# A provisional list of the Saturniidae Boisduval, 1837 (Lepidoptera) of the Province Oxapampa, Peru

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**Abstract:** Lepidoptera, or butterflies and moths, are found within the largest animal group, the insects. They have a high impact on ecosystem services and may be used as indicator organisms. The nocturnal species of Saturniidae are suitable for comparative ecological studies and long-term monitoring, especially, because of their relatively low local species richness and their attraction to light sources. However, our understanding of the biodiversity and patterns of lepidopteran species distribution within tropical regions is rudimentary. So far, there exists no complete faunal study about the Saturniidae neither of Peru nor the Peruvian province Oxapampa. Thus, the aim of this study is to compile a provisional list of saturniid species which were recorded in and around the district Villa Rica (province Oxapampa, department Pasco, Central Peru). The specimens were sampled by light-trapping, mainly in the montane and premontane forests of the eastern Andean slopes during February and March 2017. As a result, a comparably high species richness of 96 Saturniidae was recorded during 15 trap-nights at 10 sites. This is consistent with the designation of the Tropical Andes as one of the 35 global biodiversity "hotspot" areas. Also, the result highlights the importance of the protection of primary and secondary forests in the Tropical Andes.

**Keywords:** tropics, South America, Peru, Pasco, Villa Rica, light-trapping, biodiversity, forest.

### Eine provisorische Artenliste der Saturniidae (Lepidoptera) der Provinz Oxapampa, Peru

**Zusammenfassung:** Ziel der vorliegenden Arbeit ist es, zur Faunenkenntnis von Peru beizutragen. Umgesetzt wird dies durch die Kartierung der Saturniidae Boisduval, 1837 (Lepidoptera) mittels Lichtfang im Distrikt Villa Rica (Provinz Oxapampa, Department Paso). Im Frühjahr 2017 wurde hierfür in 10 Gebieten der tropischen submontanen und montanen Bergwälder insgesamt 72 h Lichtfang betrieben und die anfliegenden Tiere bestimmt. Die resultierende Artenliste umfaßt 96 Arten aus 6 Unterfamilien und wird in der vorliegenden Arbeit präsentiert. Am Ort mit der höchsten festgestellten Artenvielfalt konnten 29 Arten gezählt werden. Im Vergleich zu ähnlichen Studien benachbarter Regionen und Länder zeigt sich eine hohe Artenvielfalt der Gruppe der Saturniidae innerhalb der Provinz Oxapampa. Dies läßt auf eine hohe Artenvielfalt auch in anderen Artengruppen schließen und unterstreicht die Bedeutung des Schutzes der noch erhaltenen tropischen Bergwälder.

## Introduction

Butterflies and moths are found within the largest (= most rich in species) animal group, the insects. They play an important role in food webs and, therefore, have a high impact on ecosystem services and stability (van Swaay et al. 2016). Also, lepidopterans most often are short-lived species and show a quick response to changes in habitat quality. Thus, they may be used as indicator organisms and help to evaluate effects of e.g. land-use or climate change (Meineke 1995, van Swaay et al. 2016, Braga & Diniz 2018). Among the largest moths (in average size) are the Saturniidae Boisduval, 1837 (Lepidoptera). In 2011, there have been recorded 2349 species worldwide (van Nieukerken et al. 2011); only a few years later, this number increased to 3454 species (Kitching et al. 2018).

Because of the relatively low local species richness in Saturniidae, they allow for an extensive assessment and are suitable for comparative ecological studies and long-term monitoring (Basset et al. 2017). Most of the species occur in the Neotropics (Scoble 1995). Within the Neotropics, the Tropical Andes Region is one of the most diverse areas. It has been designated as one of the global biodiversity "hotspot" areas and contains a high percentage of endemic and threatened species (Schulenburg & Awbrey 1997, Myers et al. 2000).

However, our understanding of the biodiversity and patterns of lepidopteran species distribution within these regions is rudimentary (Ignatov et al. 2011). In addition, the response of tropical fauna to habitat change is poorly understood (Hawes et al. 2009). Therefore, faunistic surveys of local areas are of immense importance for our understanding of biodiversity and for conservation management actions. Hence, preliminary lists can be seen as a powerful tool and a first step to further research (Racheli & Racheli 2005b, Siewert et al. 2010).

