

A new species of *Sphingonotus* (Acrididae: Oedipodinae) from the Salvage Islands with an updated list of taxa from the Macaronesian Islands

Martin Husemann¹, Oliver Hawlitschek²

¹ Staatliches Museum für Naturkunde Karlsruhe, Karlsruhe, Germany

² Department of Evolutionary Biology and Environmental Studies, University of Zurich, Zurich, Switzerland

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Corresponding author: Martin Husemann (martin.husemann@smnk.de)

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Abstract

A new species of the genus *Sphingonotus* Fieber, 1852 is described, *Sphingonotus* (*Sphingonotus*) *axeli* sp. nov. from the Salvage Islands. The synonymy of *Sphingonotus* (*Neosphingonotus*) *asper* (Brullé, 1840) with *Sphingonotus* (*Neosphingonotus*) *pachecoi* (Bolívar, 1908) is established and an updated list of currently known taxa from the other Macaronesian Islands is provided.

Key Words

Madeira, Canary Islands, Azores, Selvagem Grande, synonymy

Introduction

The Macaronesian Islands are a group of five archipelagos in the Atlantic Ocean: the Azores, Madeira, the Salvages, the Canary Islands, and the Cape Verdes. While the Canary Islands are close to the African coast, the other archipelagos are more isolated, with the Azores being most distant from the mainland (Fig. 1). While the larger archipelagos are densely populated and well-known touristic destinations, the Salvage Islands are uninhabited and largely represent wilderness.

Macaronesia is the home to a rich orthopteran fauna, which has been the target of historical and more recent exploration. As in many regions of the world, historical species descriptions were often conducted without comprehensive comparisons to the types of other local taxa. As a result, a number of taxa described many decades or centuries ago have later been synonymized, especially in groups with high variability and few diagnostic characters, while new taxa remain being discovered and

described (Bland and Gangwere 1998; Hochkirch and Husemann 2008; Hochkirch and Görzig 2009).

The genus *Sphingonotus* Fieber, 1852 (Acrididae: Oedipodinae) is among the most characteristic elements of the Macaronesian orthopteran fauna (Hochkirch and Husemann 2008; Husemann et al. 2014). Globally, it represents one of the most species-rich genera of grasshoppers with more than 170 species in three groups, provisionally separated into three subgenera (Cigliano et al. 2026). In the Canary Islands, *Sphingonotus* is represented by eight endemic species, three of which belong to the subgenus *Neosphingonotus*: *Sphingonotus* (*Neosphingonotus*) *pachecoi* (Bolívar, 1908), *S.* (*Neosphingonotus*) *fuerteventurae* Husemann, 2008 and *S.* (*Neosphingonotus*) *sublaevis* (Bolívar, 1908). Five species belong to the nominal subgenus: *Sphingonotus* (*Sphingonotus*) *willemsei* Mistshenko, 1937, *S.* (*Sphingonotus*) *ganchus* (Johnsen, 1985), *S.* (*Sphingonotus*) *rugosus* (Bland & Gangwere, 1998), *S.* (*Sphingonotus*) *picteti* (Krauss, 1892) and *S.* (*Sphingonotus*) *asper* (Brullé, 1840)). The

