

A remarkable new species of *Phocides* (Lepidoptera: HesperIIDae) from Bolivia and taxonomic considerations on *Phocides charon*

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ABSTRACT. A new skipper butterfly, *Phocides petroleum* Siewert, Leviski, Mielke & Casagrande sp. nov. is described and illustrated from Caranavi, La Paz Department, Bolivia. The new species seems closely related to *Phocides charon* (C. Felder & R. Felder, 1859) but could be easily distinguished by a set of external characteristics. Lectotypes are designated for *Erycides charon* C. Felder & R. Felder, 1859 and *Erycides scythron* Godman & Salvin, 1879.

KEYWORDS. Butterfly, Eudaminae, Neotropical, systematic, taxonomy.

Among the seven subfamilies recognized in HesperIIDae, Eudaminae stands out with over 110 species allocated in 17 genera distributed on Neotropics (with exception of the Asian genus *Lobocla* Moore, 1884) (WARREN *et al.*, 2009, 2017). Although no morphological synapomorphy has been recognized yet, Eudaminae was recently treated as a subfamily separated from Pyrginae (WARREN *et al.*, 2009; SAHOO *et al.*, 2016, 2017). The adults can be partly characterized by the long forewing discal cell and by the long hind wings, produced at the tornus, with the dorsum longer than the abdomen (WARREN *et al.*, 2009). However the generic relationships within the most Eudaminae are poorly resolved, and futures studies are encouraged to be conducted to improve the knowledge of their relationships.

Phocides Hübner, [1819] is a notorious genus of Eudaminae with 18 described species characterized mostly by the blue, white and black wing pattern (MIELKE, 2005). The genus is part of a large and complex mimicry system together with *Tarsoctenus* Watson, 1893 (Eudaminae) and the pyrhopygines *Elbella* Evans, 1951, *Granila* Mabilie, 1903, *Jemadia* Watson, 1893, *Parelbella* Mielke, 1995, *Protellabella* Mielke, 1995, and *Zonia* Evans, 1951.

Two specimens of *Phocides* from Bolivia closely related to *Phocides charon* (C. Felder & R. Felder, 1859) drew our attention due its remarkable wing pattern during the study of Eudaminae from the Olaf Mielke collection in Coleção Entomológica Pe. Jesus Santiago Moure of the

Departamento de Zoologia of Universidade Federal do Paraná, Brazil (DZUP-OM). With the aim to contribute to the knowledge of the Neotropical biodiversity of HesperIIDae, this paper describes a new species of *Phocides* from Caranavi, La Paz, Bolivia, and provides taxonomic considerations on *P. charon* and on its associated synonyms.

MATERIAL AND METHODS

The specimens dissected had their abdomens detached and soaked in a heated 10% potassium hydroxide solution (KOH) for about 5-10 minutes. The genitalia was removed and its structures were analyzed and illustrated with the aid of a camera lucida attached to a stereoscopic microscope. The dissected parts were kept in vials with glycerin. For the morphological study, the terminology follows CARNEIRO *et al.* (2012, 2013). The specimens dissected are indicated with an asterisk and in 'Type Material' section the labels are separated by '/'.

All specimens studied are from the Olaf Mielke collection in Padre Jesus Santiago Moure collection, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (DZUP-OM), Natural History Museum, London, United Kingdom (NHMUK), Zoologische Staatssammlung München, München, Germany (ZSM), and Museum für Naturkunde Leibniz-Institut für Evolutions und Biodiversitätsforschung an der Humboldt-Universität zu Berlin, Germany (ZMHU).

RESULTS

Phocides petroleum Siewert, Leviski, Mielke
& Casagrande sp. nov.

(Figs 1, 2, 5, 7)

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CF8E58293844

Diagnosis. *Phocides petroleum* sp. nov. resembles *P. charon* (Figs 3, 4, 6) externally, but differing from the latter by the whitish blue patch from costa to the middle of discal cell on the underside of forewings, the whitish blue patch at basal area from costa to 2A on the underside of hind wings, the absence of yellow fringes on the tornus of hind wings, and the deepest serrated distal margin of uncus.

