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THESPIEUS MAACKI SP. NOV. (LEPIDOPTERA: HESPERIIDAE, HESPERIINI): A NEW SKIPPER FROM SOUTHERN BRAZILIAN PÁRAMOS

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ABSTRACT

A new species of *Thespieus* Godman, 1900 (Hesperiidae, Hesperiini), *Thespieus maacki* **sp. nov.**, is described from high altitude grasslands on Araçatuba Mountain peak, Tijucas do Sul, Paraná, Brazil. Similar habitats surrounding the type locality were also sampled, but this species was never recorded elsewhere. The most similar species *Thespieus caraca* Evans, 1955 is also illustrated and compared, in order to provide clear diagnostic characters for species identification.

Key Words: restricted distribution, butterfly, new species, grassland habitats

RESUMO

No presente estudo, uma nova espécie de *Thespieus* Godman, 1900 (Hesperiidae, Hesperiini), *Thespieus maacki* **sp. nov.**, é descrita dos campos de altitude do pico da Montanha Araçatuba, Tijucas do Sul, Paraná, Brasil. Habitats similares foram também amostrados em montanhas próximas à região, porém essa espécie não foi registrada em nenhum outro local. *Thespieus caraca* Evans, 1955, a espécie mais similar a *Thespieus maacki* **sp. nov.** é também ilustrada e comparada a fim de fornecer caracteres diagnósticos para sua delimitação e identificação.

Palavras-Chave: distribuição restrita, borboleta, nova espécie, campos de altitude

Brazilian páramos constitute grassland habitats over mountains tops, usually neglected by Lepidoptera researchers due to their relatively low number of species (Carneiro et al. 2014) thus being frequently omitted from tropical butterfly surveys. As no studies have associated species richness patterns of butterflies with environmental gradients of high altitudes in Brazil, we surveyed Hesperiidae ensembles in Serra do Mar along elevational transects (900–1,800 m above sea level. However, when intensively sampled, this vegetation is shown to harbor a distinct entomological fauna, including a substantial number of undescribed taxa (Carneiro et al. 2014; Dolibaina et al. 2011; Mielke et al. 2012). In some cases, these species are restricted to grassland or open landscape habitats, which makes them especially vulnerable to habitat reduction caused by vegetation and soil exploitation (Mikich & Bernils 2004; Machado et al. 2008).

Thespieus Godman, 1900 currently includes 32 species, some of which are associated to open landscape habitats (Dolibaina et al. 2011; Mielke et al. 2012; Carneiro et al. 2014). Here is described an additional species of *Thespieus*, which is restricted to high altitude grasslands (Páramos) from Araçatuba Mountain peaks, Tijucas do Sul, Paraná, Southern Brazil.

MATERIAL AND METHODS

During 2 collection trips to Araçatuba Mountain, Tijucas do Sul, Paraná, Brazil (S 25° 54' 07" W 48° 59' 39"), 19 specimens of an undescribed *Thespieus* species were collected visiting some blooming Asteraceae on mountain top around 1600-1670 m asl. The specimens were prepared and dissected by standard methods. Illustrations were drawn from the new species and compared to the most similar species in the genus: *Thespieus caraca* Evans, 1955, from Caraça, Minas Gerais, Brazil. The description is based on males and the different characters for females are given at the end of each described structure. Dissected specimens are assigned with "*" in type material. All

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material is deposited in the Coleção Entomológica Pe. Jesus Santiago Moure, Curitiba, Paraná, Brazil (DZUP). Supplementary material for this article in Florida Entomologist 97(4) (2014) is online at http://purl.fcla.edu/fcla/entomologist/browse.

Thespieus maacki Carneiro, Dolibaina, Mielke & Casagrande **sp. nov.**
(Figs. 1-4, 9, 11)

Thespieus sp.; Carneiro; Mielke; Casagrande & Fiedler 2014. Neotrop. Entomol. 43, Electr. Supl. Mat.: 7.

