

## Scientific Note

# First records of Sphingidae, Saturniidae, and Arctiinae (Lepidoptera) in the forests of *Polylepis sericea* in the Huascarán National Park, Ancash, Peru

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Edited by: Mabel Alvarado<sup>1</sup>

Received: March 18, 2022. Accepted: June 08, 2022. Published: July 07, 2022.

**Abstract.** *Polylepis* forests are home to endemic species and are of great ecological importance. The degradation of these forests, a remarkable and unique biome in the Andean region, might cause severe consequences for the yet poorly studied high-altitude biota. In the context of Global Climate Change and other anthropogenic impacts, such as habitat loss and species invasion, the threat in this region is alarming. Therefore, studies informing about fauna and flora in this area are essential for conservation efforts and political decisions. In this study, we performed an inventory of three nocturnal Lepidoptera taxa (Sphingidae, Saturniidae, and Arctiinae) in *Polylepis* forests of the Huascarán National Park. The Huascarán National Park is a reserve in the Ancash region in the Andean zone of Peru. The specimens were collected using mixed light traps, from 18:00 to 24:00 hours in November (2015), February (2016), May (2016), and August (2016). We recorded seven species and 155 individuals, corresponding to two species of Sphingidae, one of Saturniidae, and four of Arctiinae. All the species presented are new records for the Huascarán National Park, three are new records for the department of Ancash and one new record for Peru.

**Keywords:** Andes, Cordillera Blanca, inventory, moths, new records.

In Peru, it is estimated the occurrence of 1,600 species of Arctiinae (Erebidae), 197 species of Sphingidae, and 342 species of Saturniidae (Lamas 2000; Grados 2011). Currently, there have been increased efforts to learn about these groups in this country, areas such as taxonomy (Grados & Ramírez 2016; Grados 2018; Grados & Mantilla 2018), biogeography, and ecological studies (Grados 2011; Ignatov et al. 2011; Grados et al. 2017) have been approached. Although there are several studies in different regions of Peru, the main focus is the Amazon region. Very few studies were carried out in other areas, as the high parts of the Andes Mountains. Lamas & Perez (1983) carried out one of the few works in the Andean region to catalog part of the lepidopteran diversity. This work was conducted in the Huascarán National Park (HNP), but it dates back almost 30 years. Since then, the region remained little explored in relation to the lepidopteran fauna.

The HNP is a Natural Protected Area (NPA) located in the Cordillera Blanca in the department of Ancash, and despite being recognized as a World Natural Heritage Site and Core Zone of the Huascarán Biosphere Reserve, it is currently severely affected by anthropic pressure (All et al. 2017). The main vegetal formations in the HNP include the river forest, lithophyte communities, brushes located in dry and humid zones, pastures, aquatic and semi-aquatic communities, bogs and *Polylepis* forests (SERNANP 2010-2015). There are four species of *Polylepis* in the HNP (*Polylepis incana* H. B. K., *Polylepis racemosa* Ruiz & Pav., *Polylepis weberbaueri* Pilg. and *Polylepis sericea* Wedd.) (Casana et al. 2010). This vegetation is representative of the central Andes; they grow at high altitudes, ranging from 3,500 to 5,100 m, and have a very restricted distribution (Kessler 2006; Casana et al. 2010). The forests have remarkable ecological functions, such as storing water from rainfall or mist, helping to prevent soil erosion, and being a restricted habitat for many animal species (Fjeldså et al. 1999; Kessler 2006). Despite its relevance, it represents one of the most threatened habitats in Peru: 98% of its area has disappeared due to anthropogenic action (Fjeldså & Kessler 1996).

The loss of habitat due to *Polylepis* deforestation and the reduction of glaciers caused by climate change would bring as an irremediable consequence the decrease in the populations of species associated with that ecosystem, and potentially local extinctions (Otavo & Echeverría 2017). However, it is not feasible to mention which species could be at risk if there are no studies of the species occurring in such habitats. In this context, the faunal inventory of the Sphingidae, Saturniidae, and Arctiinae have been carried out in two localities of *P. sericea* forests in HNP.

The sampling was carried out in two localities of *P. sericea* forests in the HNP: Llanganuco Sector (9°4'7.57"S, 77°38'21.74"W, 3,848 m) and Llaca Sector (9°26'15.05"S, 77°26'52.56"W, 4,412 m) (Fig. 1). We choose *P. sericea* forests as object of study due to its high abundance and the study sites by the logistical facilities for evaluation. In each locality, a light trap with a 250-watt mixed-light lamp was installed between 18:00-24:00 hours for three consecutive days. The sampling dates coincided with the new moon phase, the most efficient period for capturing nocturnal insects (Yela & Holyoak 1997), being the following: Llanganuco: 08-10.xi.2015, 06-08.ii.2016, 04-06.v.2016 and 31.vii-02.viii.2016; Llaca: 12-14.xi.2015, 10-12.ii.2016, 09-11.v.2016 and 03-05.viii.2016.