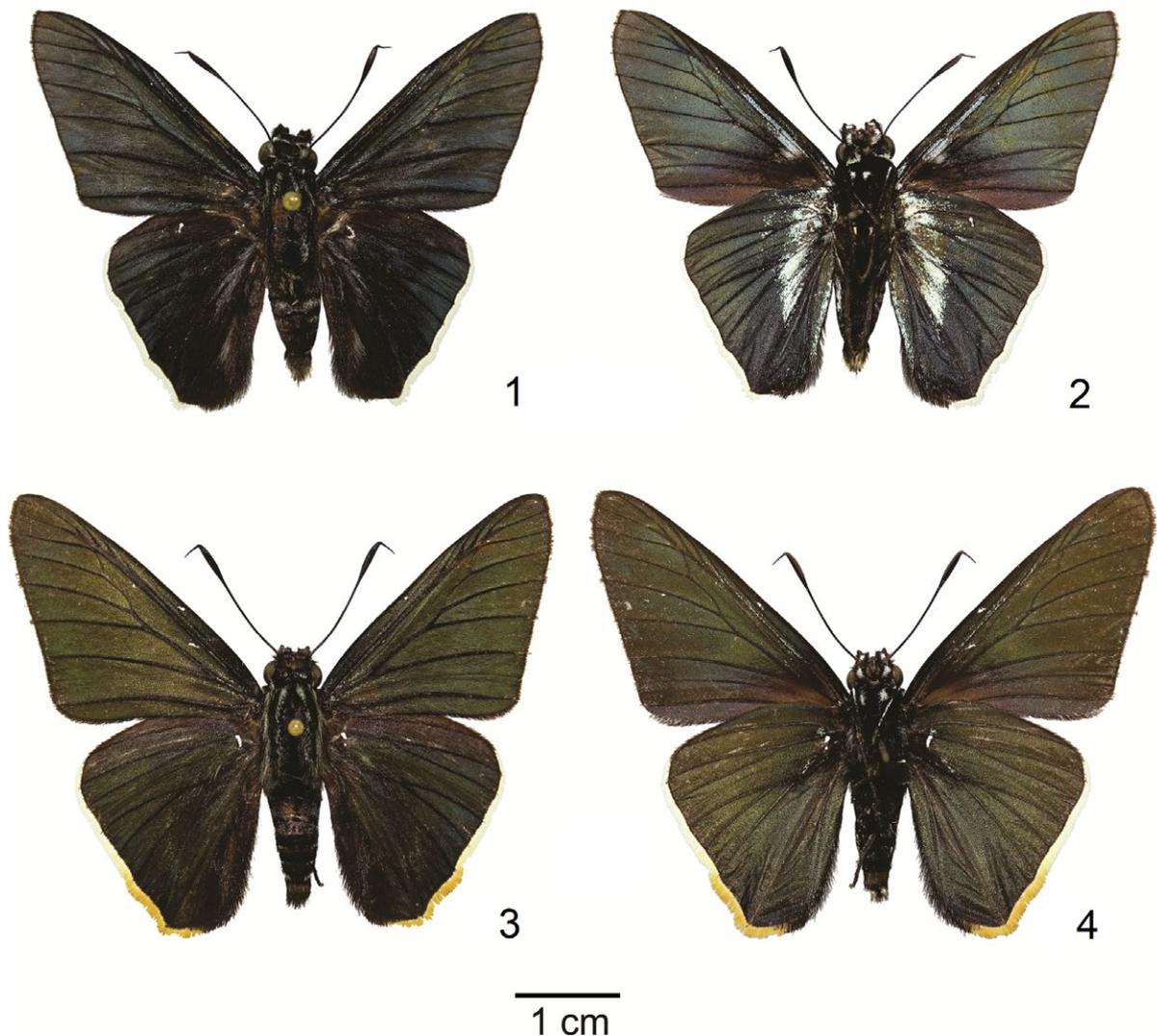
Description. Head: dark brown, frons covered by dark brown and whitish blue scales; antenna dark brown, nudum 37-38 (n=2); labial palpus dark brown, base of first segment mixed with dark brown and whitish blue scales

ventrally, second segment with a distal circular whitish blue spot, third segment entirely dark brown, stout.