Diagnosis

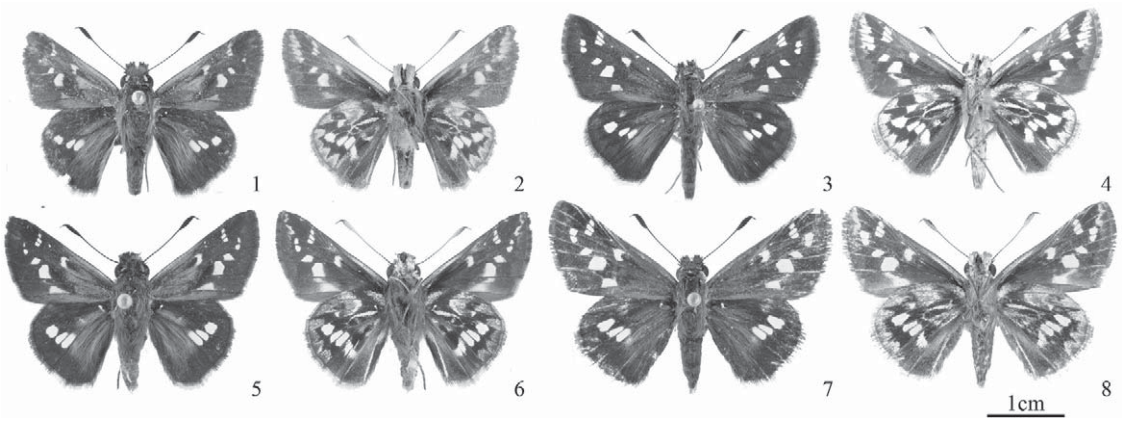
The color pattern of both the forewing and the hind wing on the ventral surface is markedly covered by bright yellow spots, a feature lacking in any other *Thespieus* except *T. caraca* Evans, 1955, which is the most similar species to *T. maacki*. The following characters distinguish these 2 species: 1) female antennal club is ventrally black on its distal half in *T. maacki* while whitish in *T. caraca*; 2) dorsal forewing triangular spot in CuA_2-2A is ochreous in males of *T. maacki* while larger and yellowish in *T. caraca*; 3) ventral forewing submarginal bright yellow band from apex, wide, continuous, extending to M_3 and fusing with M_1-M_3 submarginal hyaline spots in *T. maacki* while narrow, somewhat discontinuous, extending to M_1 and never fusing with M_1-M_3 submarginal hyaline spots in *T. caraca*; 4) ventral hind wing with a thin whitish line in M_2 in *T. maacki* while absent in *T. caraca*; 5) ventral hind wing postdiscal yellow opaque spot in Rs-M_1 larger in both sexes in *T. maacki* while small in both sexes in *T. caraca*; 6) ventral hind wing postdiscal whitish spot in CuA_2-2A, not divided in *T. maacki* while crossed by a thin rufous line in *T. caraca*; 7) fenestra narrower with an anterior prolongation in *T. maacki* while broader in *T. caraca*; 8) uncus shorter in *T. maacki* than in *T. caraca*; 9) harpe distally broader and dorsally pointed in *T. maacki* while narrower and dorsally rounded in *T. caraca*; 10) fultura inferior narrower in *T. maacki* than in *T. caraca*; 11) aedeagus shorter in *T. maacki* than in *T. caraca*, with the opening of the ejaculatory bulb shorter and distally inserted in *T. maacki* while longer and proximally inserted in *T. caraca*, and distal ventral margin of aedeagus rounded in *T. maacki* while with a central lobular projection in *T. caraca*; 12) sterigma slightly broader and shorter in *T. maacki*, with a truncated apex.

Description

Head: vertex mostly ochreous brown, with a line of whitish scales close to the eyes, interrupted by the dark brown posterior chaetosema; eyes black; anterior chaetosema ochreous; antenna about 60% of the costa length, dorsally black; club anteriorly and ventrally white in males and black in females; nudum 15; labial palp dorsally ochreous, ventrally white; third segment short, cylindrical, mostly hidden by apical scales of second segment. Female as male.