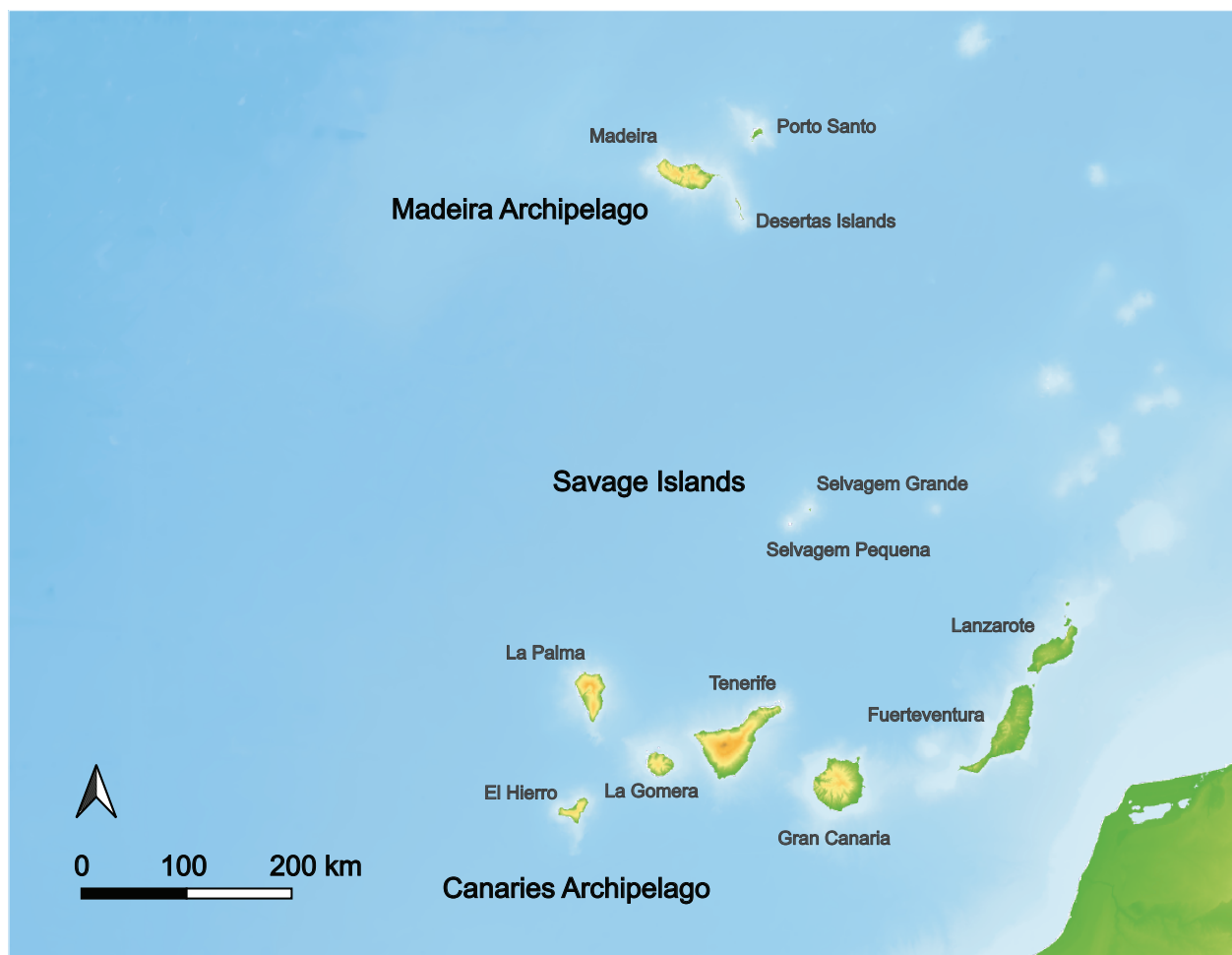


Figure 1. A map of north-eastern Macaronesia including the Savage Islands. *Sphingonotus axeli* sp. nov. is endemic to Selvagem Grande, *S. rubescens* occurs on Selvagem Grande and Madeira.

endemics are complemented by two widespread species of the nominal subgenus occurring on most islands: *Sphingonotus* (*Sphingonotus*) *rubescens* (Walker, 1870) and *S.* (*Sphingonotus*) *savignyi* de Saussure, 1884. The Cape Verdes also host two endemic taxa of the subgenus *Sphingonotus*: *Sphingonotus* (*Sphingonotus*) *atlanticus* (Popov, 1884) and *S.* (*Sphingonotus*) *rubescens burri* Chopard, 1936), complemented by the widespread *S.* (*Neosphingonotus*) *canariensis* Saussure, 1884, *S.* (*Sphingonotus*) *savignyi* and *S.* (*Sphingonotus*) *rubescens rubescens*. *Sphingonotus* (*Sphingonotus*) *rubescens rubescens* was also previously reported from Madeira. So far, no species of *Sphingonotus* have been reported from the Azores and the Salvages. Here, we report *S.* (*Sphingonotus*) *rubescens* for the first time for the Salvages and describe a new species from the same archipelago.

Materials and methods

We examined specimens assigned to the genus *Sphingonotus*, collected on the Salvage Islands, the Canary Islands and Madeira from the following repositories:

Muséum national d'Histoire naturelle, Paris, France (MNHN); Academy of Natural Sciences of Drexel University, Philadelphia, U.S.A. (ANSP); Natural History Museum Vienna, Austria (NMW); Staatliche Museum für Naturkunde Karlsruhe, Germany (SMNK); and Leibniz-Institut zur Analyse des Biodiversitätswandels, Bonn, Germany (ZFMK). The specimens included the rediscovered type specimens of *Sphingonotus* (*Neosphingonotus*) *asper* and the neotypes of *S.* (*Neosphingonotus*) *pachecoi*. Specimens of *Sphingonotus asper* were either imaged with a Canon EOS 200d and a 100 mm Canon macro lens or with a Canon EOS 5DS and a 100 mm macro lens implemented in a custom-made DUN Inc. stacking system. Measurements were taken with a digital steel caliper to the nearest 0.1 mm.