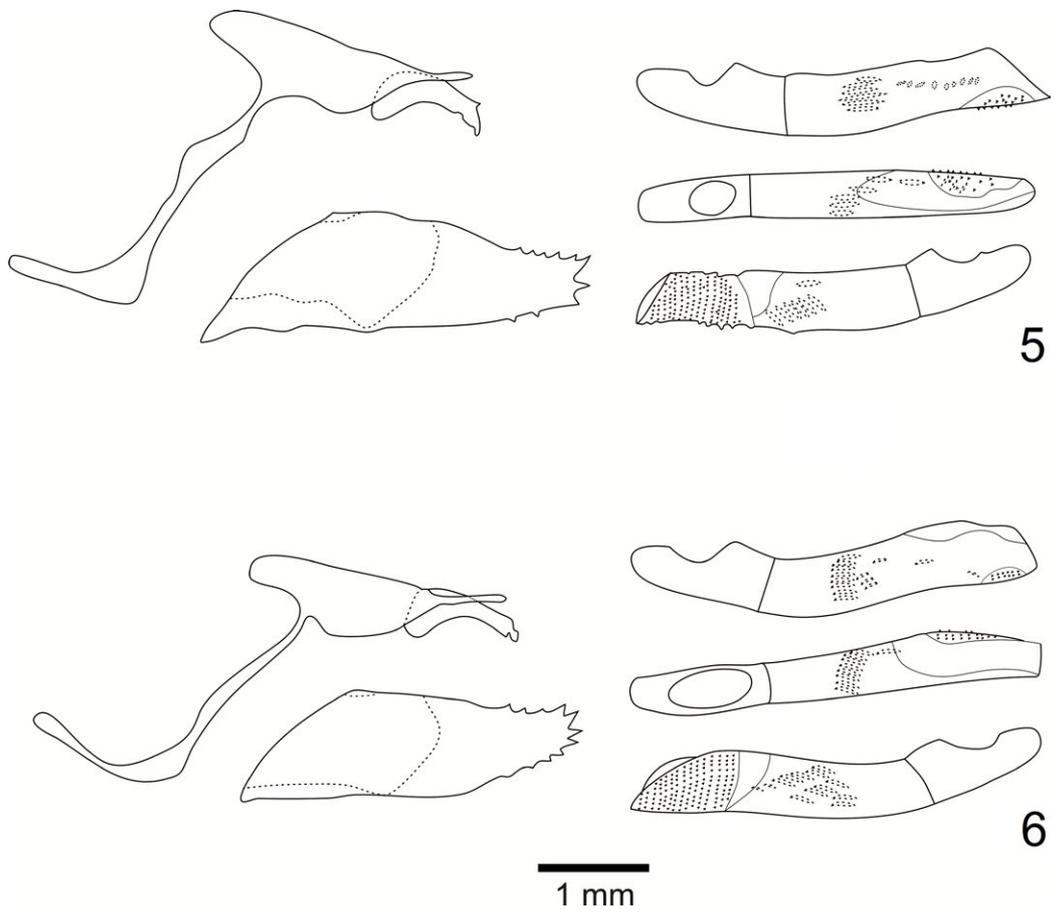
Thorax: dorsally and laterally dark brown with sparse whitish blue scales, ventrally dark brown; legs dark brown with whitish blue scales. Forewing, upper side: 26mm. Ground color iridescent dark cobalt blue; fringes white. Hind wing, upper side: similar as forewings. Forewing, underside: similar to upper side with a whitish blue patch at basal area from costa to 2A; anal margin with sparse whitish blue scales. Hind wing, underside: similar to upper side with a whitish blue patch from costa to the middle of discal cell; iridescent purple from CuA₂ to internal margin.