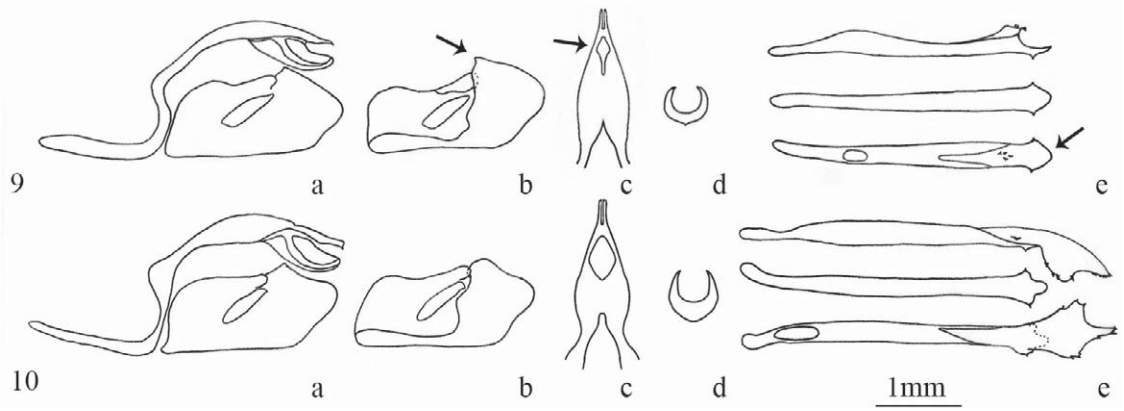
Thorax: dorsally dark brown, with long ochreous to rufous scales; ventrally densely covered by long ochreous scales, latero-posterior margin dark brown to rufous; mesotibia doubly spined with 2 pairs of spurs, metatibia spined with one pair of spurs

Dorsal forewing: males 14.5-15.5mm (n = 10) (holotype: 15.5mm); females 16.5-18mm (n = 9) (allotype: 16.5mm); triangular; costal margin straight, slightly convex near the base and the



Figs. 1-8. *Thespieus maacki* **sp. nov.** HOLOTYPE male (dorsal, Fig. 1, ventral, Fig. 2) and ALOTYPE female (dorsal, Fig. 3, ventral, Fig. 4) and *Thespieus caraca* Evans, 1955 male (dorsal, Fig. 5, ventral, Fig. 6) and female (dorsal, Fig. 7, ventral, Fig. 8). These figures are shown in color in a supplementary document online as Suppl. Figs. 1-8 in Florida Entomologist 97(4) (December 2014) at http://purl.fcla.edu/fcla/entomologist/browse .

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Figs. 9 and 10. Male genitalia of *Thespieus maacki* **sp. nov.** (Fig. 9) and *Thespieus caraca* Evans, 1955 (Fig. 10). a) lateral view of tegumen, saccus, uncus, gnathos and valve; b) opposite view of right valve; c) dorsal view of tegumen, fenestra and uncus; d) posterior view of fultura inferior; e) lateral (above), ventral (middle) and dorsal (below) views of aedeagus. Arrows indicate diagnostic characters cited in the text.

apex; apex rounded; outer margin convex from apex to M_3, then straight; tornus rounded, obtuse; inner margin straight. Ground color dark brown with long ochreous scales near the base of the wing and along the CuA and 2A, never exceeding distally the discal cell; ochreous spots on costal area from base to Sc end, around CuA_1 origin (triangular shaped), and one triangular in CuA_2-2A, and in posterior half of CuA_2-2A; 9 yellowish hyaline spots, 2 fused inside the discal cell (slightly separated in some specimens), 3 subapical in R_3-M_1, somewhat aligned with each other and towards the anal margin, distally produced in R_3-R_4 (opaque in some specimens), 2 reduced submarginal spots in M_1-M_3 (in M_1-M_2 reduced or absent in some males); and 2 discal developed spots in M_3-CuA_2, the first one smaller and distally produced than the last one; stigma black, bipartite and elongated, from origin CuA_1 to CuA_2 and from CuA_2 to 2A; fringe uniformly dark brown. Female as in male except for: the reduced ochreous spots, posterior half of CuA_2-2A rectangular; all hyaline spots lighter than in males, the subapical spot in R_3-R_4 hyaline and the submarginal spots M_1-M_3 developed, fringe whitish at the center of the spaces M_3-CuA_1 to CuA_2-2A.

Dorsal hind wing: costal margin convex; apex rounded, with a small indentation at the end of Rs; outer margin convex from apex to CuA_1, with an indentation in CuA_1-2A and from 2A to tornus produced; tornus rounded; anal margin slightly convex. Ground color dark brown with long ochreous scales from base to discal cell end, and in anal area; one thin and poorly defined ochreous spot on dcm (absent in some of the males); one discal ochreous opaque spot in Rs-M_1 (absent in part of the males), and 4 discal yellowish hyaline spots in M_1-CuA_2, with the spots M_1-M_2 and M_2-M_3 fused, subquadrate, distally projected, but never touching the subtriangular the spot in M_3-CuA_1; fringe ochreous to brown. Female as in male except for the constant presence of the discal spot Rs-M_1; fringe dark brown, whitish at the center of the spaces CuA_1-CuA_2 and CuA_2-2A.