Results and discussion

Taxonomy

Family Acrididae MacLeay, 1821

Subfamily Oedipodinae Walker, 1871

Genus *Sphingonotus* Fieber, 1852

Subgenus *Sphingonotus* Fieber, 1852

Sphingonotus (Sphingonotus) axeli sp. nov.

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Fig. 2

Type material. Holotype: • 1 ♂, Portugal, Selvagens-Inseln, Selvagen-Grande, P. Wagner, 2001. SEL-046-01. ZFMK.

Paratypes: • 2 ♂♂, MNHN-EO-Caelif-3184, -3185; [previous identification label] *Sphingonotus rubescens rubescens* (Walker), M. Descamps det. 1964; Grande Salvage, 24-7-63, Johanin leg; • 6 ♀♀, MNHN-EO-Caelif-3186 to -3190, -3192; [previous identification label] *Sphingonotus rubescens rubescens* (Walker), M. Descamps det. 1964; Grande Salvage, 24-7-63, Johanin leg. All in MNHN, besides one male and one female at SMNK.

Etymology. The new species is named after Prof. Dr. Axel Hochkirch, in honor of his important work in the conservation of Orthoptera, also in the Macaronesian archipelago. The first author also is grateful to Axel as he as BSc and MSc advisor of MH sparked his interest in the genus *Sphingonotus* and in grasshoppers in general. The name is a Latinized genitive of his first name.

Distribution. The species is endemic to the Salvage Islands (Portugal) and to date is only known from the main island (Selvagem Grande).

Description of the holotype. Habitus as typical for the genus; small to medium size: length from fastigium of vertex to end of tegmina 18.4 mm.

Coloration. Color pattern similar to other *Sphingonotus* species, brown to beige. Ventrally light beige. Head bluish grey. Antennae alternating dark and light brown. Outer lower area of hind femora whitish; inner lower area light beige. Inner side of hind femora dark with one incomplete and one complete light band before the knee. Hind tibiae bluish grey with brown spines, spines light at the base, tip dark. Tegmina translucent brownish with irregular darker markings, veins mostly beige, distal part with darker veins. Hindwings not visible.

Head: Antennae filiform, longer than head and pronotum together. Frontal ridge slightly concave with lateral carinae, widest part slightly below antennae at level of ocellus. Fastigium verticis straight; lateral carinulae and central carina present. Fastigial foveolae triangular, small, clearly visible.

Thorax: Pronotal disc rugose with three complete transverse sulci; median carina present in anterior part of prozona and in metazona, raised in complete metazona; posterior margin almost rectangular (slightly acutely angled) with rounded tip; lateral carinae of metazona missing or just slightly developed; upper hind angles of pronotum comparatively steep (“shoulders”). Metazona of pronotum longer than prozona (see measurements). Mesosternal interspace wider than long.

Wings: Tegmina in basal part densely reticulated, narrow. Intercalary vein largely straight, slightly bent posteriorly, with fine and dense serration. Costal margin expanded.