Abdomen: dorsally and laterally dark brown with sparse whitish blue scales, ventrally dark brown.

Male genitalia: tegumen rounded; distal margin with a pair of lateral apophysis with almost same size of uncus; ventral arm of tegumen fused to the dorsal arm of saccus. Anterior projection of saccus rounded, as long as uncus. Uncus shorter than tegumen, simple, slender, and thin distally. Gnathos absent. Valva three times as long as



Figs 1–4. Habitus of *Phocides* species. Figs 1, 2, *Phocides petroleum* sp. nov., holotype, in dorsal (1) and ventral (2) views; Figs 3, 4, *Phocides charon* (C. Felder & R. Felder, 1859) in dorsal (3) and ventral (4) views.



Figs 5, 6. Male genitalia of *Phocides* species: tegumen and uncus in lateral view; valva in external view; aedeagus in left, dorsal and right views: Fig. 5, *Phocides petroleum* sp. nov.; Fig. 6, *Phocides charon* (C. Felder & R. Felder, 1859) from Villarica, Paraguay (DZ 39.712).

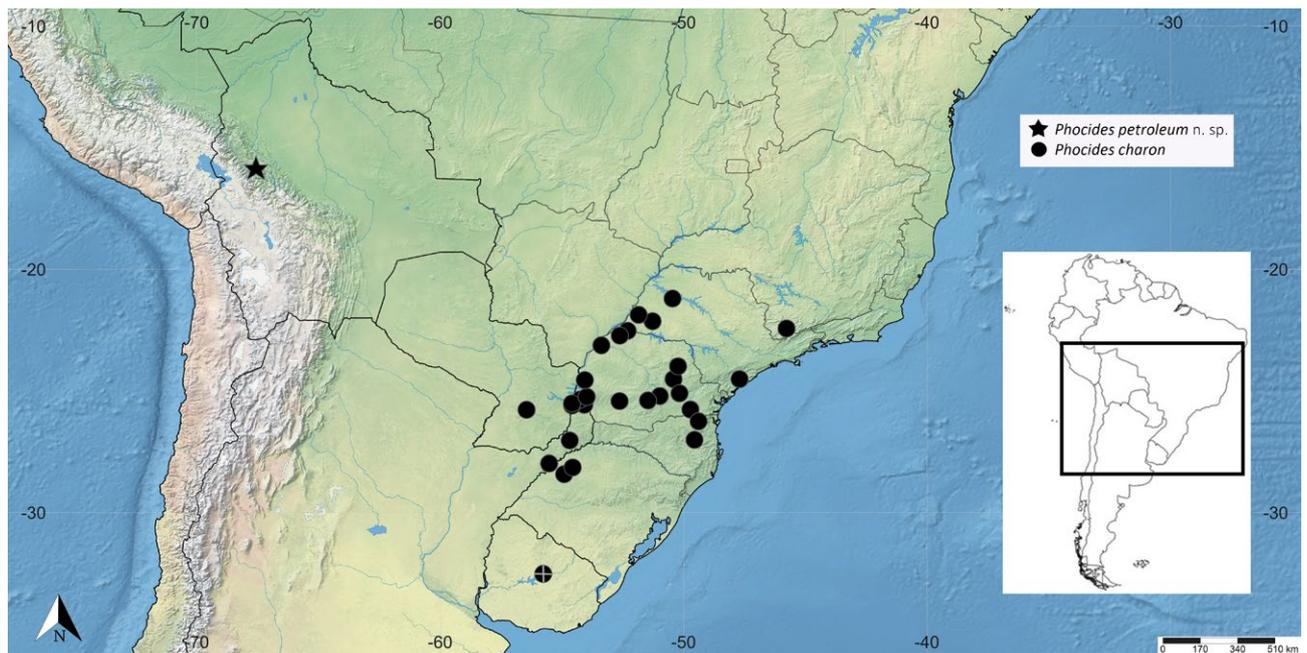


Fig. 7. Distribution of *Phocides petroleum* sp. nov. and *P. charon* (C. Felder & R. Felder, 1859).

wide; distal margin deeply serrated. Aedeagus thick; coecum rounded; opening for ejaculatory bulb ovoid; third distal portion of aedeagus covered by small spines; distal opening of aedeagus dorsal; cornuti as numerous spines.

