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## Three new species of the genus *Stolas* BILLBERG, 1820 (Coleoptera: Chrysomelidae: Cassidinae: Stolaini)

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ABSTRACT. *Stolas hameli* from Bolivia, *Stolas omaspidiformis* from Brazil and *Stolas warchalowskii* from Paraguay, all new to science, are described and photographed.

Key words: entomology, taxonomy, new species, Coleoptera, Chrysomelidae, Cassidinae, *Stolas*, Bolivia, Brazil, Paraguay.

### INTRODUCTION

The genus *Stolas* BILLBERG, 1820 in the narrow sense contains 178 species distributed in the Neotropical Region and is the fourth most diverse genus within tortoise beetles (BOROWIEC 1999, BOROWIEC & ŚWIĘTOJAŃSKA 2002). Several authors (e.g. HINCKS 1952, SEENO and WILCOX 1982) included in the genus *Stolas* also some other stolaine genera at the subgenus level: *Anacassis* SPAETH, 1913 (19 species), *Botanochara* DEJEAN, 1837 (43 species), *Cyrtonota* CHEVROLAT, 1837 (60 species), *Mesomphalia* HOPE, 1839 (16 species), *Nebraspis* SPAETH, 1913 (3 species), *Poecilaspidella* SPAETH, 1913 (6 species), *Trilaccodea* SPAETH, 1920 (6 species) and *Xenicomorpha* SPAETH, 1913 (1 species). The genus *Stolas* in broad sense contains 332 species and is exceeded in number of species only by the most diverse genus *Cassida* LINNAEUS, 1758 (421 species). In my opinion at least part of the subgenera represent coherent morphological and biological groups and should be treated as genera. The problem needs molecular study and in my World Catalogue of the Cassidinae (BOROWIEC 1999) I treated many stolaine genera in narrow sense. The genus *Stolas* in narrow sense includes large or moderate-sized species, with only four basal glabrous antennal segments, prosternal collar not producing anteriorly, antennal segments 4 and 5 not or only slightly shorter than segment 3, elytra with

tendency to form in postscutellar area gibbosity or tubercle but sometimes regularly convex, and family Convolvulaceae as host plants.

The genus *Stolas* has never been revised but its members are usually well defined species of characteristic shape and pattern. Colour photos of most of them are available on the BOROWIEC and ŚWIĘTOJAŃSKA (2002) web page. Only some common and wide spread taxa, especially from Central America, probably represent groups of biological or sibling species that was confirmed by molecular data (D. WINDSOR in litteris). FRANZ SPAETH, the leader of cassidine study at the end of XIX and first half of the XX century, in his unpublished monograph of world Cassidinae, preserved in Manchester Museum, proposed division of the genus *Stolas* into 10 morphological groups. At least some of the groups represent monophyletic lineages, this was confirmed by study of spermathecae (BOROWIEC and POMORSKA, in preparation). The division proposed by F. SPAETH is a good reference point to place newly described species in coherent morphological lineages. Below, I describe three new species of very distinct morphology belonging to the three groups.

#### METHODS

Colour photos were prepared using Syncroscopy Auto-Montage Essentials software, Nikon Coolpix 4500 photo camera and Nikon SMZ 1500 stereomicroscope. Photos were digitally cleaned for better appearance. Measurements were taken with an ocular micrometer. Body length was measured from the anterior corner of the pronotum to the apex of elytra. Pronotal length was taken from the anterior corner to the base of the pronotum, and pronotal width was measured as the distance between the most lateral points of pronotal sides. Male genitalia are not useful in determining species in this genus and were not prepared.

#### TAXONOMY

### *Stolas hameli* n. sp.

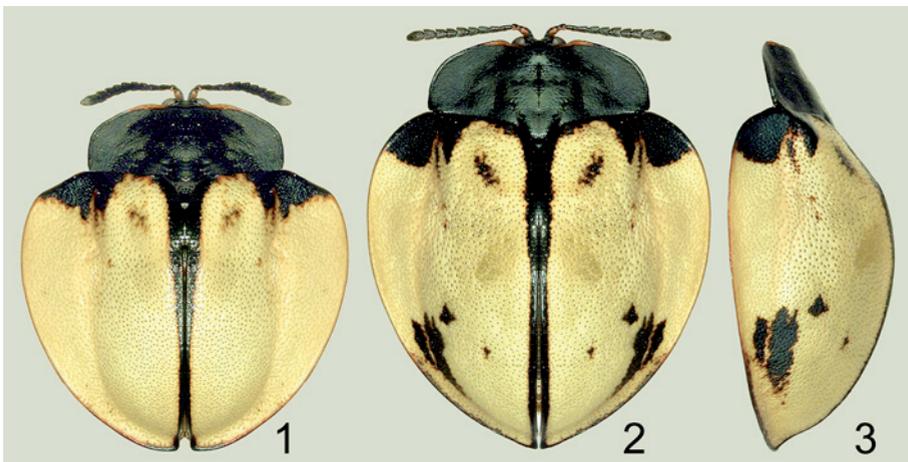
#### ETYMOLOGY

Named after its collector, A.C. HAMEL.

