

# A remarkable new species of *Argyrophorus* Blanchard, 1852 from the Peruvian Andes (Lepidoptera, Nymphalidae; Satyrinae)

Joël DELMAS<sup>1</sup> & Yann DELMAS<sup>2</sup>

<sup>1</sup> 3, impasse du Lac, F-65460 Bours France. E-mail : joel.delmas@gmail.com  
<sup>2</sup> 25, rue André Ricaud, F-84440 Robion, France. E-mail : y.delmas@enzazaden.fr

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## Abstract

A new species of *Argyrophorus* Blanchard, 1852 is described from the puna grasslands of the Huayhuash cordillera of the Peruvian Andes: *A. splendens* Delmas J. & Delmas Y. nova sp. It resembles *A. lamna* Thieme, 1804 ventrally but is very different dorsally as it exhibits a shiny silvery reflection on the entire surface of the wings except for the dark fringe. This outstanding appearance was so far only found as a general trait, in another species of the same genus, *A. argenteus* Blanchard, 1852.

## Résumé

Une nouvelle espèce d'*Argyrophorus* Blanchard, 1852 est décrite de la puna de la cordillère Huayhuash dans les Andes péruviennes: *A. splendens* Delmas J. & Delmas Y. nova sp. Elle ressemble beaucoup à *A. lamna* Thieme, 1804 sur le revers des ailes, mais est totalement différente sur la face dorsale où, à l'exception des franges sombres, elle présente une réflexion argentée brillante sur la totalité de la surface alaire. Cette apparence exceptionnelle était jusque-là uniquement connue, comme caractéristique générale, chez une autre espèce du même genre, *A. argenteus* Blanchard, 1852.

## Key words

Lepidoptera, Nymphalidae, Satyrinae, *Argyrophorus*, *splendens*, new species, biodiversity, Neotropical region, Peru, Andes, taxonomy

## Abbreviations

MUSM: Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru;

FW: Forewing; DFW: Dorsal forewing; VFW: Ventral forewing; HW: Hindwing; DHW: Dorsal hindwing; VHW: Ventral hindwing; Genit.: Genitalia. R/V: recto-verso.

## Introduction

The Satyrinae subfamily is represented by more than 2500 species worldwide, the Neotropical region being the area with the greatest number of species. Among all the South American species, one of the most spectacular and well known is the "silver satyr" *Argyrophorus argenteus* Blanchard, 1852 from Chile and Argentina. Even though some other species of the same genus, as well as in the genus *Faunula* and

*Pampasatyrus*, also show some wide areas covered with metallic scales, their silver colour is generally rather dull and covering less than 50 % of the wings' surface. Whereas specimens entirely covered with metallic scales are known in some *Faunula euripides* Weymer, 1890 or *Argyrophorus gustavi* Staudinger, 1898, these usually represent an exceptional pattern among the array of forms displayed in these species. Hence, for more than one and a half century, *A. argenteus* was the only known Nymphalidae Satyrinae displaying a silver broadband reflection on the entire dorsal surface of the wings. The new taxa described in this paper probably represents the second Satyrinae species that displays such an outstanding homogeneous shiny metallic pattern as a general characteristic. This silver coloured reflection likely results from additive colour mixing induced by specific nanostructures composing the scales, as for *A. argenteus*.

This genus, that was represented by ten species before 1950, has been reduced to the only *A. argenteus* in the second half of the 20<sup>th</sup> century, after several authors had separated these ten species within some new genus. For instance, HEIMLICH described a new genus: *Punargentus*, 1963 for *A. lamna* and *A. angusta*. Following molecular analyses dedicated to Satyrinae taxonomy, the status of the newly described genus, including *Punargentus*, couldn't be confirmed by PEÑA *et al.* (2006).