Despite of the extensive systematic studies of the Nearctic and Neotropic fauna by Lemaire (1978, 1980a, 1988, 2002), not many papers about the Peruvian Saturniidae have been published so far. Racheli (2006) provided a list of 31 Peruvian saturniids with distributional data. Further studies in the northern parts of Peru have been summarized in papers by Racheli & Callegari (1996, 1997), Lamas (1997), Grados (1999) and Racheli & Racheli (2005a). Three additional lists of Saturniidae in the south-eastern parts of Peru have been published by Lemaire (1980b), Lamas (1988) and Lamas & Grados (2001). There exists no published list about the Saturniidae occurring in the department Pasco.

Also, a complete faunal study about the Peruvian Saturniidae does not exist so far. Lamas (*in* Racheli & Callegari 1996) estimated a number of 376 saturniid species occurring in Peru. However, this number must be considered as an underestimation, especially because of many new species which have been scientifically described during the last decades. Even since 2010, Brechlin & Meister (and a few other authors) described more than 500 new taxa in their private journal "Entomo-Satsphingia".

The aim of the present study is to compile a provisional list of Saturniidae species which were recorded in and around the district Villa Rica (province Oxapampa, department Pasco, Central Peru).

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## Methods

Sampling was conducted in the districts of Villa Rica, Oxapampa and Palcazu (province Oxapampa, department Pasco). One site is located in the department Junín, but close to the border of Pasco (see Fig. 1). Most of the sites are located in the district Villa Rica. Sampling was conducted in the wet season between 19. II. and 6. III. 2017, resulting in a total sampling effort of 15 trap-nights and 72 h of light-trapping. Dates and geographic data of each spot are listed in Tab. 1.

The research area is located on the eastern slopes of the Andes and belongs to the ecosystem of the Yungas of Peru. The district Villa Rica embraces a surface area of about 78 762 ha (Suyo Pomalía 2018) and is characterized by a mountainous relief, valleys and steep slopes. Light-trapping was done in tropical premontane and montane primary and secondary forests (Catchpole 2012) at altitudes between 660 and 2298 m. The climate in Pasco is tropical with a wet season from October to April and a dry season from May to September (Catchpole 2012). The average annual temperature in Oxapampa is 16.35°C, the average annual rainfall is 1450 mm (1984–2011; Catchpole 2012). In 2015 and the beginning of 2016 there was a strong El Niño event, followed by a weak La Niña event in the end of 2016 (NOAA 2016). Temperature was measured at the beginning and the end of light-trapping. There is no data for 9.5h of light-trapping (spread over 5 days) at location 1. Average temperature while light-trapping was 19°C (mean value of temperature at start and at end of collecting period;

**Tab. 1:** Light-trapping sites (ordered by provinces) with coordinates in decimal degrees (± 0.5 km), elevation (in m above sea level), date (DD.MM.YYYY) and duration of light-trapping per site (h:min, total of all nights). — *: The province Chanchamayo borders Villa Rica. However, it is located in the department Junín instead of Pasco.

| Site ID | Coordinates | Elevation | Date | Duration in h (∑) |
|---|---|---|---|---|
| **Villa Rica** | | | | |
| 1 | 10.713° S, 75.265° W | 1535 | 19. II.–6. III. 2017 | 20:50 |
| 2 | 10.776° S, 75.358° W | 908 | 21. II. 2017 | 7:00 |
| 3 | 10.600° S, 75.156° W | 969 | 22. II. 2017 | 8:00 |
| 4 | 10.590° S, 75.108° W | 748 | 27. II. 2017 | 7:30 |
| 5 | 10.833° S, 75.275° W | 823 | 4. III. 2017 | 2:20 |
| 6 | 10.623° S, 75.151° W | 1024 | 5. III. 2017 | 6:10 |
| **Oxapampa** | | | | |
| 7 | 10.662° S, 75.331° W | 2235 | 20. II. 2017 | 6:20 |
| 8 | 10.667° S, 75.321° W | 2298 | 25. II. 2017 | 2:30 |
| **Palcazu** | | | | |
| 9 | 10.498° S, 75.052° W | 660 | 24. II. 2017 | 5:30 |
| **Chanchamayo*** | | | | |
| 10 | 10.881° S, 75.315° W | 996 | 1. III. 2017 | 6:00 |

