



A new species of *Phylloptera* Serville, 1831 (Orthoptera, Tettigoniidae, Phaneropterinae) from southern Brazil and lectotype designation for *Phylloptera picta* Brunner von Wattenwyl, 1891

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ABSTRACT

Here we describe a new katydid species, *Phylloptera jaci* **sp. nov.**, from the Iguaçu National Park, a large Atlantic Forest protected remnant in southern Brazil. This is the first record of a species of *Phylloptera* of the *picta* species group both for Brazil and the Atlantic Forest. We also designate the lectotype for *Phylloptera picta*, from Peru, and present a complementary description of this species. An occurrence map for the species of *Phylloptera* of the *picta* species group are also presented.

Introduction

Phyllopterini is a tribe of katydids (Orthoptera: Tettigoniidae: Phaneropterinae) comprised by 116 species and 14 genera, and that encompasses the genera originally placed by Brunner von Wattenwyl (1878) in the groups Phyllopterae and Phrixae (Cadena-Castañeda, 2015). Phyllopterini is currently divided in two subtribes, Phyllopterina, with 114 species, and Uberabina, with only two described species (Cigliano et al., 2020). Among the subtribe Phyllopterina, *Phylloptera* Serville, 1831 appears as the most speciose genus, with 42 species described so far (Cigliano et al., 2020). Cadena-Castañeda (2015) presented important taxonomic changes that, besides delimiting more appropriately this genus, had a pronounced effect on its distribution; with the transfer of an African and an Asian species originally described under *Phylloptera* to other genera, *Phylloptera* (and also Phyllopterini) came to be understood as Neotropical groups. This way, Phyllopterini

inhabits areas between Mexico and central Argentina, with a few species occurring in the Antilles and a single species introduced in southern USA (Florida) (Cadena-Castañeda, 2015).

Six species groups are currently recognized within *Phylloptera* (in brackets the number of species): *ancilla* species group (5), *famula* (2), *fosteri* (11), *picta* (2), *quinquemaculata* (5), and *socia* species group (10), besides seven species that had not been assigned to any of those groups (Cadena-Castañeda, 2015; Cigliano et al., 2020). The separation of these groups relies basically on the coloration of pronotal disc and lateral carinae of pronotum, besides color and position of spots on tegmina (see Cadena-Castañeda, 2015).

The species currently placed in the *picta* group can be recognized by the lateral carinae of pronotum outlined in black, usually with an additional external yellowish line, and tegmina with one or

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more spots on the intersection and/or ramification of CuA and MP veins (Cadena-Castañeda, 2015; see also Brunner von Wattenwyl, 1891 and Bruner, 1915 [here the terminology for veins follows Desutter-Grandcolas, 2003, unlike the terminology followed by Cadena-Castañeda, 2015]). The two described species, *Phylloptera picta* Brunner von Wattenwyl, 1891 and *Phylloptera lineapurpurea* Bruner, 1915 can be readily distinguished by those spots: while the first presents a single oval black spot, the latter presents a sequence of red/ dark red spots in the tegmina. *Phylloptera picta* is known from the Peruvian Amazon while *P. lineapurpurea* is known from forests of Bolivia (see Cigliano et al., 2020). We assume that the type-locality of *P. lineapurpurea* (Sara province in Santa Cruz Department) correspond to a forest area (or at least under much influence of forests) through the interpretation of the map presented by Herzog et al. (2005).

Regarding the name-bearing types of each species, *P. lineapurpurea* was described from the holotype (Bruner, 1915; see also Cigliano et al., 2020), and *P. picta* was described from two syntypes (Brunner von Wattenwyl, 1891; see also Cigliano et al., 2020). This way, the designation of a lectotype for *P. picta* is desirable for ensuring the stability and correct use of this name.

Here we describe a new species of *Phylloptera* of the *picta* group from the Brazilian Atlantic forest, southern Brazil, designate the lectotype for *Phylloptera picta*, complementing its description and presenting an occurrence map for the species of *Phylloptera* of the *picta* species group.

Material and methods

We collected the new species during fieldwork carried out in the Parque Nacional do Iguçu, western Paraná state, southern Brazil.