Female remains unknown.

Type Material. Holotype. ♂ from Caranavi, La Paz Department, Bolivia, deposited at DZUP-OM with the following labels: /HOLOTYPUS/ VIII-1989 CARANAVI BOLÍVIA, 600-1000 m C. Tello leg./ OM 23.853 /HOLOTYPUS *Phocides petroleum* Siewert, Leviski, Mielke & Casagrande/. Paratype ♂. BOLIVIA: La Paz – Caranavi Area, 1100-2100 m, XII-2012-I-2013, C. Tello leg., OM 61.335* (DZUP-OM).

Etymology. This species is named after the beer Dum Petroleum. The Dum is an Brazilian brewery located in Curitiba, Paraná, founded in July 2010. The name is also in reference to the iridescent dark cobalt blue of wings, resembling the petroleum.

Distribution. *Phocides petroleum* sp. nov. is known only from its type locality.

DISCUSSION

Phocides petroleum sp. nov. is easily distinguished from *P. charon* by its external morphology. Until now, *P.*

petroleum sp. nov. is known only from Caranavi, La Paz, Bolivia while *P. charon* has its occurrence recorded in several Southeast (Minas Gerais and São Paulo) and South Brazilian states (Paraná, Santa Catarina and Rio Grande do Sul), Uruguay (SCHWEIZER & KAY, 1941), Argentina (Chaco and Misiones) (HAYWARD, 1973), and Paraguay (Tab. I, Fig. 7). The record from Peru reported by DRAUDT (1921) is probably wrong.

Concerning the morphology of male genitalia, *Phocides* seems to follow a known pattern for many Eudaminae: the similarity of this structure even in not closely related species (GRISHIN, 2013). This is also the case of *P. petroleum* sp. nov. when compared to *P. charon*, possibly its closest ally, and also with other species from the genus (EVANS, 1952). The taxonomy of some Eudaminae could be difficult by the presence of many criptic species, and an integrative approach (*e.g.* BÄCHTOLD *et al.*, 2017) is a highly recommended tool to better understand the true diversity of Neotropical skippers.

Taxonomic considerations on *Phocides charon*.

Phocides charon has currently two synonyms: *Erycides scython* Godman & Salvin, 1879 described from Paraguay, without mentioning a specific locality, and *Erycides tophana* Plötz, 1879 described from Minas Gerais, Brazil. The former was synonymized in *P. charon* by EVANS (1952) while the

Tab. I. Geographical records of *Phocides charon* (C. Felder & R. Felder, 1859).