In 2010, after studying morphological, ecological and biogeographic features, PYRCZ proposed to synonymize these new genus with *Argyrophorus*. That same year, a new species of *Argyrophorus*: *A. blanchardi*, was described by PYRCZ & WOJTUSIAK (2010). The new species described in this paper increases the species number of *Argyrophorus* to 12.

All the butterflies of this genus are found between the Andes of Northern Peru and Patagonia to the South. They are usually flying in open grassland, often scattered with small bushes at mid to high altitudes in Peru and Bolivia, to lowlands in Southern Patagonia. This genus displays one of the highest adaptations to cold climatic conditions among the Satyrinae, with some of its species flying at altitudes that very few other Satyrinae can overpass (at least up to 4850 m for *A. gustavi*) and others flying farther south in Patagonia than most other species from other genus can do (*A. antarcticus* and *A. chiliensis* in Chile and Argentina).

## Materials and methods

Type material, composed of six males coming from the same locality in Peru, was examined. Wings' pattern and morphology, including the holotype genitalia, were examined and compared to a series of eleven *Argyrophorus lamna* Thieme, 1804 from a neighbouring locality, as this species, and particularly the selected subspecies, is ventrally exhibiting the most similar pattern to *A. splendens*. It is also the closest species of the genera, geographically speaking. The male genitalia were dissected according to standard procedures, and mounted on glass slides with 70 % ethanol. Photographs of genitalia with the aedeagus extracted were taken in lateral view using a research stereomicroscope (AXIO Zoom.V16, Carl Zeiss).

The male genitalia of *A. lamna* were also extracted for comparison. Genitalia terminology follows KLOTS (1956). Wing terminology follows MILLER (1970). Photographs of adult specimens were made with an Olympus OMD E-M10II digital camera. Colour plates were composed using Adobe Lightroom 6.14.

## Results and discussion

### *Argyrophorus splendens* Delmas J. & Delmas Y., nova species (Fig. 1-3)

**Type locality.** Peru, Ancash (red area on the map), western slopes of the Huayhuash cordillera, rio Achin valley, 4200-4500 m a.s.l. (green circle on the map).



## Material examined

**Holotype** ♂: Peru, Ancash, western slopes of the Huayhuash cordillera, rio Achin valley, 4200-4500 m, June 17, 2012, J. Delmas leg., to be deposited in MUSM

**Paratypes** (5 ♂) : same data as the holotype, ex col. Y. Delmas, (prep. genit. M-GO6730/14.03.2019, G. ORHANT).

## Description

### Male (Figs. 1-2)

**Head:** Labial palpi three times as long as the eye diameter (0,9 mm in diameter), ventrally covered with very long black hairy scales and dorsally and laterally by shorter grey hairy scales, eyes coffee coloured, rather dull, antennae slender, half of the costa length (total length 9 mm), dorsally looking dark brown with antennae segments showing a grey basis almost until the club, ventrally uniform grey including the club, formed gradually, rather thin, 4 to 5 times thicker than shaft, and cylindrical.

**Thorax:** dark patagium, tegulae and prothorax rather sparsely covered with long ash grey hairy scales on both sides; legs: femora ventrally covered with black hairy scales, dorsally with ash grey hairy scales, tibiae and tarsi covered with ash grey scales with many amber spines, tibiae with a few long black hairs.



*Argyrophorus splendens*. Holotype ♂. R/V. Enlarged. Huayhuash cordillera, 4200 m, June 17, 2012, J. Delmas leg.

