyuji (2023)
São Paulo state (SP), Pedregulho*	20°14'03.8"S 47°26'46.6"W	—	16.XI.2020	Nicodemo (2020)
Minas Gerais state (MG), Dolores do Indaiá*	19°27'38.8"S 45°35'47.4"W	—	25.XII.2017	Beloch (2017)
Goiás state (GO), Catalão*	18°09'57.9"S 47°56'40.1"W	—	11.XII.2016	Rodrigues (2016)

antennae, which in males may reach the length of the body, and there are species with hair tufts on the final two or three abdominal sternites (Roberts 1973). Likewise, these species may present a colorful body, robust shape, protuberant eyes, contrasting colors of the hind femur (Riede 1993), concavity of the sternum, and epi- or endophytic egg valves (Amédégno 1997). Among these characteristics, *L. rosea* presents reddish colors of the hind femur (Fig. 2B, 4E), hair tufts on the final abdominal sternites (Fig. 4B), and a slight concavity of the sternum (Fig. 4C). The specimens analyzed also present the inner face of the posterior tibiae with purple/purple bands between the spines and the posterior tarsi have a dorsal surface of the same color. The antennae also have this pattern, with a purple inner surface and a greener outer surface (Fig. 4D–E).

Two specimens analyzed in the present study were found accidentally, after adverse climatic conditions that caused them to fall off trees. Despite its cryptic habits and rarity, members of this tribe of grasshoppers are likely widely distributed geographically. This suggests that Leguini specimens represent a particular and unique lifestyle,