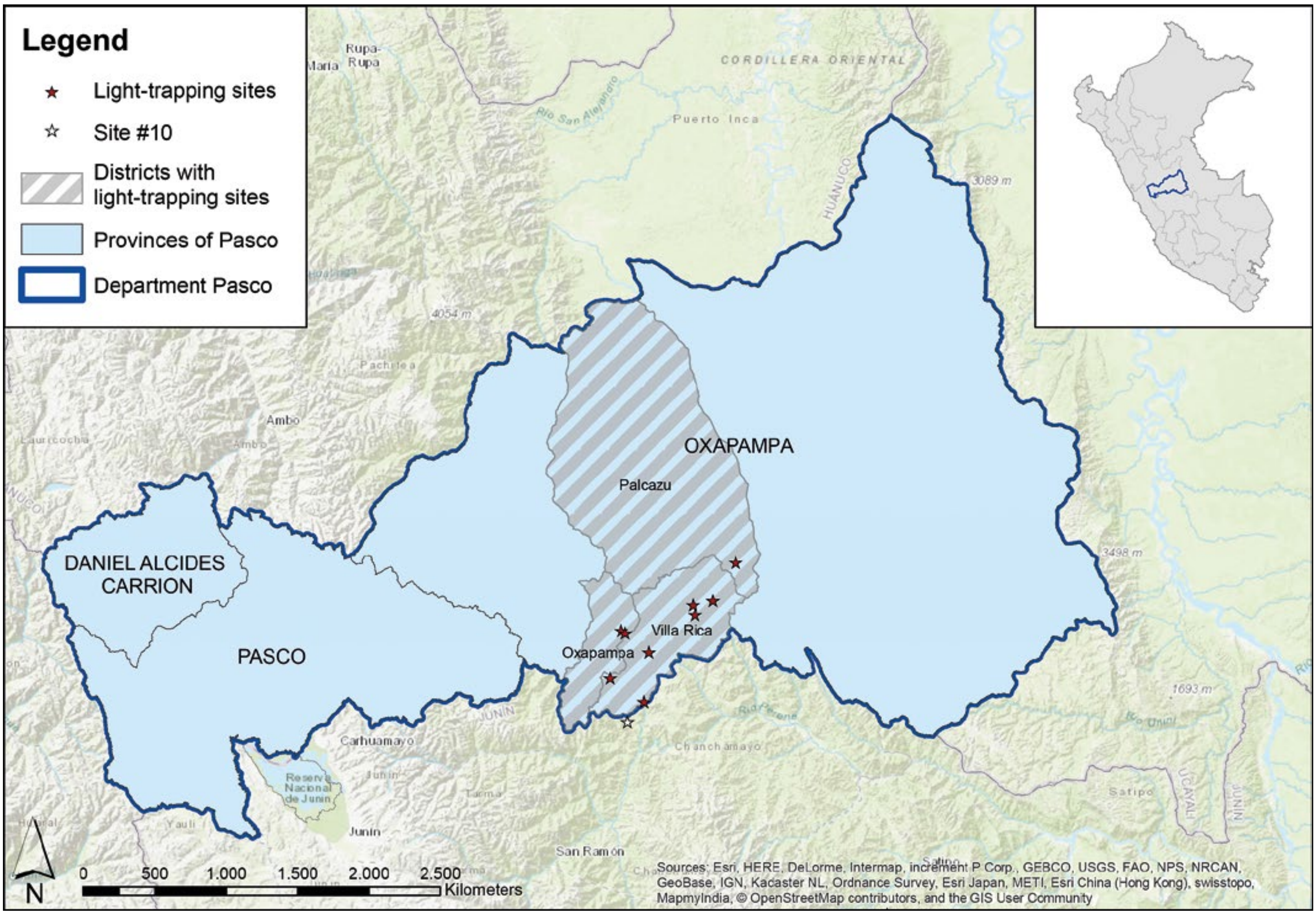


**Fig. 1:** Sampling area within Peru. Light-trapping sites located within Pasco are marked with a red star. White star: site #10 located in Junín near the border to Pasco. Sampled districts are marked with grey diagonals. Provinces of Pasco are filled with a blue background, department Pasco is marked with a dark blue border.

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absolute min. = 13.8°C, max. = 25°C, n = 62:40 h). Most of the daytime the weather was cloudy and/or rainy. On 26. II. 2017 there was a New Moon. Except for site 1, there were no competing light sources near the trapping sites.