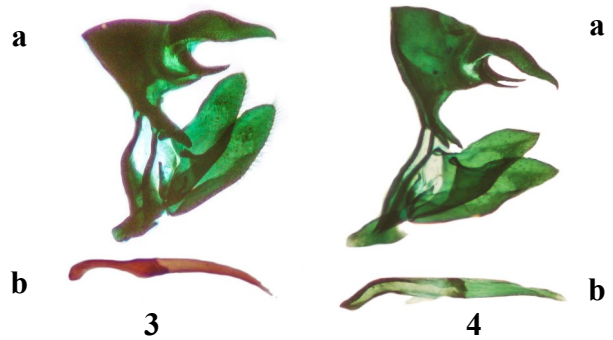
**Forewing (FW):** length 18 mm, with a subacute apex and slightly convex outer margin outlined by a dark grey fringe composed of very wide scales becoming leaner at the anal angle. DFW beside the fringe, exhibits a shiny silvery reflection on the entire wing surface (shinier and more extended than in related *A. lamna*). VFW chestnut brown on the central basal and discal area, with a grey costa and chocolate brown colour below Cu2 and up to the apex in the submarginal area. Postdiscal area showing yellowish almond shaped eye patterns outlined with black scales in cells R5-M1, M1-M2, M2-M3, M3-Cu1, with two central large non-pupiled black ocelli in cell M1-M2 and M2-M3 and a small black ocelli in cell M3-Cu1 (a small dot can also be present in cell Cu1-Cu2 as seen on one of the paratypes). Pattern prolonged by yellowish areas in cells R4-R5 and Cu1-Cu2. Marginal strip externally outlined by two adjoining lines: an internal black line extending from the apex to Cu2 and interrupted by venation coupled with an external continuous slightly thicker ash grey line diffusing along the costa part of the apex and on R5 and M1 in the submarginal area.

**Hindwing (HW):** Teardrop shaped. DHW with the same shiny silvery reflection as DFW except for a thin brown strip along the costa (also showing silvery reflection on some paratypes specimens). VHW chocolate brown contrasting with an ash grey wing venation joining the similarly coloured marginal line extending from M1 to 2A also found on the forewing contour, adjoining the same internal interrupted black marginal line. Discal area ground colour darker and separated from the basal area and from the postdiscal area by thick black broken lines. Postdiscal area exhibiting yellowish arrow shafts ended with black arrowheads in each cell between 3A and Rs, specially sharply designed in cells between 2A and Rs, each arrow shaft of these latest cells being adorned in its center with a black ocelli of decreasing size going from cell Rs-M1 to cell Cu2-2A. A vestigial yellowish line is present in Sc-R1-Rs cell. VFW and VHW very similar to those of neighbouring *A. lamna* populations.

**Abdomen:** dorsally covered with dusty black scales, ventrally covered with white, ash grey and sandy yellow scales.

**Male genitalia (Fig. 3):** Uncus slightly longer than tegumen, very stout (less thick in *A. lamna*: Fig. 4a), thicker and clearly dorsally domed in its median part; gnathos stout, long and strongly curved, approximately 2/3 the length of uncus; futura superior very elongated and straight; valvae 4/5 the length of tegumen+uncus with a rounded end (more pointed in *A. lamna*: Fig. 4a); saccus rather wide and short; aedeagus (Fig. 3b) slender, gently curved (straight in *A. lam-*

*na*: Fig. 4b), approximately as long as saccus + valvae, without lateral spines.



*Argyrophorus splendens n. sp.*

Male genitalia -

a: lateral view - b: aedeagus

*Argyrophorus lamna*

Male genitalia -

a: lateral view - b: aedeagus

**Female.** Unknown.

### Diagnosis

VFW and VHW pattern is very similar to *Argyrophorus lamna* Thieme, 1904 (Figs 5-6) and rather close to *Argyrophorus angusta picota* Fuchs, 1954 but dorsally, this species exhibits a shiny silvery reflection on the whole surface of the wings except for the dark fringe. So far, it is only sharing this spectacular appearance as a general trait with *Argyrophorus argenteus* Blanchard, 1852 (Figs 7-8), which is ventrally totally different, showing shiny silvery reflection on a large part of the VFW as well, whereas *A. splendens* is ventrally brownish.

### Distribution

This species is so far only known from the type locality (Fig. 9) and another nearby spot, on the western slopes of the Huayhuash cordillera, in the Ancash region of Peru. It is also likely occurring in the adjoining Lima region.