Details of the area and sampling protocol can be found in Fianco et al. (2019). The records of the species of *Phylloptera* of the *picta* group was obtained from labels and for the new species we used the coordinates where the new species was collected. We built a map using the free and open source QGIS (version 3.14) and Inkscape (version 0.91), using shapefiles from Agência Nacional das Águas e Saneamento Básico (ANA), Brazil (ANA, 2020).

Specimens of the new species were dissected, pinned and dried in an oven for ca. 48 h (at 40°C), and studied under a Zeiss Stemi 2000 stereomicroscope. The morphological measurements and photographs were made under a Zeiss Discovery.V12 stereomicroscope, with Zeiss PlanApo S 1.0x FWD 60 mm lens, attached to a Zeiss AxioCam 105 camera, and using AxioVision SE64 software.

The photos of the syntype male of *Phylloptera picta* were taken by Dr. Przemysław Dawid Szymroszczyk (Museum and Institute of Zoology of the Polish Academy of Science, Warsaw). The photos A, B, and C of the Fig. 1 were taken under a Leica microscope, combined with Helicon Focus (A: 6x120 individual photos; B and C: 120 photos). The photos of the syntype female were taken in Natural History Museum, Vienna, NOaS Image Collection / H. Bruckner, and kindly sent to us by Dr. Susanne Randolf. All photos of *P. picta* are published here with permission granted by the curators.

The labels of examined specimens were transcribed in the following manner: one inverted bar symbol (|) indicates the different lines in a given label; double quotation marks indicates a label itself; comments on specific features of a given label (e.g. if handwritten) are presented between brackets. Depository institutions and their acronyms are as follows: Coleção de Entomologia Pe. J. S. Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil (DZUP); Muzeum i Instytut Zoologii, Polskiej Akademii Nauk, Warsaw, Poland (MZPW); Naturhistorisches Museum Wien, Vienna, Austria (NMW).