Each site was sampled by the author and Falk Zahlaus (Greding, Germany) once. An exception is site 1, which was sampled 9 times. For sampling, a sheet trap design was used. In the period of 19. to 28. II. we used a 400 W mercury-vapour bulb (Narva) to attract moths. Between 1. and 6. III. we used a 500 W mercury-vapour bulb (Narva) and a 500 W self-ballasted mercury lamp (Philips) in combination. The bulb(s) were placed in front of a vertical, white 2 m × 3 m sheet at a height of around 1.90 m above ground. The bulbs were powered by a Honda EU1000i generator.

Each saturniid moth was determined by the author. Identification of each specimen based on the external morphology as well as elevation and area of occurrence given in the works of Lemaire (1978, 1980a, 1988, 2002). Additionally, the genitalia of some specimens were dissected by the author for determination. More recently described species were determined based on the descriptions of Brechlin (2017a, 2017b, 2017c, 2018a, 2018b, 2018c, 2018d), Brechlin & Meister (2008a, 2008b, 2008c, 2008d, 2008e, 2011a, 2011b, 2011c, 2011d, 2012a, 2012b, 2014, 2018) and Brechlin et al. (2013, 2016). Several species were determined by Bill Oehlke (Montague, Canada). Some species cannot be determined reliably without DNA analysis. I determined them as the most probable species based on external morphology, genitalia, elevation and area of occurrence. These species are marked by a star (*). Species which still could not be determined based on our knowledge and the given literature are listed as genus + "sp." + an ongoing number.

## Results

A total of 96 saturniid species (in total ca. 318 specimens) was recorded during 15 trap-nights at 10 sites in the province Oxapampa. The highest species richness at a single site was obtained at site 9 with 30 saturniid species. Most of the species (80%) have been observed no more than at one or two sites. None of the species has been found at all 10 sites.

A graph with the cumulative number of species vs. trap-nights can be seen in Fig. 2.

The complete list of all observed Saturniidae species is shown in Tab. 2.

**Tab. 2:** Observed species of Saturniidae during the fieldwork in Pasco in 2017, ordered by subfamilies. Site IDs see in Tab. 1. — Some species cannot be determined correctly at present. These species or sites where they occurred are marked by a star (*). Specimens of which the genitalia has been dissected are indicated with an apostrophe (′). Site #10 is located in Junín, but close to the border of Pasco.

| **Saturniidae** | **Localities** | **Specimens** |
|---|---|---|
| **Oxyteninae** | | |
| *Oxytenis* sp. 1 | 10 | 1 |
| *Oxytenis* sp. 2 | 3′, 9′ | 2 |
| *Oxytenis modestia* (Cramer, [1780]) | 2 | 1 |
| *Oxytenis nubnapoensis* Brechlin & Käch, 2014 * | 3, 4′, 9, 10′ | 11 |
| *Therinia buckleyi* Druce, 1890 | 3, 10 | 3 |
| Sum Oxyteninae specimens | | **18** |
| **Cercophaninae** | | |
| *Janiodes lavernoboliviana* Brechlin & Meister, 2011 | 1 | 1 |
| *Janiodes oxapampensis* Brechlin & Meister, 2008 | 8 | 2 |
| *Janiodes* sp. 1 | 10 | 1 |
| Sum Cercophaninae specimens | | **4** |
| **Arsenuriinae** | | |
| *Arsenura albopicta* Jordan, 1922 | 3 | 1 |
| *Arsenura armida* (Cramer, 1779) | 2 | 1 |
| *Arsenura ciocolatina* Draudt, 1930 | 1, 7, 9 | 4 |
| *Arsenura delormei* Bouvier, 1929 | 2, 9 | 3 |
| *Arsenura rebeli* Gschwandner, 1920 | 2, 3, 4 | 4 |
| *Dysdaemonia boreas* (Cramer, 1775) | 1, 10 | 2 |
| *Loxolomia johnsoni* Schaus, 1932 | 10 | 1 |
| *Rhescyntis hermes* (Rothschild, 1907) | 4 | 1 |
| *Rhescyntis hippodamia* (Cramer, [1777]) | 1, 9 | 2 |
| *Titaea tamerlan* (Maassen, 1869) | 4 | 1 |
| *Titaea timur* (Fassl, 1915) | 3, 4 | 5 |
| Sum Arsenurinae specimens | | **25** |
| **Ceratocampinae** | | |
| *Adeloneivaia acuta* Schaus, 1896 | 2, 3, 4, 9 | 9 |
| *Adeloneivaia catoxantha* (Rothschild, 1907) | 2, 9 | 2 |
| *Adeloneivaia jamazonica* Brechlin & Meister, 2011 | 2, 3, 4, 9, 10 | 12 |
| *Adeloneivaia jaustralica* Brechlin & Meister, 2011 | 3 | 1 |
| *Adeloneivaia orientoandensis* Brechlin & Meister, 2011 | 3 | 2 |
| *Adeloneivaia pelias* (Rothschild, 1907) | 2 | 1 |
| *Adeloneivaia subangulata* Herrich-Schäffer, 1855 | 9 | 8 |
| *Adelowalkeria flavoboliviana* Brechlin & Meister, 2011 | 7 | 1 |
| *Citheronia andina* Lemaire, 1971 | 1, 3 | 3 |
| *Citheronia aroa* Schaus, 1896 | 2, 3′, 4′, 9 | 9 |
| *Citioica anthonilis* (Herrich-Schäffer, [1854]) | 1, 2′, 3, 4, 8, 9, 10 | 9 |
| *Eacles callopteris* Rothschild, 1907 | 3, 4 | 3 |
| *Eacles imperialis* (Drury, 1773) | 1, 2, 3, 4, 9 | 12 |
| *Eacles ormondei* Schaus, 1889 | 2, 3 | 5 |
| *Othorene hodeva* (Druce, 1904) | 4, 9 | 2 |
| *Ptiloscola* sp. 1 | 5 | 1 |
| *Ptiloscola* sp. 2 | 2′, 5′ | 3 |
| *Ptiloscola wolfei* Brechlin & Meister, 2008 * | 1, 2, 3′, 4′, 5, 6, 9′, 10 | 14 |
| *Syssphinx lapazcellata* Brechlin & Meister, 2011 | 1 | 1 |