Ventral forewing: ground color dark brown, rufous brown from apex to discal cell end, and CuA_2; spots as in dorsal surface, except by the spot in CuA_2-2A, which is whitish, and a submarginal wide, bright yellowish and contiguous band from apex to M_3, fused with the 2 submarginal hyaline spots in M_1-M_3; costal area from base to Sc end yellowish; fringe dark rufous brown, whitish at the center of the space CuA_2-2A. Female as in male except for the reduced yellow markings; presence of a thin, whitish cream spot in in anterior half of CuA_2-2A, distally inclined and surrounding distally the whitish cream spot in posterior half of CuA_2-2A; fringe with short rufous brown scales, dark brown at the end of the veins, whitish at the apex and at the center of the spaces R_5 to 2A.

Ventral hind wing: ground color dark brown, rufous brown from costal margin to anterior half of CuA_2-2A and from 3A to anal margin; a basal large bright yellow spot from the base of the wing to the first third of costa; 2 discal large bright yellow spots from costal margin to Rs, covered by rufous brown scales at the center; discal cell crossed longitudinally by a white stripe that covers dcm and dci, then a thin line extending on M_2 finishing at discal yellowish hyaline spot on M_1-M_3; a bright yellow line from origin of Rs, covering dcs, crossing vertically the discal cell, and extending to 2A (variable among individuals); 6 discal spots from Rs to 2A, all bright yellow except by the whitish spot in CuA_2-2A, hyaline from M_1 to CuA_2, the spots in M_1-M_2 and M_2-M_3 fused; submarginal bright yellow band from Rs to CuA_2 with the proximal margin irregular and distal margin

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covered by rufous scales; fringe dark brown, whitish at the apex, and from CuA_2 to the tornus. Female as in male.

Abdomen: dorsally dark brown with ochreous scales, ventrally ochreous. Female as in male except for the whitish ventral abdomen, with a central thin dark brown poorly defined line.

Male genitalia (Fig. 9): tegumen dorsally broad and laterally narrow, distally tapered; fenestra losangular, with an anterior thin extension; ventral arms of tegumen and dorsal arms of saccus fused and thin; ventral arms of tegumen strongly inclined distally; anterior projection of saccus as long as tegumen + uncus and narrow; uncus divided, thin and short, arms short, thin and parallel to each other; gnathos divided, formed by 2 parallel bars, comma-shaped in lateral view with a median membranous area between the 2 sclerotized plates; valva with an external membranous area at the middle; costa absent; harpe broad, distally projected and rounded and, dorsally pointed; ampulla short, rounded, produced to harpe's anterior margin, with a rounded external tip; fultura inferior U-shaped; aedeagus longer than valva, thin, coecum short, rounded, slightly right turned, insertion opening of ejaculatory bulb ovoid, undeveloped, distal end triangular, with 2 lateral spines, center of the distal margin rounded, distal opening dorsal, and anteriorly prolonged; cornuti present as 4 small spines.

Female genitalia (Fig. 11): lamella antevaginalis absent; lamella postvaginalis T-shaped with lateral arms truncated, posterior margin with a wide median depression with semicircular patch of small bristles; inferior portion strongly constricted at the middle; ostium bursae wide, and free; bursa copulatrix less than 3 times the sterigma length; ductus bursae broad, cylindrical and sclerotized, shorter than corpus bursae; corpus bursae posteriorly jagged, anteriorly ovoid, without signa.

Type Material

HOLOTYPE male with the following labels: / HOLOTYPUS/ Morro Do Araçatuba[,] Tijucas do Sul[,] Paraná, BRASIL 18-II-2011 Carneiro leg./ 25° 54' 07" S; 48° 59' 39" W Campos de Altitude[,] Altitude: 1,684[m]/; DZ 30.140/; Holotypus *Thespieus maacki* Carneiro, Dolibaina, Mielke & Casagrande det. 2014/. Deposited at the Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (DZUP).

ALLOTYPE female with the following labels: / ALLOTYPUS/ Brasil, Paraná[,] Tijucas do Sul, Morro do Araçatuba[,] 1670m 14-II-2014, Carneiro, Dias & Dolibaina LEG./; DZ 30.155/; Allotypus *Thespieus maacki* Carneiro, Dolibaina, Mielke & Casagrande det. 2014/. Deposited at the Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (DZUP).