#### DIAGNOSIS

The species belongs to the "I" group in SPAETH's classification with *Stolas discoides* (LINNAEUS, 1758) as the oldest species. The group is characterized by elytra regularly convex with no or shallow scutellar impressions, pronotum moderately broad with broadly rounded sides, and distinct sexual dimorphism with males more broad than females, with wider explanate margin of elytra. Elytral colouration is completely metallic or metallic with pale spots or pale with metallic or black pattern, some species are strongly polymorphic. Punctuation of elytra varies from moderate to fine, mostly uniform or with coarser punctures in principal impressions. Only three species of the group have, like *S. hameli*, elytra mostly yellow with metallic pattern: *S. extricata* (BOHEMAN, 1850)

from Colombia and Venezuela, *S. quatuordecimsignata* (BOHEMAN, 1850) from Bolivia and Peru, and pale forms of *S. ephippium* (LICHTENSTEIN, 1795) widely distributed in Central America and northern part of South America, south to Ecuador. *S. ephippium* distinctly differs in elytra mostly metallic green with large yellow spots in 1/2 to 2/3 length of elytra but with apex of disc always uniformly green, while in the remaining species apex of elytra is yellow. In the palest form of *S. ephippium* yellow spots increase and occupies almost 3/4 of anterior surface of elytra but apex of disc is always metallic green. Sexual dimorphism in *S. ephippium* is stronger than in *S. hameli*, females are more oval and larger than males. *S. extricata* is the palest species with a green pattern occupying only the elytral suture, humeral calli and anterior margin of elytra, usually also extreme lateral margin of elytra is narrowly green or at least darkened while in *S. hameli* at least humeral part of explanate margin is metallic green and in both females examined elytra have metallic spots. Sexual dimorphism in *S. extricata* is similar to *S. ephippium* and distribution of the taxon within southern area of *S. ephippium* suggests that *S. extricata* is the only extremely pale form of *S. ephippium*, but this hypothesis needs verification through field and molecular studies. *S. quatuordecimsignata* is the most similar to the new species. It has the same type of sexual dimorphism and elytra mostly yellow with green spots. *S. quatuordecimsignata* distinctly differs in the humeral part of explanate margin of elytra being completely yellow (in *S. hameli* with diagonal metallic spot), extreme lateral margin of elytra uniformly yellow (in *S. hameli* narrowly green or darkened at least in posterior third), elytral spots regularly spread out on disc and with spot on explanate margin before mid-length of border between disc and explanate margin (in *S. hameli* elytral spots, if present, group in posterior half of disc and in area between humeral callus and suture, explanate margin without spots or if they are present they occur in posterior half of the margin). *S. quatuordecimsignata* and *S. hameli* are sympatric in Santa Cruz province of Bolivia.



1-3. *Stolas hameli* n. sp.: 1 – male dorsal, 2 – female dorsal, 3 – female lateral

## DESCRIPTION

Length: male 11.1 mm, female 10.8-12.3 mm, width: male 10.8 mm, female 9.0-10.8 mm, length of pronotum: male 3.0 mm, female 2.8-3.4 mm, width of pronotum: male 6.2 mm, female 5.7-6.8 mm, length/width ratio: male 1.03, female 1.14-1.20, pronotum width/length ratio: male 2.07, female 2.00-2.04. Sexual dimorphism distinct, male distinctly stouter than female with explanate margin of elytra in humeral part obliquely truncate while in female humeri are regularly rounded (Figs 1, 2).

Holotype male: pronotum black with indistinct green metallic tint. Anterior margin yellow, except area behind head. Almost whole elytra pale yellow except black (black parts of elytra have indistinct green metallic tint) diagonal humeral spots on explanate margin, black humeral calli, and black suture broadest in anterior part and gradually narrowing posteriorly. Extreme lateral margin of elytra mostly brown, apically gradually darker and in apical 1/7 black. Few punctures in postscutellar area brown or black with brownish areola but they do not form a separate spot. Antennae black, ventral side of antennomeres 1-5 yellow. Legs and ventrites black, only sternites 3-5 on sides with small, transverse, yellow spot.