Country	State/Province	Municipality	Locality
Argentina	Chaco		No specific locality
Argentina	Misiones	Concepción de la Sierra	
Argentina	Misiones	Dos de Mayo	
Argentina	Misiones	General Belgrano	Almirante Brown, Reserva Yacutinga
Argentina	Misiones	Puerto Iguazú	
Brazil	Minas Gerais	Conceição dos Ouros	
Brazil	Paraná		12,5km N de Ventania
Brazil	Paraná		Rio das Cobras
Brazil	Paraná	Foz do Iguaçu	
Brazil	Paraná	Guararuava	Santa Clara
Brazil	Paraná	Lapa	Fazenda Uru
Brazil	Paraná	Marechal Cândido Rondon	Vila Mercedes
Brazil	Paraná	Matelândia	
Brazil	Paraná	Monte Castelo	
Brazil	Paraná	Ponta Grossa	
Brazil	Paraná	Prudentópolis	Reserva Particular do Patrimônio Natural Ninho do Corvo
Brazil	Paraná	São Miguel do Iguaçu	Parque Nacional do Iguaçu
Brazil	Paraná	Terra Rica	Parque Nacional Três Morrinhos
Brazil	Paraná	Tibagi	
Brazil	Rio Grande do Sul	Guarani das Missões	
Brazil	Rio Grande do Sul	São Luis Gonzaga	
Brazil	Santa Catarina	Ibirama	Barra do Prata
Brazil	Santa Catarina	São Bento do Sul	Rio Natal
Brazil	São Paulo	Araçatuba	
Brazil	São Paulo	Indiana	
Brazil	São Paulo	Presidente Venceslau	
Brazil	São Paulo	Rio Paraná	Porto Cabral
Brazil	São Paulo	Teodoro Sampaio	Parque Estadual Morro do Diabo
Paraguay	[Guairá]	Villarica	
Uruguay			No specific locality

latter was synonymized by HAYWARD (1933). The examination of the type material of *P. charon* and its synonyms led us to describe *P. petroleum* sp. nov. and designate lectotypes for *Erycides charon* C. Felder & R. Felder, 1859 and *E. scython*.

Erycides charon was described based on an unknown number of male specimens from Brazil. The species was reallocated in *Phocides* by DRUCE (1908). After studying the type material of the Felder collection deposited at NHMUK, one syntype male of *E. charon* from Brazil was found. To provide stability to the name proposed by C. Felder & R. Felder, this specimen is hereby designated as the lectotype. The male lectotype is illustrated in the Butterflies of America website (WARREN *et al.* 2017), and has the following labels: /Type / Type H T [verse of the same label: H 1 2 1] / 310 / Brazil merid Type / Felder Coll n. / *Erycides charon* Feld / *charon* n. / Rothschild Bequest B. M. 1939-1/. The following labels will be added: /LECTOTYPUS / Lectotype *Erycides charon* C. Felder & R. Felder, 1859 Siewert, Leviski, Mielke & Casagrande/.

Erycides scython was described without mention the number of specimens from Paraguay collected by Keith Johnson. After studying the Godman & Salvin type collection deposited at the NHMUK, one syntype male from Paraguay collected by Keith Johnson was found. To provide stability to the name proposed by Godman & Salvin, this specimen is hereby designated as the lectotype of *Erycides scython*. The male lectotype is illustrated in the Butterflies of America website (WARREN *et al.*, 2017), with the following labels: /Type H T [verse of the same label: H 1 2 2] / Paraguay. [Johnston]. Bates Coll. / ♂ / ♂ Paraguay / not found in HSW coll. 1879 / *Erycides scython* Type G. & S. / Godman-Salvin Coll. 1912.-23. *Phocides tophana* Plotz./ The following labels will be added: /LECTOTYPUS / Lectotype *Erycides scython* Godman & Salvin, 1879 Siewert, Leviski, Mielke & Casagrande/.

Erycides tophana was described based on a single specimen [holotype] from Minas Gerais, Brazil (carrying a label with the number 4943). The holotype is deposited at the ZMHU and has the following labels: /Lectotypus [should be Holotypus] / Type / 4943 / Minas V. Olf / *tophana* Pl. Type/. In ZSM there is another male specimen with the following labels: /Original / Brasil; S.[ão] Paulo / *Phocides tophana* Pl. Bras. / *Erycides tophana* Plötz / Paralectotypus *Erycides tophana* Plötz, 1879, Zool. Staatssammlg. München, O. Mielke det. 1979/. The 'Lectotypus' and 'Paralectotypus' labels were mistakenly added in these specimens by Olaf Mielke during his visit in these collections in 1970s. Plötz used to mention the exact number of specimens (through the codes) which was used to describe his species, therefore these labels should not be interpreted as true lectotypes and paralectotypes.

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