The collected moths were deposited in the Department of Entomology of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima (Peru) (MUSM). The record and altitudinal distributional records are mainly based on specimens deposited in the MUSM collection and bibliographic sources (cited under each species section). Species were identified by consulting the original descriptions and reviewing the type series at the following collections: Muséum National d'Histoire Naturelle, Paris (France) (MNHN); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (United States of America) (USNM); Natural History Museum, London (United Kingdom) (NHMUK).

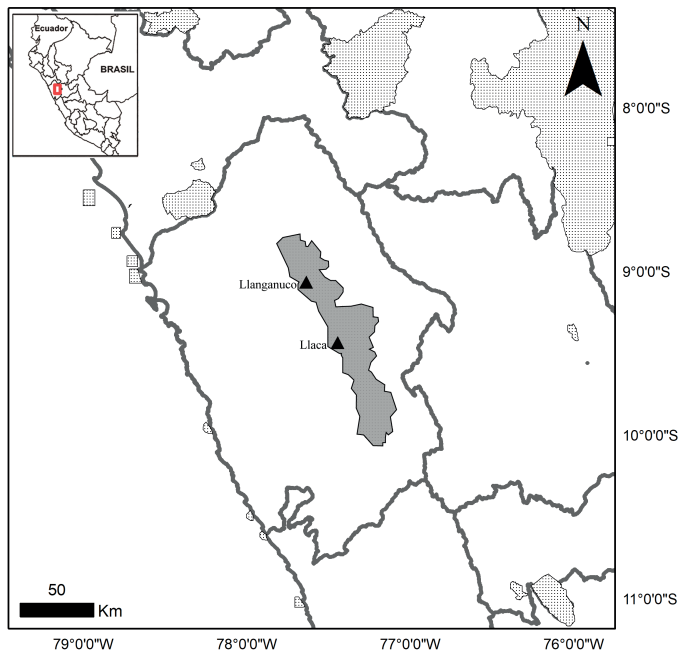


Figure 1. Sampling sites: Llanganuco (3,848 m) and Llaca (4,412 m) located in the Huascarán National Park.

We recorded 155 specimens corresponding to seven species: two Sphingidae (19 specimens), one Saturniidae (40 specimens), and four Arctiinae (96 specimens) (Tab. 1, Figs. 2, 3). Seven species were collected at 3,880 m and four species at 4,412 m (Tab. 1). Abbreviations used in the text: AY (Ayacucho), AM (Amazonas), AN (Ancash), CA (Cajamarca), CU (Cusco), HV (Huancavelica), JU (Junin), LA (Lambayeque), LI (Lima), LL (La Libertad), MD (Madre de Dios), PA (Pasco), PI (Piura), SM (San Martin), TU (Tumbes). An annotated list of the species recorded is presented below:

### Sphingidae

***Agrius cingulata* (Fabricius, 1775)** (Fig. 2a) Comment: Specimens were identified using the original description (Fabricius 1775). Geographic distribution: The entire Neotropical region, including southern Florida (USA) (Haxaire & Mielke 2019). Distribution in Peru: TU, PI, LA, LL, CA, LI, JU, PA, CU, and MD (MUSM). Altitudinal distribution in Peru: From sea level (Talara, PI) to the high parts of the Andes (3,848 m, Quebrada Llanganuco, AN). Our record, for now, is the highest reported for this species (3,848 m), being also a new record for the department of Ancash.

***Eriinnys ello ello* (Linnaeus, 1758)** (Fig. 2b) Comment: Specimens were identified using the original description (Linnaeus 1758). Geographic distribution: From Canada to Argentina (Haxaire & Mielke 2019). Distribution in Peru: TU, LA, LL, LI, AM, PA, JU, CU and MD (MUSM). Altitudinal distribution in Peru: From 50 m (Lima, LI) to 4,412 m (Llaca, AN). It is a new record for the department of Ancash.

### Saturniidae

***Copaxa medea* (Maassen, 1890)** (Fig. 2c) Comment: According to the captures in this work and the samples deposited in the MUSM (Peru), *C. medea* is a variable species, in size and coloration, coinciding with that proposed by Wolfe (2005). Geographic distribution: Wide distribution in the Andes, including the countries of Ecuador, Peru, and Bolivia (D'Abbrera 1998; Wolfe 2005). Distribution in Peru: CA, AY, AN, LI, SM, JU, HV and HU (Gamboa & Grados ined.; Wolfe 2005). Altitudinal distribution in Peru: From 2,400 m (Matucana, LI) to 4,412 m (Llaca, AN).