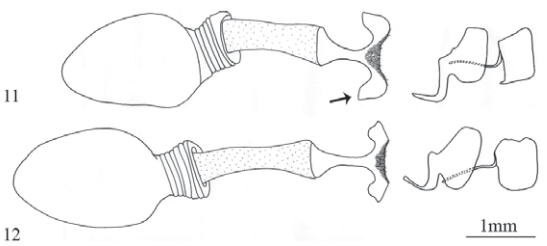
PARATYPES (9 males and 8 females, DZUP): BRAZIL – *Paraná*: Tijucas do Sul (Morro do Araçatuba), 25° 54' 07" S; 48° 59' 39" W, 1,624-1,684 m, 18-II-2011, 1 male, Carneiro *leg*. (DZ 30.139), 2 females (DZ 30.141, DZ 30.138*), 1672m, 25-II-2011, Carneiro, Grossi, Dolibaina & Zacca *leg*., 4 males (DZ 27.427*, DZ 30.143, DZ 30.147, DZ 30.148), 5 females (DZ 27.477*, DZ 30.142, DZ 30.144, DZ 30.145, DZ 30.146), 14-II-2014, 4 males, Carneiro, Dias & Dolibaina *leg*. (DZ 30.150, DZ 30.151, DZ 30.152, DZ 30.154), 1 female (DZ 30.153).

Distribution

The species is known to occur only at the peak of Araçatuba Mountain, Tijucas do Sul, Paraná, Brazil, where high altitude grasslands (páramos) are present. The same mountain was sampled along 2 years but specimens were recorded only in February. Other mountains in the region were also explored in the same month, but this species was never recorded elsewhere.

Etymology

This species epithet honors Reinhard Maack (1892-1969), a German geologist, known for describing the vegetation of Paraná in detail, and for discovering the highest peak of southern Brazil, Pico do Paraná, along with several surrounding mountains. During his life he was pioneer in urging society to militate against the over exploitation of vegetation and soil. Further, Maack predicted anthropogenic damage to biodiversity damage even before the establishment of the biological conservation sciences.



Figs. 11 and 12. Female genitalia of *Thespieus maacki* **sp. nov.** (Fig. 11) and *Thespieus caraca* Evans, 1955 (Fig. 12). Left to right: ventral view of sterigma and bursae copulatrix; lateral view of the papilla anal and Tergum VIII. Arrow indicates diagnostic characters cited in the text.

Discussion

Thespieus is a skipper genus marked by the presence of hyaline spots on forewing and a particularly colored ventral hind wing (Godman & Salvin 1887-

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1901). Its species present male genitalia with similar patterns (Evans 1955). Valvae lack projections, uncus bifid, aedeagus long, cylindrical and vesica with several cornuti (see Mielke 1971; Mielke 1993; Mielke & Schroeder 1994). On the wings however, differences are more evident, with species having contrasting ventral hind wing patterns (Warren et al. 2013). In this aspect, *T. maacki* **sp. nov.** is more similar to *T. caraca* Evans, 1955 (Figs. 5-8, 10, 12), as no other species of *Thespieus* present such bright yellow markings in the spots and submarginal band of the ventral hind wing.

Both of these species are distantly allopatric and have restricted distributions, as is also commonly observed in other species in the genus, e.g. *Thespieus abauna* Zikán, 1938, *T. duidensis* Bell, 1932, *T. fassli* (Draudt, 1923), *T. hieroglyphica* Draudt, 1923, *T. matucanae* Lindsey, 1925, *T. pinda* Evans, 1955 and *T. zikani* Mielke, 1971. It is also common to some species of *Thespieus* to be especially associated with grassland habitats (Mielke et al. 2012; Carneiro et al. 2014) or páramos as the case of *T. maacki* **sp. nov**. These 2 particular conditions raise the importance of those species to be evaluated in regional threatened lists, as grassland habitats in South America have been greatly replaced by urban areas during recent decades (IUCN 2008). Furthermore, several grassland habitats remain to be explored in the Neotropical region, which might harbor several threatened, although undescribed species. The challenge of entomological researchers resides now in accelerating the description of species that will potentially require special conservations measure, such as *Thespieu maacki* **sp. nov**.

Acknowledgments

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