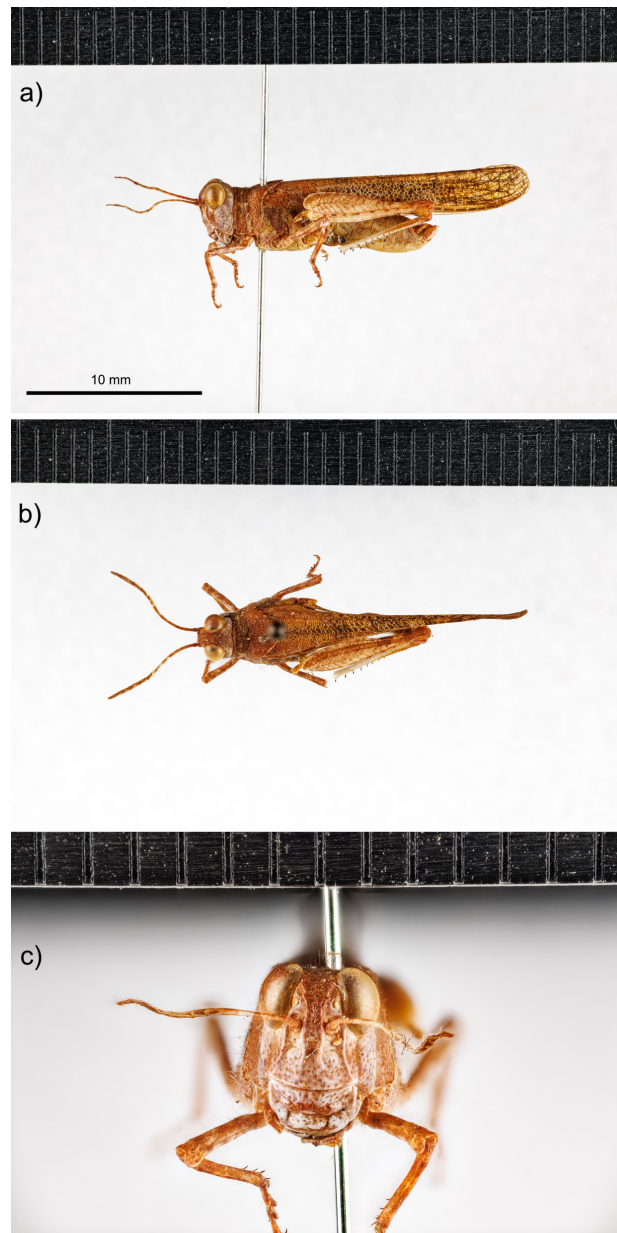


Figure 2. *Sphingonotus axeli* sp. nov. in **a.** Lateral; **b.** Dorsal; **c.** frontal view; **d.** Original labels of the holotype.

Hind femora: Hind femora longer than wide (see measurements). Spurs of hind tibiae of normal length; not elongated. Arolium small (slightly less than half of claw length).

Abdomen: Tympanum large, as high as long, broadly rounded; ventral lobe covering about 30% of anterior part of opening. Basal outer areas and apical area of supra-anal plate slightly concave, margins lightly elevated, basal part trilobite, outer lobes with strongly thickened ridges appearing similar to spines from above, tip broadly rounded. Cerci short, about as long as outer margins of supra-anal plate. Sub-genital plate trilobite, intermediate parts concave.

Measurements as in Table 1.

Male paratypes. As in holotype, but slightly differing in dimensions (see table). Coloration duller (likely more

Table 1. Measurements of *Sphingonotus (Sphingonotus) axeli* sp. nov. [in mm].

Specimen	sex	Body length (fastigium to tip of tegmen)	Elytra length	Elytra width (widest point)	Pronotum length	Femora length	Femora width	Tibia length
Holotype	male	18.5	14.9	2.4	3.0	7.6	2.0	6.7
Paratype (MNHN 3184)	male	20.0	17.0	2.8	2.7	7.5	2.6	6.7
Paratype (MNHN 3185)	male	18.8	15.9	2.6	2.7	7.7	2.1	6.7
Paratype (MNHN 3186)	female	26.6	21.9	3.2	4.3	10.5	2.6	9.3
Paratype (MNHN 3187)	female	25.6	19.8	3.4	3.8	10.5	2.8	8.4
Paratype (MNHN 3188)	female	26.2	20.5	3.1	3.8	10.7	2.8	9.3
Paratype (MNHN 3189)	female	24.6	20.8	3.4	4.2	9.9	2.9	9.2
Paratype (MNHN 3190)	female	25.4	20.6	3.3	3.6	10.4	2.5	9.5
Paratype (MNHN 3192)	female	27.4	22.4	3.6	4.3	10.5	2.6	9.0

discolored). Hind wings transparent, slightly hyaline with darkened veins, no dark or colored bands. Frontal ridge slightly concave with lateral carinae, widest part between antennae and level of ocellus. Fastigium verticis straight; lateral carinulae present, central carinae in one specimen absent (MNHN-3185). Fastigial foveolae triangular, small, less distinct than in holotype. Basal outer areas and apical area of supra-anal plate slightly concave, margins lightly elevated, basal part trilobite, outer lobes with thickened ridges appearing similar to spines from above, but less so than in holotype.

Females. Habitus as typical for the genus; medium size: length from fastigium of vertex to end of tegmina 24.6 and 27.4 mm.