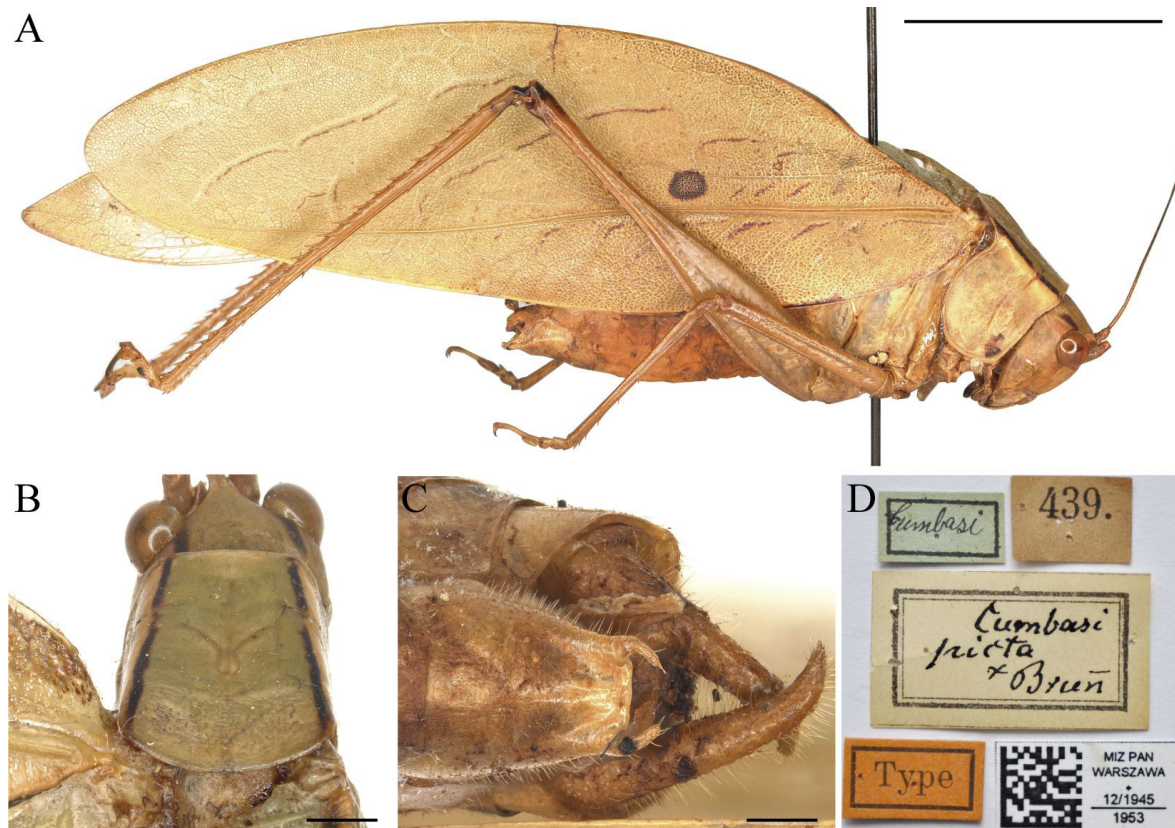


Figure 1 Lectotype (male) of *Phylloptera picta*. A: habitus, lateral view; B: head and pronotum, dorsal view; C: subgenital plate and cerci, ventral view; D: labels. Scale bars: A: 1cm; B and C: 2mm.

General terminology follows Snodgrass (1937) and Emsley et al. (1967). Wing venation terminology follows Desutter-Grandcolas (2003): Cu, cubital vein, A, anterior, P, posterior; M, median vein, A, anterior, P, posterior; R, radial vein.

The following abbreviations were used in the text for measurements (in mm): BL, body length (distance from the front to the apex of abdomen, excluding terminalia); TegL, tegmina length; HW, head width; PrL, pronotal disc length; PrH, pronotal lobe height; PLL, pronotal lobe length; FLiii, femur III length; TLiii, tibia III length; SPL, subgenital plate length; CL, cercus length; OL, ovipositor length.

Results

Taxonomy

Phylloptera Serville, 1831

Type species: *Locusta cassinaefolia* Saint-Fargeau & Serville, 1825 by subsequent designation; unspecified primary type, whereabouts unknown (see Cigliano et al. 2020); type locality: Brazil.

Phylloptera picta Brunner von Wattenwyl, 1891

(Figs. 1, 2 and 4A)

Phylloptera picta Brunner von Wattenwyl, 1891, lectotype male (MZPW), labelled “Cumbasi [green label, handwritten]”, “439” [red label], “Cumbasi\ picta\ Bruñ” [handwritten], “Type” [red label], “MIZ PAN\ WARSZAWA\ 12/1945\ 1953” [with a QR Code at the left side], **specimen hereby designated**, examined through photographs; paralectotype female (NMW), labelled “Coll. Br.v.W.\ Alto Amazonas\ Staudinger”, “det. Br.v.W.\ Phylloptera\ picta Br.” [last two lines handwritten], “15.465” [red label, handwritten].

The designation of a lectotype for *Phylloptera picta* is justified for ensuring the stability and correct use of this name. Even if the International Code of Zoological Nomenclature do not deal with group of species within a given genus, the designation could also help to delimit the boundaries of the *picta* species group, mainly now when a new species is described after more than a century.

When describing *P. picta*, Brunner von Wattenwyl (1891) did not directly mention the number of syntypes. However, some evidences support the interpretation that there were only two: (i) Brunner von Wattenwyl stated “coll. m.” (Brunner von Wattenwyl’s collection)



Figure 2 Paralectotype (female) of *Phylloptera picta*. A: habitus, lateral view; B: head and pronotum, lateral view; C: head and pronotum, dorsal view; D: spot of the tegmen; E: meso and metasternum, ventral view; F: subgenital plate, ventral view; G: ovipositor, lateral view; H: labels. Scale bars: A: 1cm; B: 5mm; C–G: 2mm

and “coll. Dohrn” as depositories of the studied specimens. The first collection is currently housed in NMW and specimens from Stettin, including Dohrn’s collection, have been moved to Warsaw (MZPW) (Dr. Holger Braun, personal communication). We have contacted the current curators of those collections and they both were not able to find any additional specimen of *Phylloptera picta*; (ii) in the original description, Brunner von Wattenwyll presented single measurements for male and female, which suggest that there was only one male and one female. For comparison, in the description of *Phylloptera roseoinflata* Brunner von Wattenwyl, 1891, three pages earlier in the very same monograph, ranges for body length as well as length and width of the tegmina of males (there was more than one male), and single measures of the conspecific female (a single specimen) was mentioned.