### Arctiinae (Erebidae)

***Amastus camposi* (Schaus, 1927)** (Fig. 3a) Comment: Species described from a male, collected in Azogues (Ecuador), not specifying the altitude (Schaus 1927). We assume that the species was collected in the surroundings of the actual city of Azogues, at approximately

2,500 m. The holotype is in the USNM. This species is a new record for Peru, and it is the first time that the female of the species is recorded. Female: Antennae wood brown less pectinate than in male. Palpi and head similar to male. Collar and thorax similar to male. Abdomen similar to male. Wings covered by scales, different from the male that has hyaline wings. Forewing: costa and base of inner margin light cinnamon; all surface with brown cinnamon scale. Hindwing: beige with cinnamon brown margins. This species exhibits marked sexual dimorphism in the wings (Fig 3a). Altitudinal distribution in Peru: From 2,400 m (Matucana, LI) to 3,848 m (Llanganuco, AN).

***Amastus mossi* (Rothschild, 1922)** (Fig. 3b) Comment: Species described with one male and three females collected in Lima (Peru) and two males from Ecuador (one in an unspecified city, the other in Riobamba) (Rothschild 1922). The lectotype of the species was recently designated based on the male from Peru (Vincent & Laguerre 2013). *Amastus mossi* is easily confused with females of *Amastus melas* (Dognin, 1902). The latter was described based on a female from Popayán (Colombia), the type being deposited in the USNM. The morphology of the female was illustrated by Watson (1973). The analysis of the male specimens collected in our work and material from the highlands of the department of Lima show congruence with the external morphological characters of the revised lectotype (NHMUK). On the other hand, female specimens were dissected in order to corroborate whether they could belong to the species *Amastus melas*. The morphology is very different from that shown by Watson (1973). Therefore, for now, we have no evidence of the occurrence of *A. melas* in Peru, but *A. mossi* is a new record for Ancash.

***Amastus pluto* Toulgoët, 1992** (Fig. 3d) Comment: The holotype of the species is a male, collected in Ancash, 35 km SE of Huaraz, Cerro Cahuish, 4,100 m, Quebrada Pucavado, 15-18.ii.1987 (Ole Karsholt), deposited in Zoological Museum, Copenhagen (ZMUC). Toulgoët (1992) mentions the existence of paratypes from the same place and Ruta Gualaceo-Limon, pk 44, 2,000 m, Morona-Santiago (Ecuador). We examined some of these paratypes from Ecuador (MNHN). The species in Peru is known only from the department of Ancash.

***Metacrisia courregesi mutabilis* Grados, 2020** (Fig. 3c) Comment: The genus *Metacrisia* consists of three species reported from the high parts of the Andes. *Metacrisia courregesi* was described from three males and one female specimen from Loja (Ecuador). Watson (1973) designated lectotypes for this species. The subspecies *Metacrisia courregesi mutabilis* was described based on the individuals collected in this study (Grados et al. 2020).

The environmental conditions of the Andes are rigorous; altitude is associated with other factors that influence the diversity, the activity, and the size of the insects. In this way, atmospheric dryness is favored by the lower density of the air, allowing a greater incidence of ultraviolet radiation; thus, high insolation and strong winds cause heat energy to be lost easily, causing insects to reduce their activity, diversity, and size (Mani 1962 as cited in Lamas & Perez 1983). Probably for this reason, the high Andean zones are known for having a low number of species compared to areas located at lower altitudes.

This pattern was observed in our study and coincided with other works in high zones. For example, Lamas & Perez (1983) recorded 23 species of butterflies at the lowest altitude (3850-3350 m) and 18 species at the highest altitude (3,950-4,767 m) in the Huascarán National Park (Ancash). Gamboa (2021) collected seven species between 2,900-3,140 m., and three species between 3,770-3,950 m. in the Nor-Yauyos Cocha Landscape Reserve (Lima).

Some individuals of *C. medea*, *A. mossi*, and *M. courregesi* have also been recorded by Gamboa (2021); however, only *C. medea* and *M. courregesi* were recorded in *Polylepis* forests between 3,770 - 3,880 m. *Polylepis* forests are important areas of a high Andean landscape mosaic, fulfilling ecological and environmental functions (Lloyd 2008; Casana et al. 2010). In this way, the lepidopteran communities recorded in our study could be food for many insectivorous birds that depend on small insects for their survival (Lloyd 2008). We do not consider moths as pollinators due to the anemophilous pollination of *Polylepis* (Kessler 2006), although they could pollinate other plants associated with these forests.