Coloration: Color pattern similar to other *Sphingonotus* species, brown to beige. Ventrally light beige. Head bluish grey. Antennae alternating dark and light brown. Outer lower area of hind femora whitish; inner lower area light beige. Inner side of hind femora dark with one incomplete and one complete light band before the knee. Hind tibiae bluish grey with brown spines, spines light at the base, tip dark. Tegmina translucent brownish with irregular darker markings, veins mostly beige, distal part with darker veins, no dark or colored bands. Hind wings transparent, slightly hyaline with darkened veins.

Head: Antennae filiform, longer than head and pronotum together. Frontal ridge slightly concave with lateral carinae, widest part between antennae and level of ocellus or at level of ocellus. Fastigium verticis straight; lateral carinulae present, central carina visible only in some individuals. Fastigial foveolae triangular, small, indistinct.

Thorax: Pronotal disc rugose with three complete transverse sulci; median carina present in anterior part of prozona and in metazona, raised in complete metazona; posterior margin almost rectangular (slightly acutely angled) with rounded tip; lateral carinae missing or slightly developed in metazona; upper hind angles of pronotum comparatively steep ("shoulders"). Metazona of pronotum longer than prozona (see measurements). Mesosternal interspace wider than long.

Wings: Tegmina in basal part densely reticulated, narrow. Intercalary vein largely straight, slightly bent posteriorly, in parts dissolved, no visible serration. Costal margin expanded.

Hind femora: Hind femora longer than wide (see measurements). Spurs of hind tibiae of normal length. Arolium small (slightly less than half of claw length).

Abdomen: Tympanum large, as high as long, broadly rounded; about 30% of the opening is anteriorly covered by the ventral lobe. Valves of ovipositor short, margins darkened. Sub-genital plate widening posteriorly, posterior margin straight; distal half with two depressions separated by a ridge; depressions with a distal dot. Supra-anal plate obtusely angled without further features.

Measurements as in Table 1.

Differential diagnosis. *Sphingonotus (Sphingonotus) axeli* sp. nov. is endemic to the Savage Islands, where only a single additional species of the genus *Sphingonotus* is known from: the widespread *Sphingonotus (Sphingonotus) rubescens*. The two species are distinguished by the different shape of the intercalary vein: S-shaped in *S. rubescens* and rather straight in *S. (Sphingonotus) axeli* sp. nov.; and by the differently angled metazona of the pronotum: slightly acutely angled in *S. axeli* sp. nov., slightly obtusely angled and more rounded in *S. rubescens*. Furthermore, they differ in size, with *S. (Sphingonotus) rubescens* being the larger species. The other non-endemic, more widespread species in the Macaronesian islands are *S. (Neosphingonotus) canariensis* and *Sphingonotus (Sphingonotus) savignyi*. Both species can be easily distinguished by the dark wing band on the hind wings (beyond a variety of other differences). *Sphingonotus (Neosphingonotus) canariensis* furthermore has the typical stridulatory apparatus of the subgenus *Neosphingonotus* (elevated cross veinlets between radius and media), whereas the new species has the typical serrate intercalary vein in males.

Further material studied. *Sphingonotus (Sphingonotus) rubescens*.

SAVAGE ISLANDS: • 1 ♂: MNHN-EO-Caelif-3183, *Sphingonotus rubescens* (Walk.), det. B. Uvarov 1936, *S. coerulans* 4, Chopard det., Museum Paris, Grande Salvage, 2 Tage 6.8.33. • 1 ♀: MNHN-EO-Caelif-3193, *Sphingonotus rubescens rubescens* (Walker), M. Descamps det. 1964, Grande Salvage, 24.0.63, Johanin rec.

MADEIRA: • 1 ♀, MNHN-EO-Caelif-3179, Porto Santo (Mad.), 6.–12.07.1957, Lindberg. • 1 ♀, MNHN-EO-Caelif-3180, Mad., Deserta Grande, 20.–21.06.1957,

Lindberg. • 1 ♀, MNHN-EO-Caelif-3181, Museum Paris, Madère (V-VI), CH. Alluaud 1938. • 1 ♀, MNHN-EO-Caelif-3182, Porto Santo (Mad.), 6.–12.07.1957, Lindberg.

Note. First record of *Sphingonotus rubescens* for the Salvage Islands.

Sphingonotus asper (Brullé, 1840)

Fig. 3

Type material. • 1 ♀, TYPE, Museum Paris, Canaries, Webb et Berthelot, 3-41, asperum Br.