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| Saturniidae | Locali-ties | Speci-mens |
|---|---|---|
| *Syssphinx molina* (Cramer, 1780) | 2, 4, 9 | 6 |
| Sum Ceratocampinae specimens | | **104** |
| **Hemileucinae** | | |
| *Automeris* sp. 1 | 4′ | 1 |
| *Automeris amanda* Schaus, 1900 | 7 | 2 |
| *Automeris chaconoides* Brechlin & Meister, 2008 | 4, 9 | 2 |
| *Automeris cinctistriga* (C. Felder & Rogenhofer, 1874) * | 10 | 2 |
| *Automeris duchartrei* Bouvier, 1936 | 1 | 2 |
| *Automeris hamata* Schaus, 1906 | 2, 3, 4 | 8 |
| *Automeris harrisorum* Lemaire, 1966 | 1′, 7 | 4 |
| *Automeris liberia* Cramer, 1780 | 1, 2, 3, 4, 9 | 15 |
| *Automeris peggyae* Brechlin & Meister, 2011 | 1 | 1 |
| *Catacantha sofiae* Brechlin, Meister & van Schayck, 2010 | 8 | 1 |
| *Catacantha stramentalis* (Draudt, 1929) | 1, 2 | 3 |
| *Cerodirphia mandoriana* Brechlin & Meister, 2011 | 3, 6′ | 2 |
| *Cerodirphia paradama* Brechlin & Meister, 2011 | 7 | 1 |
| *Cerodirphia siriae* Brechlin & Meister, 2011 | 4, 9 | 5 |
| *Dirphia allae* Brechlin & Meister, 2011 | 3, 7 | 4 |
| *Dirphia centralis* Johnson & Michener, 1948 | 2, 7 | 13 |
| *Dirphia somniculosa* Cramer, 1777 | 3 | 1 |
| *Dirphiopsis cuscoensis* Brechlin & Meister, 2011 | 6′, 10′ | 2 |
| *Gamelia juniettei* Brechlin & Meister, 2012 | 2 | 1 |
| *Gamelia paradargei* Brechlin & Meister, 2012 | 7 | 1 |
| *Hylesia* sp. 1 | 10′ | 1 |
| *Hylesia* sp. 2 | 4′ | 1 |
| *Hylesia* sp. 3 | 10′ | 1 |
| *Hylesia andperuex* Brechlin & Meister, 2016 * | 8 | 2 |
| *Hylesia andrex* Brechlin & Meister, 2016 | 2, 3, 4, 10 | 4 |
| *Hylesia annulata* Schaus, 1911 | 4 | 1 |
| *Hylesia ascodex* Dyar, 1913 | 3, 4, 10 | 4 |
| *Hylesia bouveretti* Dognin, 1889 | 8 | 2 |
| *Hylesia canitia* (Cramer, [1780]) | 1, 10 | 2 |
| *Hylesia ernestonis* Strand, 1920 | 1, 6 | 3 |
| *Hylesia melanostigma* (Herrich-Schäffer, 1855) | 4, 6 | 2 |
| *Hylesia olivenca* Schaus, 1927 | 2, 4 | 2 |
| *Hylesia peggyae* Brechlin, 2016 | 7, 8 | 5 |
| *Hylesia praedjunensis* Brechlin & Meister 2016 * | 9′ | 1 |
| *Hyperchiria acuta* (Conte, 1906) | 1 | 1 |
| *Hyperchiria interacuta* Brechlin, Käch & Meister, 2011 | 1 | 2 |
| *Hyperchiria nausica* (Cramer, [1779]) | 1, 2, 3, 9, 10 | 6 |
| *Molippa simillima* Jones, 1907 | 1′, 2, 4, 7 | 5 |
| *Molippa intermediata* Brechlin & Meister, 2011 | 1, 10 | 4 |
| *Paradirphia oblita* (Lemaire, 1976) | 3, 7, 8 | 3 |
| *Periga* sp. 1 | 9′ | 1 |
| *Periga* sp. 2 | 8′ | 1 |