### Bionomics - Habitat

This species inhabits dry puna grassland biotopes and was observed between 4200 and 4500 m a.s.l.. It flies together with *Colias euxanthæ* C. & R. Felder. *A. splendens* is a fast flying butterfly. Males are patrolling rather close to the ground and let themselves be blown by the wind as soon as they are disturbed. The immature stages and larval food plants are unknown but are very likely some puna's grasses.

### Derivatio nominis

The name *splendens* comes from the latin *splendens* (= shining) and refers to the shiny silver reflection of the wings.



*Argyrophorus splendens*. Holotype ♂. R/V. scale 1/1  
Huayhuash cordillera, 4200 m, June 17, 2012, J. Delmas leg.

## Discussion

The underside pattern of this new species is extremely similar to the one of *Argyrophorus lamna* Thieme, 1904 from a nearby locality which suggest a recent divergence in speciation. These two species are very likely closely related within the *Argyrophorus* genus. This is also confirmed by the rather cylindrical antennae club found in both species, whereas there are spoon shaped in other *Argyrophorus* species (PYRCZ & WOJTUSIAK, 2010). When more specimen of this new species will be available, future investigations on this species position within the *A. lamna* group should have a focus on the FW venation as *A. lamna* displays four radial veins, which is so far a unique character among the Nymphalidae ((PYRCZ & WOJTUSIAK, 2010). Considering the geographic proximity between populations of these two species, it is not impossible that *A. splendens* and *A. lamna* are sympatric in some other localities. Still, while *A. lamna* is generally flying between 2500 and 4300 m, *A. splendens* was discovered in two very near localities above 4200 m and up to 4500 m. *A. splendens* could also be a high altitude vicariant species of *A. lamna*, restricted to high mountain ranges of central Peru. Other closely related species are *A. angusta* Weymer, 1911 and possibly the newly described *A. blanchardi* Pyrcz & Wojtusiak, 2010.



*Argyrophorus lamna* ♂. R/V. Scale 1/1  
Cordillera Negra, near Conococha, 3950 m, Ancash, Peru,  
June 14, 2012, J. Delmas leg. Photos 1-4: Y. Delmas



*Argyrophorus argenteus* ♂. R/V. Scale 1/1.  
Argentina, Neuquen, Villa de Angostura, 800 m,  
January 15, 2008, L. Manil leg. & photo

When it is flying, this butterfly displays a stroboscopic flight as its shiny metallic dorsal wing surface is contrasting with its ventral dark colours. While resting on the naked soil with its



9. Cordillera Huayhuash, 4200 m. Peru. June 18, 2012. Type locality of *Argyrophorus splendens* nova sp.

wings closed, the ventral side of the wings displays a perfect camouflage pattern against its potential predators. In the butterfly habitat, where dominant perching spots are scarce, it cannot be excluded that this shiny dorsal reflection represents a protection against some of their low flying predators, as the stroboscopic flight induced by the wings' pattern might disturb the eye focus of some of them, specially while flying above the horizon line.

Additionally, the issue of silvery reflection within various geographic forms of another *Argyrophorus* species: *A. gustavi* has been discussed by several authors, MODOLELL *et al.* (2009), PYRCZ (2012) and CERDEÑA *et al.* (2014). According to them, the silver forms dominate at the highest altitudes and likely provides some thermoregulatory advantages to the butterfly.

It is noticeable that dorsal silvery metallic patterns, which are extremely rare among butterflies worldwide, are shared by several genus within the grassland butterflies of the Andes: several *Argyrophorus* species (*A. argenteus*, *A. lamina*, *A. angusta*, *A. gustavi*, *A. splendens*) as well as a few other Satyrinae such as *Faunula euripides* Weymer 1890 or the newly described *Pampasatyrus gorkyi* Pyrcz, Cerdeña & Zacca, 2014, but also some Lycaenidae of the *Itylos* genus.

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