We also highlight that the locality of “Cumbasi” presented in the lectotype corresponds to the current San Antonio de Cumbaza, Peru (Penny, 1982).

Complementary description

Lectotype male (Figs. 1 and 4A).

Head: fastigium of the vertex rounded, with one sulcus that not exceeds the fastigium length; vertex greenish, with one black stripe from eye towards pronotum (Fig. 1B).

Thorax: Pronotal disc (Fig. 1B) greenish, anterior margin straight, posterior margin convex; furcal sulci with a median constriction; lateral carinae outlined in black and yellow; prozona with a sulcus that extends to lateral lobes of pronotum; lateral lobes of pronotum (Fig. 1A) higher than long; tegmina (Fig. 1A and 4A) rounded at apex, yellowish, with one oval black spot outlined in yellow, above CuA bifurcation; MP vein starting before the middle of tegmina, with one ramification (on the middle of the tegmina), and ending before tegmina apex; first branch of CuA vein diverging at the black spot; second branch diverging before first branch of MP; one closed cell between CuA and MP; four closed cells between branches of MP; three closed cells between the principal branch of MP and MA; Fifteen branches leaving R towards subcostal

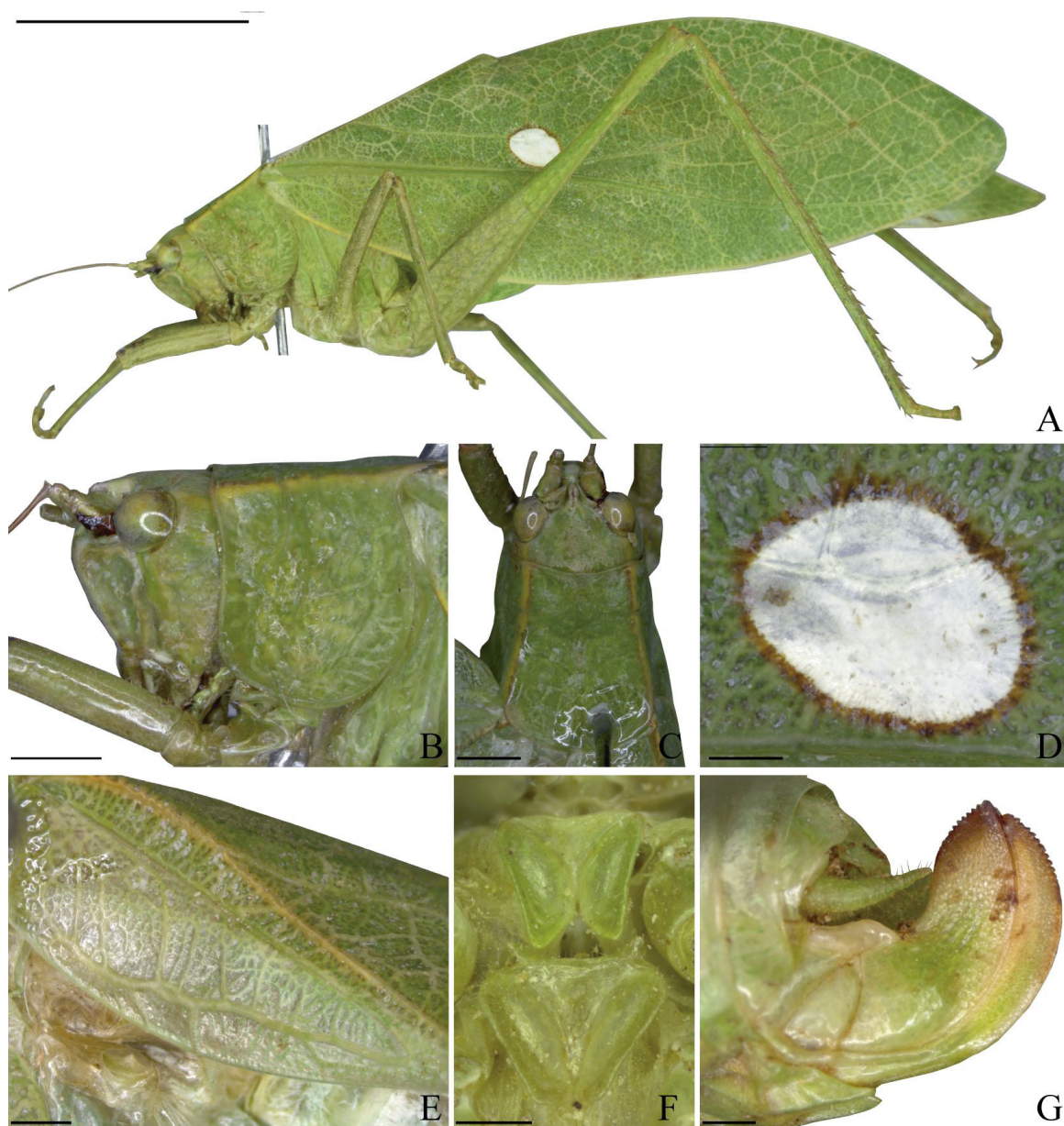


Figure 3 Holotype (female) of *Phylloptera jaci* sp. nov. A: habitus, lateral view; B: head and pronotum, lateral view; C: head and pronotum, dorsal view; D: spot of the wing; E: stridulatory files of the right tegmina; F: meso and metasternum, ventral view; G: ovipositor, lateral view. Scale bars: A: 1cm; B: 5mm; C-G: 2mm

border; stridulatory area greenish, becoming brownish towards the apex dark brown; apex of femur III dark brown with black stains.

Abdomen: subgenital plate trapezoidal, with two median orientated stilli (Fig. 1C); cerci conical, straight on its first *ca.* four parts, becoming curved in fifth part (Fig. 1C).

Paralectotype female (Fig. 2)

Overall morphology as in males (Fig. 2 A-D); subgenital plate bilobate, triangular, with one large keel that begins at its base (Fig. 2F); ovipositor curved upwards, dorsal valves pointed, ventral valves slender on its first part, becoming larger towards the apex (Fig. 2G).