Due to great interest in the genus on the islands, additional species had been recorded and described in the past, but have been either found to be synonymous (*S. freyi* Uvarov, 1948, *Acridium asperum* Brullé, 1840), or based on misidentification (*S. (Neosphingonotus) paradoxus*, *S. (Neosphingonotus) canariensis*, *S. (Sphingonotus) picte-*

ti). The status of most other species has been confirmed in previous studies (e.g., Hochkirch and Husemann 2008), but the location of the type of *S. (Neosphingonotus) asper* remained unknown. The type was rediscovered in the MNHN (Fig. 3). The type location is not defined for the species and only given as “Canaries”. Based on the morphology, we establish *S. (Neosphingonotus) asper* to be synonymous with *S. (Neosphingonotus) pachecoi* (Fig. 4). As no type location is known from *S. (Neosphingonotus) asper* and the Canarian endemics are usually only found on a single island, we synonymize the two and consider *S. (Neosphingonotus) pachecoi* as the valid name. As *S. (Neosphingonotus) pachecoi* has been shown to have cross veins typical for the subgenus *Neosphingonotus* (see Hochkirch and Husemann 2008), it is assigned to this subgenus.

Thus, we propose the following synonymy: *Sphingonotus (Neosphingonotus) asper* (Brullé, 1840) = *Sphingonotus (Neosphingonotus) pachecoi* (Bolívar, 1908).