Paratype female 1: mostly coloured as holotype but humeral diagonal spot broader than in holotype, areolae around punctures in postscutellar area coalescent, forming a separate spot, each disc of elytron in posterior third with two small black spots centrally and a large spot laterally; on explanate margin in area close to large spot on disc there is an elongate spot partly coalescent with the spot on disc. Below black humeral callus short blackish stripe. Extreme lateral margin of elytra black in posterior third.

Paratype female 2: coloured as paratype female 1 but below humeral calli no stripe, only few darker punctures, no spots on explanate margin, spots in posterior third of disc differently arranged – two central spots are larger than posterolateral spot and partly coalescent, the posterolateral spot in the form of short stripe. Dark punctures in postscutellar area arranged as in holotype, they do not form a separate spot. Extreme lateral margin of elytra brown to black in posterior 1/4.

Pronotum transversely subpentagonal, anterior margin deeply, semicircularly emarginate, sides with softly marked lateral angles, basal corners almost straight. Disc of pronotum moderately convex, finely and shallowly punctate, distance between punctures 3-5 times wider than puncture diameter. Explanate margin indistinctly bordered from disc by shallow impression in anterior and posterior part of the border, as coarsely and shallowly punctate as on disc. Surface microreticulate, appears dull, punctures of explanate margin with extremely short adherent seta.

Scutellum triangular, shiny. Base of elytra much wider than base of pronotum. In male humeral part of explanate margin obliquely truncate but without emargination before angle, in female humeri regularly rounded. Sides of elytra regularly rounded, moderately converging posteriorly, in both sexes maximum width of elytra in anterior 1/3. Disc in profile regularly convex, with top of convexity in 1/3 (Fig. 3). Punctuation of disc completely irregular, fine, mostly uniform, only punctures in principal area slightly coarser than in other parts of disc. Distance between punctures 1.5-3 times wider than puncture diameter. Surface between punctures slightly shiny. In male no impressions on disc, in female principal impression present but very shallow. Border between disc

and explanate margin indistinctly marked by irregular impunctate interval in anterior 2/3 of disc. Explanate margin in widest part in male almost as wide as half width of disc, in female as wide as 1/3 width of disc, its punctuation as coarse and dense as on disc. Apex of elytral epipleura bare.

Ventrites with no diagnostic characters. Antennae typical for the genus *Stolas* BILLB., third segment almost twice longer than second, segments 9 and 10 approximately as long as wide.

#### MATERIAL EXAMINED

Holotype male: "BOLIVIA: Sta. Cruz, Los Volcanes, 18°06'19"S63°35'49"W, 1050-1200 m, Hand Collecting, coll. A.C. Hamel L. IV/03" "Oxford University, Museum of Natural History (OUMNH)"; paratype female: the same data but date "V/03"; paratype female: [BOLIVIA: Sta. Cruz] "Los Volcanes, 11-Mars-2002, c. Hamel" "Oxford University, Museum of Natural History (OUMNH)" (holotype and one paratype preserved in the collection of Museum of Natural History, Oxford University, one paratype in the collection of Department of Biodiversity and Evolutionary Taxonomy, Institute of Zoology, University of Wrocław).

#### *Stolas omaspidiformis* n. sp.

#### ETYMOLOGY

Named after its body shape resembling some species of the genus *Omaspides* CHEVROLAT, 1837, especially *O. conjugens* SPAETH, 1937 and *O. boliviana* BOROWIEC, 2003 distributed in the same mountain regions of Peru and Bolivia.