***Phylloptera jaci* new species** Fianco, Szinwelski & Faria

urn:lsid:zoobank.org:act:76102D2B-2A8C-479A-B750-BB76F0B3512E (Figs. 3 and 4B)

Diagnosis

The new species can be recognized and separated from its congeners by the presence of one very conspicuous white spot (outlined in gold) on the first bifurcation of CuA of each tegmen, and by the lateral carinae of pronotum outlined in light and dark yellow.

Description

Holotype female (Figs. 3 and 4B).

Head (Fig. 3B): vertex and occiput green, with one yellow line from behind the eyes towards pronotum; fastigium bilobate, lobes barely distinct; carinae of fastigium of the vertex without exceeding its length; frons light green with light yellow stains, trapezoidal; frons triangular, with one large lemon green ocellus; clypeus light yellow, labrum white; gena yellowish, with one pale yellow strip from eye to base of occiput.

Thorax: pronotal disc green (Fig. 3C); lateral carinae outlined in light yellow, with a slender dark yellow border (Fig. 3C); anterior margin of carinae concave, posterior margin convex; prozone with a sulcus extending to lateral lobes; lateral lobes green, higher than long (Fig. 3B); lateral suture not reaching half of the height of pronotal lobe; coxal spine prominent; tegmina (Fig. 3A and 4B) pointed at apex, yellowish green, with one oval white spot outlined in golden on the first CuA bifurcation (Fig. 3D); MP vein starting before the middle of tegmina, with one ramification before the middle of tegmina, and ending before tegmina apex; first branch of CuA vein diverging in the white spot, second branch near the first closed cell of MP and CuA; one closed cell between CuA and MP; two closed cells between branches of Rs; one closed cell between the main branch of MP and MA; nine branches leaving R in direction to subcostal border; CuP vein yellow, dentate in proximal region; right tegmen with just one stridulatory vein, with 10 teeth (Fig. 3E); mesosternum triangular, mesosternal lobes triangular and long, without reaching distal area (Fig. 3F); metasternum triangular, with large and rounded lobes (Fig. 3F).