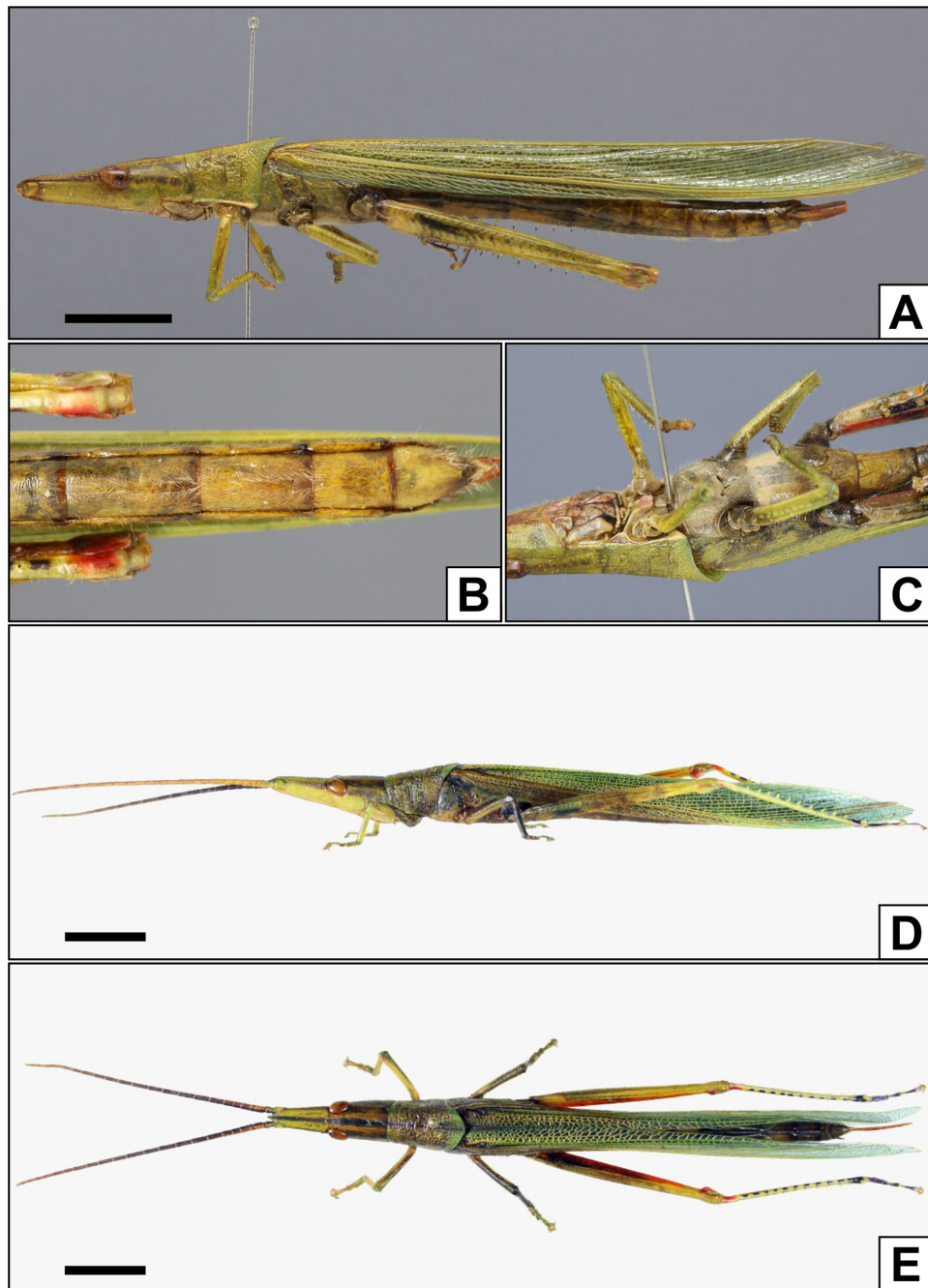


Figure 4. *Legua rosea* Amédégnato and Poulain, 1986 **A–C)** Newly reported male specimen from Goiás state. **A)** Lateral view. **B)** Hair tufts on the final abdominal sternites. **C)** Slight concavity of the sternum. **D–E)** Male specimen from Mato Grosso do Sul state. **D)** Lateral view. **E)** Dorsal view.

associated with an underexplored environment (Amédégnato and Poulain 1986; Rowell 2013). This report was possible only due to the use of two important tools for the study of biodiversity: online social media and museum collections. For this reason, the information presented here about *L. rosea* was limited to the description.

First, a significant aspect of this study was the images shared on Instagram Story, a popular social network for image circulation. Using these images from undergraduate student activities, an interaction between researchers was established, resulting in this new report. Reports on other taxa have benefited from using Instagram, for

example Mantodea (Vujić and Ivković 2023), sea turtles (Leitão et al. 2022), and sawfish (Kroetz et al. 2021). An additional online social medium used in this study was iNaturalist, which allows users to document their observations of biodiversity, including time, date, place, taxonomic identification, photos, audio recordings, and a vast number of other user-defined data fields. The social media platform iNaturalist is a collaborative project between the National Geographic Society and the California Academy of Sciences, run by a committed team of volunteers and citizen scientists (iNaturalist 2023). This social media platform enabled us to report new occurrence instances of the species that we have been studying from Goiás, Brasília, São Paulo, and Minas Gerais state (Table 1).

In the age of online community photo-sharing in entomology (Skvarla and Fisher 2023), our knowledge of biodiversity has been highly impacted by these tools, both throughout temporal and geographical scales (Callaghan et al. 2022). These records have already started to be noticed in the Neotropical Orthoptera, such as *Bactrophora dominans* Westwood, 1842 (Silva et al. 2021), and raspy crickets (Cadena-Castañeda et al. 2020).

Likewise, this study enables us to understand how lesser known museum collections contribute to the biodiversity ranges of rare species. The specimen from Mato Grosso do Sul is housed at the Zoological Collection of the Universidade Federal de Mato Grosso do Sul (ZUFMS). According to Graciolli and Sinani (2015) and data provided by ZUFMS, the entomological collection currently houses more than 28,000 specimens, from all phytogeographic domains present in Mato Grosso do Sul state, such as the Cerrado, Pantanal, Chaco, and Atlantic Forest. There are also specimens from other Brazilian states and neighboring countries, such as Bolivia, Paraguay, and Peru. The best represented groups are Diptera, Hymenoptera, Lepidoptera, Odonata, and Orthoptera. Regarding Polyneoptera only, the collection houses more than 4,300 specimens, of which 90% belong to Orthoptera and the remainder are Blattodea, Dermaptera, Embioptera, Mantodea, Phasmatodea, and Plecoptera. It stands out for the presence of holotypes and paratypes, mainly of the families Eumastacidae and Tettigoniidae.

Since natural history museums and collections are repositories of biodiversity and frequently house vouchers and type specimens with crucial information for genetic, phylogenetic, biogeographic, and ecological studies, they are even more significant in these days of increasing environmental degradation and extinction rates (Lane 1996; Burrell et al. 2015; Ceballos et al. 2017; Schmitt et al. 2018; Derkarabetian et al. 2019; Domagała and Dobosz 2019; Dumbacher and Chaves 2023). Records of an organism's natural history and distribution can be found in museum collections, which is crucial knowledge for comprehending biodiversity (Meineke et al. 2018). Therefore, these methods are also means of pursuing further information and understanding of biodiversity, especially about rare taxa, such as Leguini grasshoppers.

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