#### DIAGNOSIS

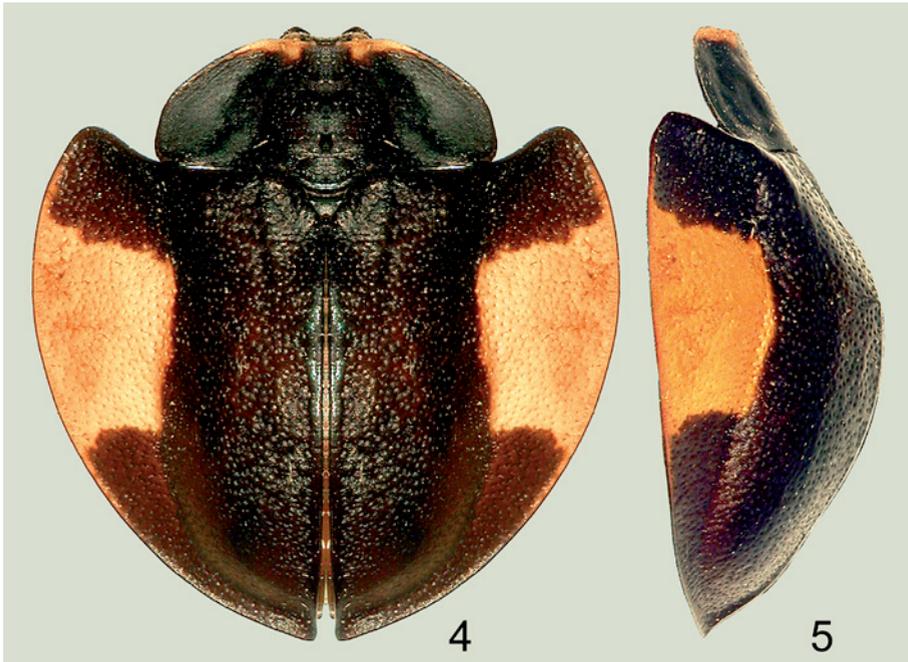
The species belongs to the group "J" in SPAETH's classification with *Stolas reticularis* (LINNAEUS, 1758) as the oldest species. The group is characterized by elytra regularly convex with no or very shallow scutellar impressions, pronotum moderately broad with broadly rounded sides, and indistinct sexual dimorphism with males only slightly stouter than females, with wider explanate margin of elytra. Elytral sides are less converging posteriorly than in the closest group "I". Elytral colouration is from metallic with pale spots or pale with metallic or black pattern to mostly pale, some species are strongly polymorphic. Punctuation of elytra varies from moderate to fine, mostly uniform or punctures are distinctly coarser in principal impressions. *Stolas omaspidiformis* belongs to a subgroup of small species, with elytra not reticulate, anterior margin of pronotum distinctly emarginate, anterior corners of pronotum pale, and elytral punctuation uniform on whole surface not or only insignificantly coarser in principal area. The subgroup comprises 9 species: *S. augur* (BOHEMAN, 1850), *S. bilineata* (BOHEMAN, 1850), *S. deleta* (BOHEMAN, 1850), *S. flavipennis* (BOHEMAN, 1850), *S. kraatzi* (BOHEMAN, 1862), *S. lineaticollis* (BOHEMAN, 1850), *S. perfuga* (SPAETH, 1926), *S. plagicollis* (BOHEMAN, 1850), and *S. schaumii* (BOHEMAN, 1850). *S. omaspidiformis* differs distinctly from all species of the group in its unique elytral pattern with pronotum black and elytra mostly black with indistinct metallic blue tint and with broad yellow window on explanate

margin. Other species of the subgroup are mostly or almost completely yellow, often with yellow or red pronotum, sometimes marked with dark median line or band, only *S. perfuga* has body mostly black with metallic tint but it differs from *S. omaspidiformis* in an elytral disc marked with yellow spots, body more convex and base of elytra not wider than base of pronotum. *S. omaspidiformis* differs from all species of the group except males of *S. lacordairei* (Boheman, 1850) in base of elytra distinctly wider than pronotum, thus at first glance the new species looks rather like members of the genus *Omaspides* more than members of the genus *Stolas*. Males of *S. lacordairei* differs from *S. omaspidiformis* in dorsal colouration red or yellow with metallic numerous spots, or uniformly metallic, and elytral surface irregular with shallow reticulation.

#### DESCRIPTION

Sex undetermined. Length: 9.5 mm, width: 9.4 mm, length of pronotum: 2.7 mm, width of pronotum: 5.3 mm, length/width ratio: 1.01, pronotum width/length ratio: 1.96. Body almost circular, base of elytra much wider than base of pronotum (Figs 4, 5).

Pronotum black with indistinct metallic green to bronze tint. Anterior margin yellow except area above frons. Elytra black with indistinct metallic green to bronze tint, explanate margin of elytra in the middle with large yellow spot that occupies approximately 2/5 space of the margin. Antennae and legs black. Ventrites mostly brown, coxa paler, yellowish brown, lateroapical margins of last visible sternite yellowish.