Abdomen: overall coloration aquamarine; subgenital plate triangular, with an apex bifid that forms two square processes, originating from a large keel that begins on plate base; ovipositor green at base, becoming brown towards apex, higher than long, upcurved in *ca.* 90° (Fig. 3G); dorsal valves dilated at the base; ventral valves slender at the base, becoming larger after the curvature; teeth light brown, beginning at the apical third of the dorsal valves and at the fifth part of ventral valves; basal plate almost triangular.

Measurements (mm)

Holotype: BL: 23.9; TegL: 38.3; HW: 4.2; PrL: 5.5; PrH: 5.3; PLL: 4.4; FLiii: 21.1; TLiii: 21.8; SPL: 2.3; CL: 2.2; OL: 5.4. **Paratype:** BL: 23.3; TegL: 37.2; HW: 3.8; PrL: 5.3; PrH: 4.7; PLL: 3.9; FLiii: 17.8; TLiii: 19.2; SPL: 1.8; CL: 2.2; OL: 5.2.

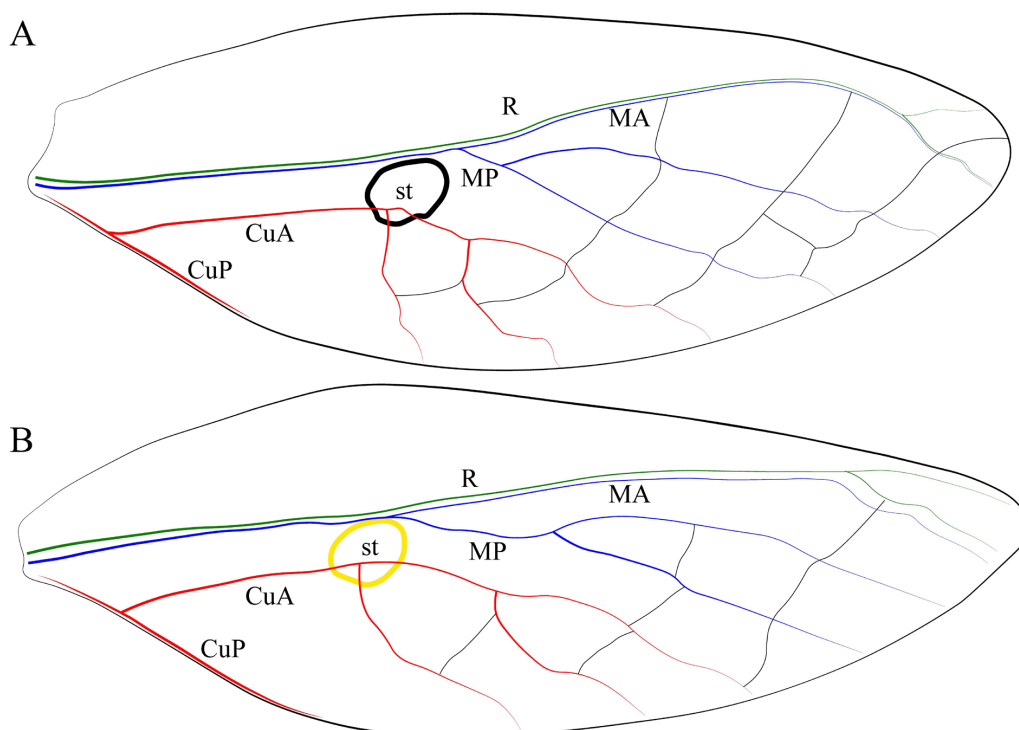


Figure 4 Tegmina of *Phylloptera picta* (A) and *Phylloptera jaci* sp. nov. (B); green, radial vein (R); blue, median veins (MA, anterior and MP, posterior); red: cubital veins (CuA, anterior and CuP, posterior); st: spot (the stridulatory file of *P. picta* is not depicted)

Etymology

In the Tupi mythology, Jaci is the moon and also the mother of fruits and vegetables (see Lima and Moreira, 2005). The name refers to the remarkable white spot found in each tegmen that resembles the full moon. Noun in apposition.