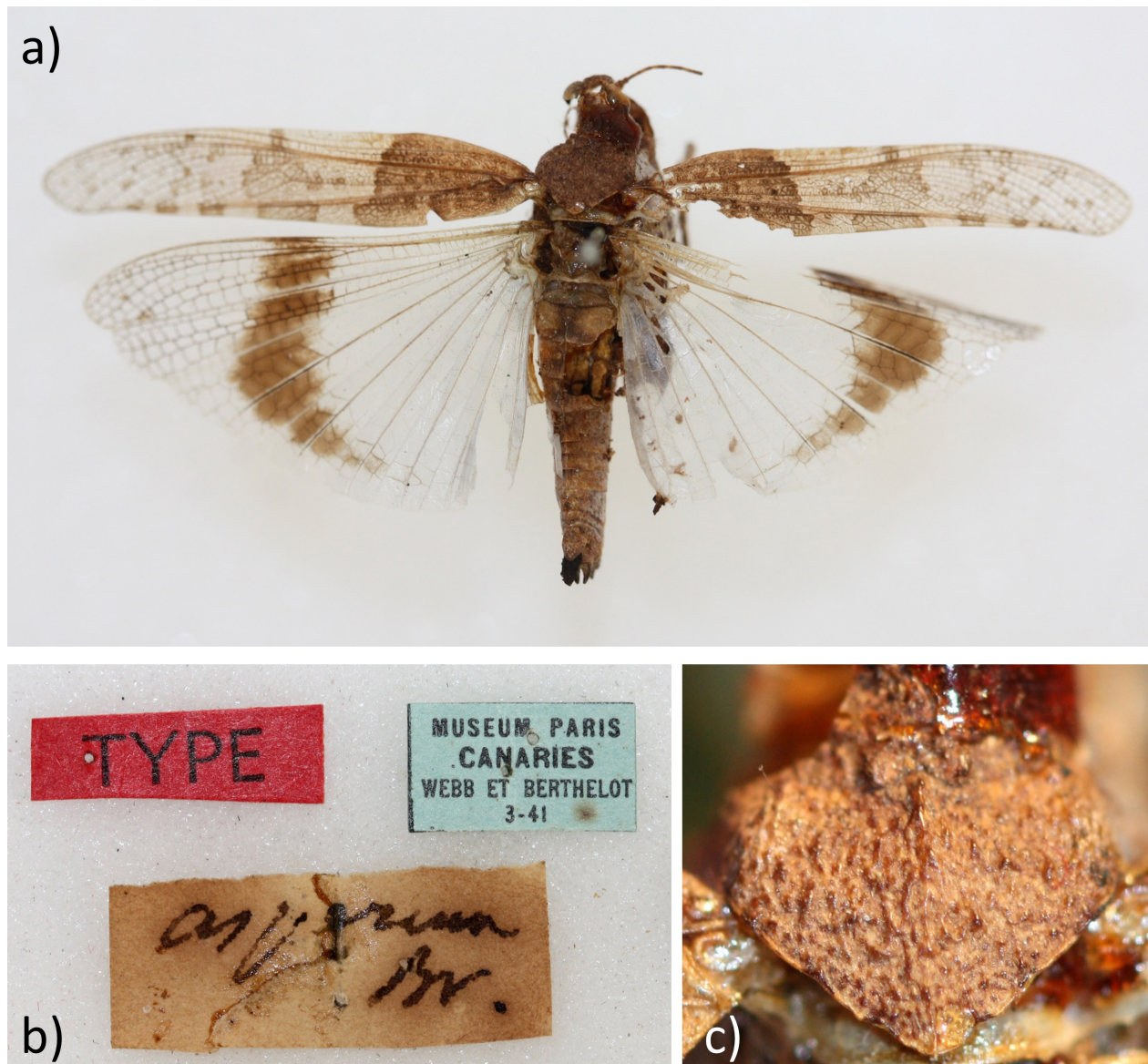


Figure 3. The rediscovered type specimen of *Sphingonotus asper* from the MNHN Paris. The figure shows the a) a dorsal view, b) the label, and c) the pronotum.