4, 5. *Stolas omaspidiformis* n. sp.: 4 – dorsal, 5 – lateral

Pronotum almost semicircular, anterior margin deeply, semicircularly emarginate, basal corners obtuse.

Disc of pronotum moderately convex, extremely fine and shallowly punctate, punctures hardly visible. Explanate margin indistinctly bordered from disc, appears impunctate. Surface of pronotum mostly dull, only in top of disc indistinctly shiny, explanate margin with sparse, very short, semierect setae.

Scutellum triangular, shiny. Base of elytra much wider than pronotum. Humeral part of explanate margin regularly rounded. Sides of elytra regularly rounded, moderately converging posteriorly, maximum width of elytra slightly behind 1/3 its length. Disc in profile regularly convex, with top of convexity in 2/5 length of its length (Fig. 5). Punctuation of disc completely irregular, uniform, fine but dense, punctures arranged regularly on whole surface without coarser punctures in principal area. Distance between punctures mostly as wide as puncture diameter. Surface between punctures slightly shiny. Border between disc and

explanate margin indistinctly marked, no impunctate interval. Explanate margin in widest part approximately as wide as half width of disc, its punctuation on black parts of the margin as coarse and dense as on disc, in yellow part of the margin as coarse as on disc but slightly deeper impressed thus punctures on yellow spots appear slightly coarser than most punctures on disc. Apex of elytral epipleura with moderately long, sparse, erect setae.

Ventrites with no diagnostic characters. Antennae typical for the genus *Stolas* Billb., third segment approximately 1.5 times as long as second segment, segments 9 and 10 slightly longer than wide.

#### MATERIAL EXAMINED

Holotype: „PERU, Callanga”. The locality is placed in Departamento de Lima, 12°34'00”S/76°19'00”W, 1507 m a.s.l. (preserved in the collection of Department of Biodiversity and Evolutionary Taxonomy, Institute of Zoology, University of Wrocław).

#### *Stolas warchalowskii* n. sp.

#### ETYMOLOGY

This species is named after Professor Andrzej WARCHALOWSKI, my mentor and first teacher in entomology and later a long time friend. It is my honour to be able to name this new species for him on the occasion of his 80<sup>th</sup> birthday celebration.

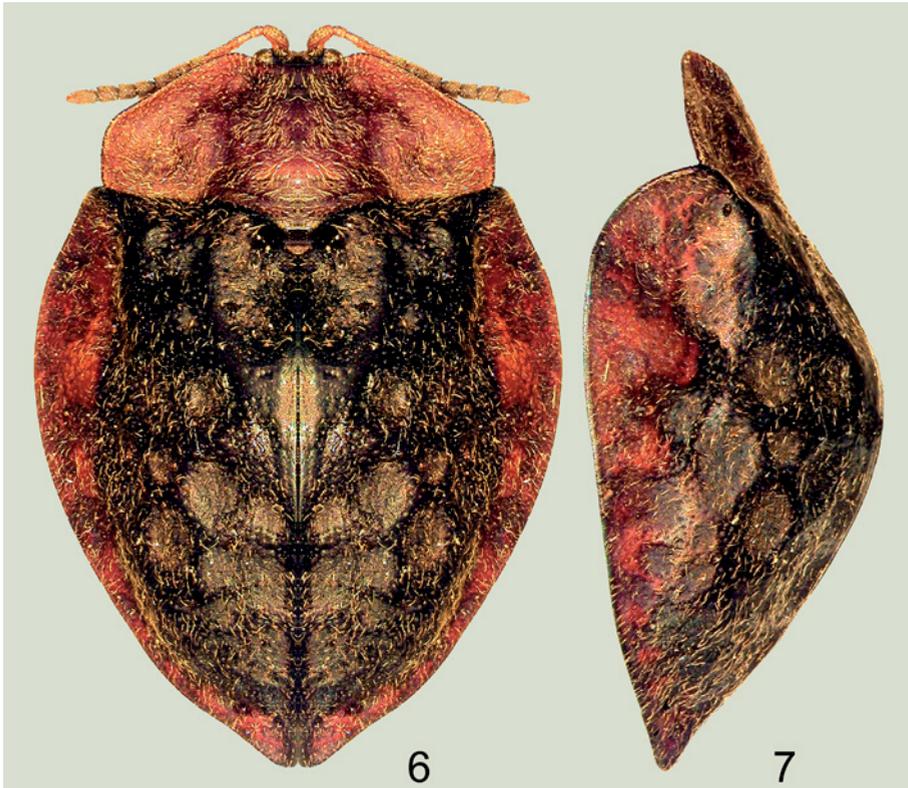
#### DIAGNOSIS

This species belongs to the group “F” in SPAETH’s classification with *Stolas cruentata* (ERICHSON, 1847) as the oldest species. The group is characterized by small size, broad pronotum with well marked lateral angles, anterior margin of elytra almost straight thus humeral angles only slightly protruding anteriorly, elytral sculpture with more or less distinct reticulation, elytral disc strongly convex to gibbous, sometimes with