Type material

Holotype female, labelled “BR, PR, Foz do Iguaçu\Parque Nacional do Iguaçu\01-04.IV.2017\Fianco, M. col” (DZUP). *Paratype female*, “BR, PR, Serranópolis do Iguaçu\Parque Nacional do Iguaçu\07-12.X.2018\Fianco, M. col” (DZUP).

Male

Unknown.

Remarks

Phylloptera jaci sp. nov. is closely related to *Phylloptera picta*, and the main differences between them are the following: the strips behind the eyes, that are black in *P. picta* and yellow in the new species; the lateral carinae that are outlined in different colours, dark yellow/yellow in *P. jaci sp. nov.* and black/yellow in *P. picta*; the single spot on the bifurcation of CuA, black in *P. picta* and white in *P. jaci sp. nov.*; the number of closed cells between the branches of MP also varies, two in the new species and four in *Phylloptera picta*; the number of closed cells between the main branch of MP and MA also varies, one in *Phylloptera jaci sp. nov.* and three in *Phylloptera picta*; even regarding venation of tegmina, nine branches depart from R in the new species and fifteen in *Phylloptera picta*; finally, the colour of the apex of the femur that differs from body coloration in *Phylloptera picta* and not in the new species. The decision of comparing the tegmina of the holotype female of *P. jaci sp. nov.* and of the lectotype male of *P. picta*

is supported by the observation that the tegmina of males and females of the same species in other Phyllopterini are quite similar (Fianco, pers. obs.), which is confirmed when the tegmina of the lectotype and paralectotype of *P. picta* are compared.

Discussion

Here we present the first description of a species of *Phylloptera* of the *picta* group since 1915, what reinforces the recognition of Neotropical katydids as a historically neglected group (Fianco et al. 2019). In this context, it is worth mentioning that the species description was based solely on two females. The decision of describing *Phylloptera jaci sp. n.* without additional specimens, and even without a known male, relates to two main issues: (i) *Phylloptera jaci sp. n.* seems to be a very rare species, as we were able to collect only two females despite a considerable sampling effort (Fianco et al. in prep.). One female was found during an active nocturnal search, resting on leaves at ca. 1.5 m above the ground, while the other was attracted to light traps; (ii) the new species can be easily recognizable by the conspicuous white spot on tegmina, totally differing from the condition found in the other species of the *picta* group. Deng et al. (2019) state that if obtaining additional specimens is hard and the known specimens are significantly different from all other taxa, the description should proceed, a position that we strongly agree.

The occurrence of the species of *Phylloptera* of the *picta* group, is, up to now, restricted to the type localities, from where only the type material is known (Fig. 5). The known distribution of *P. jaci sp. n.* is restricted to the extreme west of Paraná state, Brazil, in the municipalities of Foz do Iguaçu and Serranópolis do Iguaçu. Both specimens were collected at the Parque Nacional do Iguaçu, the largest remnant of the Brazilian Atlantic Forest that once covered the region (e.g. Paviolo et al., 2016), in areas of Seasonal Semideciduous Forest (see Souza et al., 2017). We were able to find photos on the iNaturalist database (one from Misiones, Argentina and other from the region of Curitiba, Paraná, Brazil), that