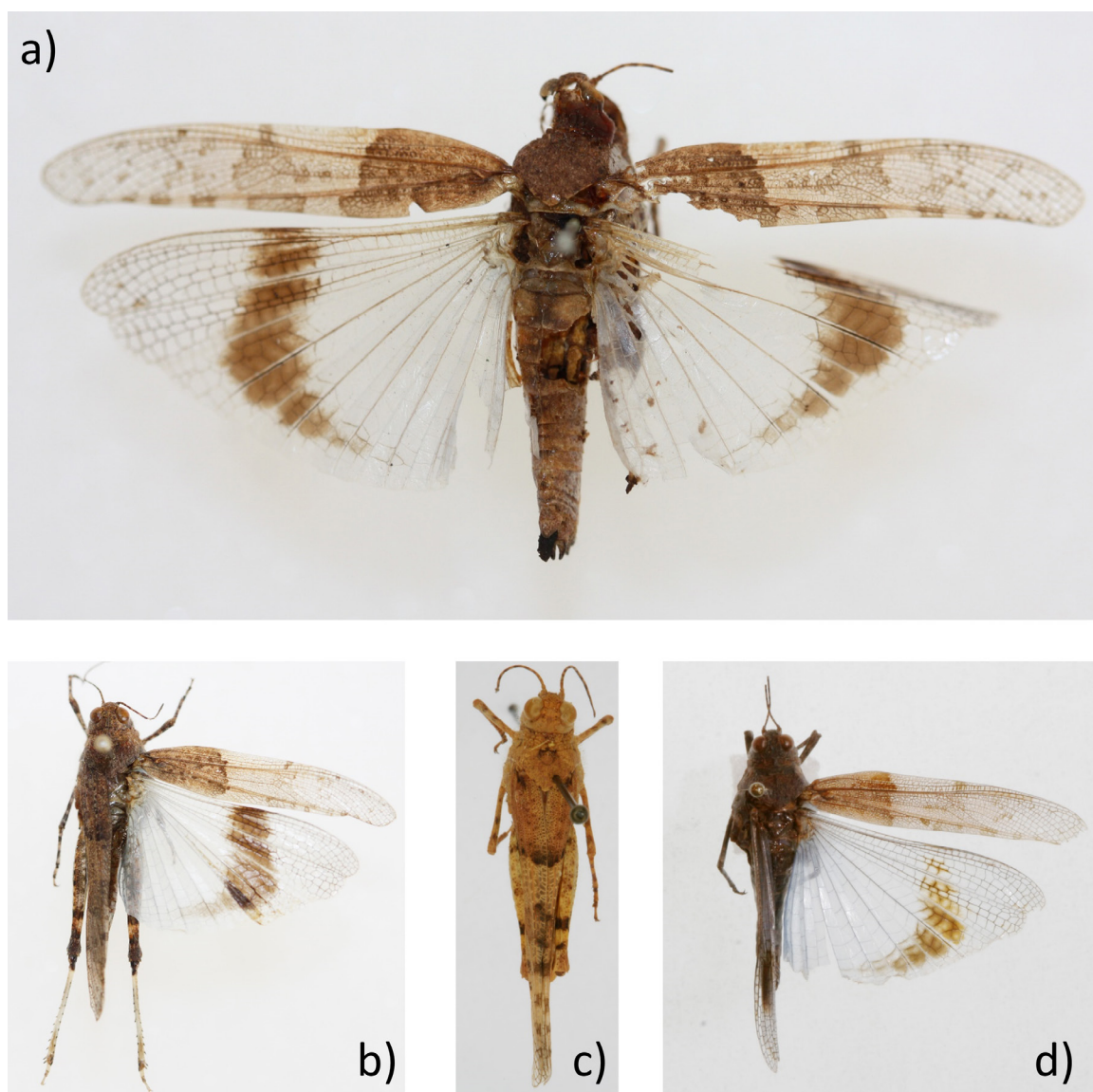


Figure 4. Dorsal view of the type of **a.** *S. asper*; **b.** A topotype of *S. (Neosphingonotus) pachecoi* from Lanzarote housed in the MNHN; **c.** A paratype of *S. (Neosphingonotus) sublaevis* from Gran Canaria housed at the Natural History Museum London; **d.** A paratype of *S. (Neosphingonotus) fuerteventurae* from Fuerteventura housed at the collection of the ANSP.

The above made changes together with distribution data derived from the literature leads to the current distributions of the taxa found on Macaronesia islands.

Updated species list for the Macaronesia Islands

Salvage Islands

Sphingonotus (Sphingonotus) axeli sp. nov. – endemic (Selvagem Grande – this study).

Sphingonotus (Sphingonotus) rubescens (Walker, 1870) – widespread (Porto Santo, Deserta Grande – this study).

Madeira

Sphingonotus (Sphingonotus) rubescens (Walker, 1870) – widespread (Porto Santo and Ponta de Sao Lourenco – Lange 1990).

Canary Islands

Sphingonotus (Neosphingonotus) fuerteventurae Husemann, 2008 – Fuerteventura – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Neosphingonotus) pachecoi (Bolívar, 1908) – Lanzarote – endemic (Husemann and Hochkirch 2008).

(Sphingonotus (Neosphingonotus) asper (Brullé, 1840) – syn. nov. of *S. (Neosphingonotus) pachecoi* (this study).

Sphingonotus (Sphingonotus) guanchus (Johnson, 1985) – Gran Canaria – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Neosphingonotus) sublaevis (Bolívar, 1908) – Gran Canaria – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Sphingonotus) picteti (Krauss, 1892) – Tenerife – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Sphingonotus) rugosus (Bland & Gangwere, 1998) – Lanzarote – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Sphingonotus) willemsei Mistshenko, 1937 – Tenerife – endemic (Husemann and Hochkirch 2008).

Sphingonotus (Sphingonotus) savignyi savignyi Saussure, 1884 – widespread (Husemann and Hochkirch 2008).

Sphingonotus (Sphingonotus) rubescens rubescens (Walker, 1870) – widespread (Husemann and Hochkirch 2008).

Cape Verde Islands

Sphingonotus (Neosphingonotus) canariensis canariensis Saussure, 1884 – widespread (most islands – Duranton et al. 1984).

Sphingonotus (Sphingonotus) atlanticus Popov, 1984 – endemic (Sta. Luzia – Duranton et al. 1984).

Sphingonotus (Sphingonotus) rubescens burri Chopard, 1936 – endemic (distribution unclear due to potential confusions with the nominate form).

Sphingonotus (Sphingonotus) savignyi savignyi Saussure, 1884 – widespread.

(Sphingonotus (Sphingonotus) picteti (Krauss, 1892) – according to Duranton et al. 1984 (only a single larva identified as *S. picteti*, hence the presence of the species highly unlikely)).

Sphingonotus (Sphingonotus) rubescens rubescens (Walker, 1870) – according to Duranton et al. 1984 (the presence of the latter three species can be doubted and has to be further evaluated, we had no specimens at hand).

Azores

No record of the genus so far (Hochkirch, pers. comm. 10.01.2023).

Discussion

We here update the species list of the genus *Sphingonotus* for the Macaronesian Islands, report *S. (Sphingonotus) rubescens* for the Salvages for the first time and describe a new species *S. (Sphingonotus) axeli* from the Salvages. This data shows the value of natural history collections for the detection of new species and provides important new records and distribution data for a grasshopper genus on these islands. Our study shows that even on relatively well explored islands new species can still be discovered. This naming of new taxa remains an important task also for conservation purposes, as only named species generally receive protection. Especially endemics on smaller islands may be under threat from anthropogenic pressures, as their populations are limited in size and remigra-

tion from other sources is not possible. Hence, the study of the orthopteran faunas of remote oceanic islands will remain an important task also in the future. The intensive study of existing collections may also help to understand changes in these island faunas and will further complement our knowledge on faunal turnover on these biodiversity laboratories.

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