postscutellar tubercle, and apex of elytra more or less angulate to acuminate but never broadly rounded. The group is comprised of 10 species distributed mostly in mountainous parts of South America and southern provinces of Brazil. *Stolas warchalowskii* differs from all congeners in its unique structure of elytra with extremely large and impressed fields of reticulation thus elytra look rather foveolate than reticulate. In *S. warchalowskii* across disc of each elytron run 2-3 fields of reticulation while in other species of the group 4 or more. At first glance *S. modica* (BOHEMAN, 1850) looks the most similar. It has large fields of reticulation (only 4 across elytron) and dark metallic elytral disc, like in *S. warchalowskii*, but differs in elytral convexity forming a sharp postscutellar tubercle (gibbous but without tubercle in *S. warchalowskii*) and fields of reticulation shallow thus elytra appear irregularly reticulate but not foveolate.

#### DESCRIPTION

Sex undetermined. Length: 10.5 mm, width: 7.9 mm, length of pronotum: 2.8 mm, width of pronotum: 5.8 mm, length/width ratio: 1.33, pronotum width/length ratio: 2.07. Body oval, base of elytra only slightly wider than base of pronotum, apex of elytra acuminate (Figs 6, 7).



6, 7. *Stolas warchalowskii* n. sp.: 6 – dorsal, 7 - lateral

Pronotum reddish-brown, slightly darker on area behind head, on top with indistinct cupreous tint. Elytral disc dark brown with distinct cupreous tint, especially when lighted from side. Explanate margin of elytra dark brown with distinct cupreous tint, broad reticulation reddish with indistinct cupreous tint. Antennal segments 1-4 reddish-brown with indistinct cupreous tint, remainder segments black. Ventrites and legs mostly brown with very distinct cupreous tint, but apical half of ventral side of femora reddish with indistinct tint and sides of sternites with reddish spots without metallic tint.

Pronotum transversely pentagonal, anterior margin deeply, semicircular emarginate, sides with well marked lateral angles, in basal 1/3 almost parallel-sided then strongly converging anteriorly, basal corners straight. Disc of pronotum moderately convex, punctation extremely fine and sparse, looks like pricks. Explanate margin indistinctly bordered from disc, in the middle with deep impression, as finely punctate as disc. Whole surface of pronotum dull and with sparse, moderately long adherent pubescence.

Scutellum triangular, dull. Base of elytra only slightly wider than pronotum. Elytra from humeral angle to 1/3 length moderately widened then distinctly converging posteriorly, apex subacuminate, humeral angles rounded. Disc in profile strongly convex, with top of convexity in 2/5 of its length (Fig. 7). Sculpture of disc forms a broad reticulation with extremely large and impressed fields of reticulation thus elytra appear rather foveolate than reticulate. Across middle of disc of each elytron run only 2-3 fields. Each field dull with extremely fine and sparse, scarcely visible punctation. Elevated parts of reticulation slightly shiny with sparse but distinctly more coarse punctation than in fields. Distance between punctures mostly three to four times wider than puncture diameter. Border between disc and explanate margin indistinctly marked, with no impunctate intervals. Explanate margin of elytra strongly declivous, in widest part as wide as 1/3 width of disc. Sculpture of explanate margin forms broad reticulation but fields are not as impressed as on disc. Punctation of the margin in both fields and net of reticulation similar to disc. Whole surface of elytra covered with moderately long, partly adherent and partly semierect pubescence. Apex of elytral epipleura with long, dense, erect setae.

Ventrites with no diagnostic characters. Antennae typical for the genus *Stolas* BILLB., third segment approximately 1.5 times as long as second segment, segments 9 and 10 slightly longer than wide.

#### MATERIAL EXAMINED

Holotype: „PARAGUAY, Sa. Trinidad, IX, 1913”. The locality is placed in Departamento Central, 25°15'00”S/57°37'60”W, 47 m a.s.l. (preserved in the collection of Department of Biodiversity and Evolutionary Taxonomy, Institute of Zoology, University of Wrocław).

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