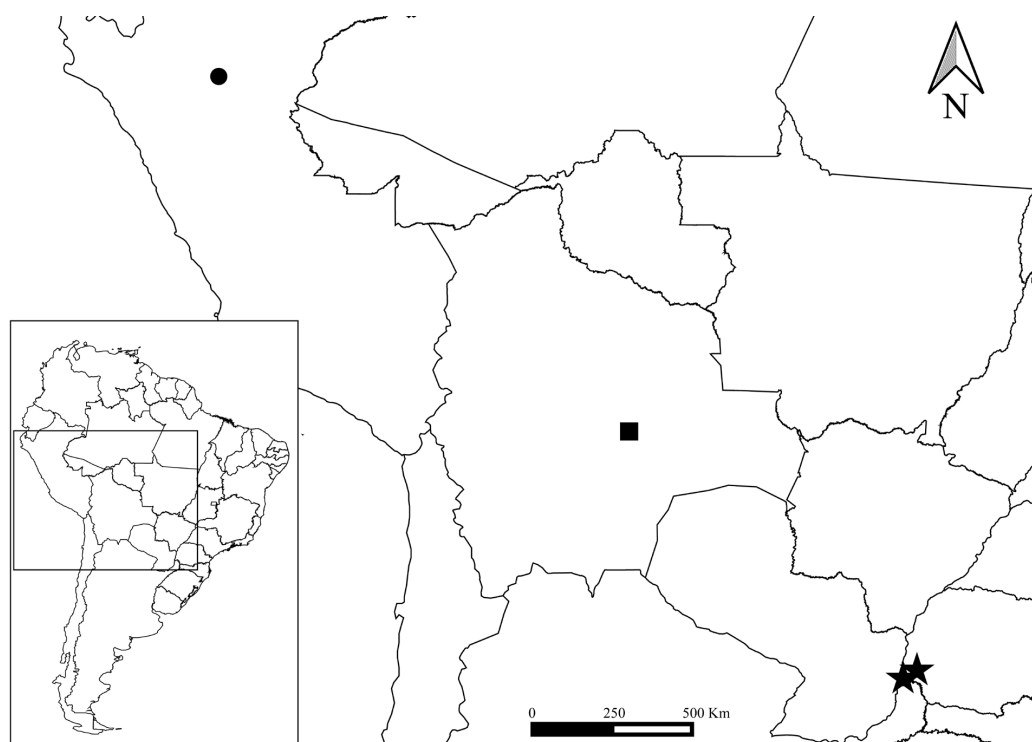


Figure 5. Occurrence map of species of *Phylloptera* of the *picta* group. Circle: *Phylloptera picta*; square: *Phylloptera lineapurpurea*; stars: *Phylloptera jaci sp. nov.*

probably represent the male of *P. jaci* **sp. nov.** Then it is very likely that *P. jaci* **sp. nov.** presents a much wider distribution than we currently suppose. We also highlight that this is the first record of a species of *Phylloptera* of the *picta* group both for Brazil and for the Atlantic Forest.

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We are deeply indebted to Dr. Susanne Randolph (NMW) and Dr. Przemysław Dawid Szymroszczyk (MZPW) for all the attention and efforts in photographing the lectotype and paralectotype of *Phylloptera picta*. We thank Rosane Nauderer (Iguaçu National Park) for field facilities, and Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for providing the collection license (SISBio nº 61175). A.J.C. Aguiar, F.F. Salles and R.B. Gonçalves are acknowledged for pertinent comments and discussion. We are indebted to the members of the Laboratório de Biodiversidade – Seção Entomologia (UNILA) and Laborth (Laboratório de Orthoptera, Unioeste) for all lab and field assistance, especially H. Preis (UNILA). PRPPG/UNILA is acknowledged for financial support (grants 137/2018 and 080/2019 to LRRF); Fundação Araucária is acknowledged for providing the facilities where most photos of the new species were taken. We are very grateful to Dr. Holger Braun (División Entomología, Museo de La Plata, Argentina) for information regarding the collections of Brunner von Wattenwyll and Dohrn. We thank the anonymous reviewers for all comments and suggestions. This study is part of M. Fianco master's degree at the Programa de Pós-Graduação em Biodiversidade Neotropical (UNILA), funded by CAPES. We dedicate the present study as a tribute to Angelina Zulpo Fianco.

Conflicts of interest

The authors declare no conflicts of interest.

Author contribution statement

MF carried out the fieldwork, including the collection of specimens of the new species; MF, NS and LRRF performed the taxonomic work; MF prepared the plates; MF, NS and LRRF wrote the manuscript.

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