*Polylepis* forests are important areas within a landscape mosaic in the Andes. These forests fulfill ecological and environmental functions (Kessler 1995; Lloyd 2008; Casana et al. 2010). The Lepidoptera species recorded in our study could act as food items on which many insectivorous birds depend (Lloyd 2008), and because of this, these forests should also be included in conservation plans. Despite the low lepidopteran diversity in the high Andes, this study corresponds to

the first records of these families in the Huascarán National Park, the Ancash department, and the country.

Our results, even focusing only on Lepidoptera, are an important contribution to the knowledge of the Andean insect fauna. The inventory of this fauna is a first step towards the conservation and preservation of unique habitats such as the *Polylepis* forests.

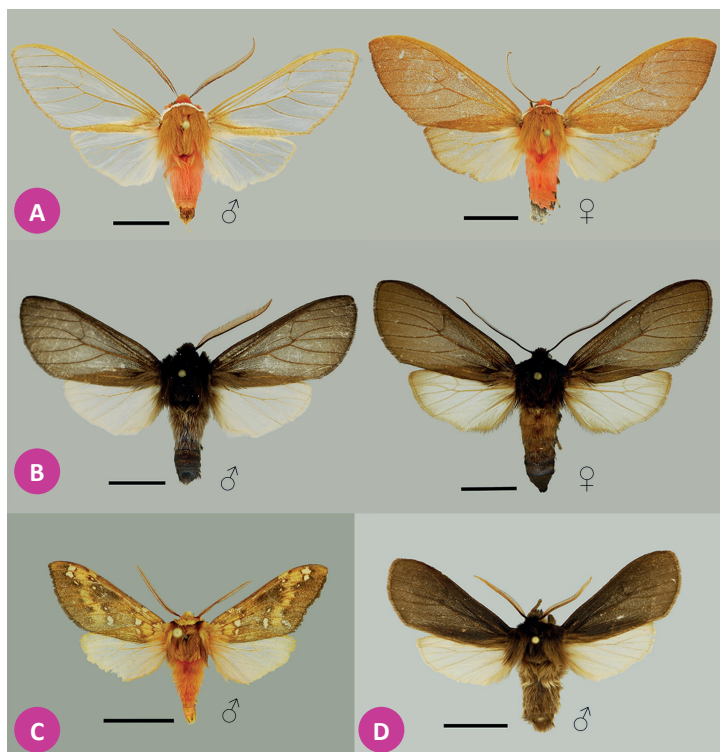
**Table 1.** Total number of specimens by species and altitude recorded in the two *Polylepis sericea* forests of the Huascarán National Park.

Family	Subfamily	Species	Number of specimens	3,848 m	4,412 m
Sphingidae	Sphinginae	<i>Agrius cingulata</i> (Fabricius, 1775) <sup>(*)</sup>	11	11	
	Macroglossinae	<i>Erinnyis ello ello</i> (Linnaeus, 1758) <sup>(*)</sup>	8	7	1
Saturniidae	Saturniinae	<i>Copaxa medea</i> (Maassen, 1890)	40	35	5
		<i>Amastus pluto</i> Toulgoët, 1992	38	6	32
Erebidae	Arctiinae	<i>Amastus mossi</i> (Rothschild, 1922) <sup>(*)</sup>	13	12	1
		<i>Amastus camposi</i> (Schaus, 1927) <sup>(**)</sup>	3	3	
		<i>Metacrisia courregesi mutabilis</i> Grados, 2020	42	42	

(\*) New records for Ancash. (\*\*) New record for Peru.



**Figure 2.** Sphingidae and Saturniidae recorded in the two forests of *Polylepis sericea* in Huascarán National Park. A. *Agrius cingulata*; B. *Erinnyis ello ello*; C. *Copaxa medea*. Scale = 1 cm.



**Figure 3.** Arctiinae recorded in the two forests of *Polylepis sericea* in Huascarán National Park. A. *Amastus camposi*; B. *Amastus mossi*; C. *Metacrisia courregesi mutabilis*; D. *Amastus pluto*. Scale = 1 cm.

### Acknowledgments

To Ernesto Rázuri-Gonzales for providing bibliographic sources and the support during the course of this study. To SERNANP for authorization to conduct scientific research with the document N°013-2015-SERNANP-PNH. To Karen Ventura for the taxonomic identification of the *Polylepis* species. To Jon Fjeldså for sending a book about *Polylepis* from Denmark to Lima (Peru). To Jefferson Suarez, Frank Rodríguez, and the team of park rangers of the Huascarán National Park for all the support provided in each field trip.

### Authors' Contributions

GPA and JG conception and design, GPA data collection and analysis, JG responsible for taxonomic identification, GPA and JG writing the paper.

### Conflict of Interest Statement

There are no conflict of interest between the authors.

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