| Saturniidae | Locali-ties | Speci-mens |
|---|---|---|
| *Periga* sp. 3 | 1 | 1 |
| *Periga bispinosa* (Lemaire, 1972) | 1, 10 | 2 |
| *Periga galbicentralis* Brechlin & Meister, 2013 | 7′ | 6 |
| *Periga quillabambensis* Brechlin & Meister, 2013 * | 1, 9′ | 3 |
| *Pseudautomeris irene* (Cramer, [1777]) | 1 | 1 |
| *Pseudodirphia agiyungana* Brechlin & Meister, 2011 | 1′, 7 | 4 |
| *Pseudodirphia birepascoensis* Brechlin & Meister, 2011 | 2, 7 | 2 |
| *Pseudodirphia obhuanucensis* Brechlin & Meister, 2011 | 9 | 1 |
| *Pseudodirphia peruviana* (Bouvier, 1924) | 4 | 1 |
| Sum Hemileucinae specimens | | **146** |
| **Saturniinae** | | |
| *Copaxa andescens* Brechlin & Meister, 2012 | 2, 3 | 5 |
| *Copaxa koenigi* Lemaire, 1974 | 4, 6, 10 | 7 |
| *Rothschildia aurota* (Cramer, [1775]) | 1, 9 | 2 |
| *Rothschildia erycina* (Shaw, [1796]) | 2 | 1 |
| *Rothschildia hesperus* (Linnaeus, 1758) | 3, 4 | 4 |
| *Rothschildia interaricia* Brechlin & Meister, 2010 | 7 | 2 |
| Sum Saturniinae specimens | | **21** |

## Discussion

During a period of 15 trap-nights and 72 h of light-trapping in 2017 a total number of 96 Saturniidae species had been found in Pasco. There are only a few comparable studies on Saturniidae species in Peru. None of the studies I am aware of shows a higher species richness than the herein presented.

The maximum number of Saturniidae species in Peru had been found by Racheli & Callegari (1997) in Loreta (northern Peru). In their paper they present a list of 73 species. Lamas (1988) compiled a list of 65 species for Madre de Dios (south-eastern Peru). Within 300 h of light-trapping, he found 58 different Saturniidae species (Lamas 1997). Lamas (*in* Racheli & Callegari 1996) estimated a total number of 376 Saturniidae species occurring in Peru. Based on this estimation, during the short period of light-trapping in Pasco I have found ca. 25% of the Saturniidae species occurring in Peru.

However, I expect both, the estimated total number in Racheli & Callegari (1996) as well as my herein presented number, to be an underestimation of the actual species richness. One reason for this assumed underestimation by Lamas is the description of hundreds of new species, mainly by Brechlin & Meister. One third of the species presented in my paper has been described in and after 2010. Therefore, it is necessary to be careful when comparing species richness assessed at different points in time.

Despite the species accumulation curve in Fig. 2 seems to build up a plateau, an amount of additional species occurring in the province has to be expected. On one

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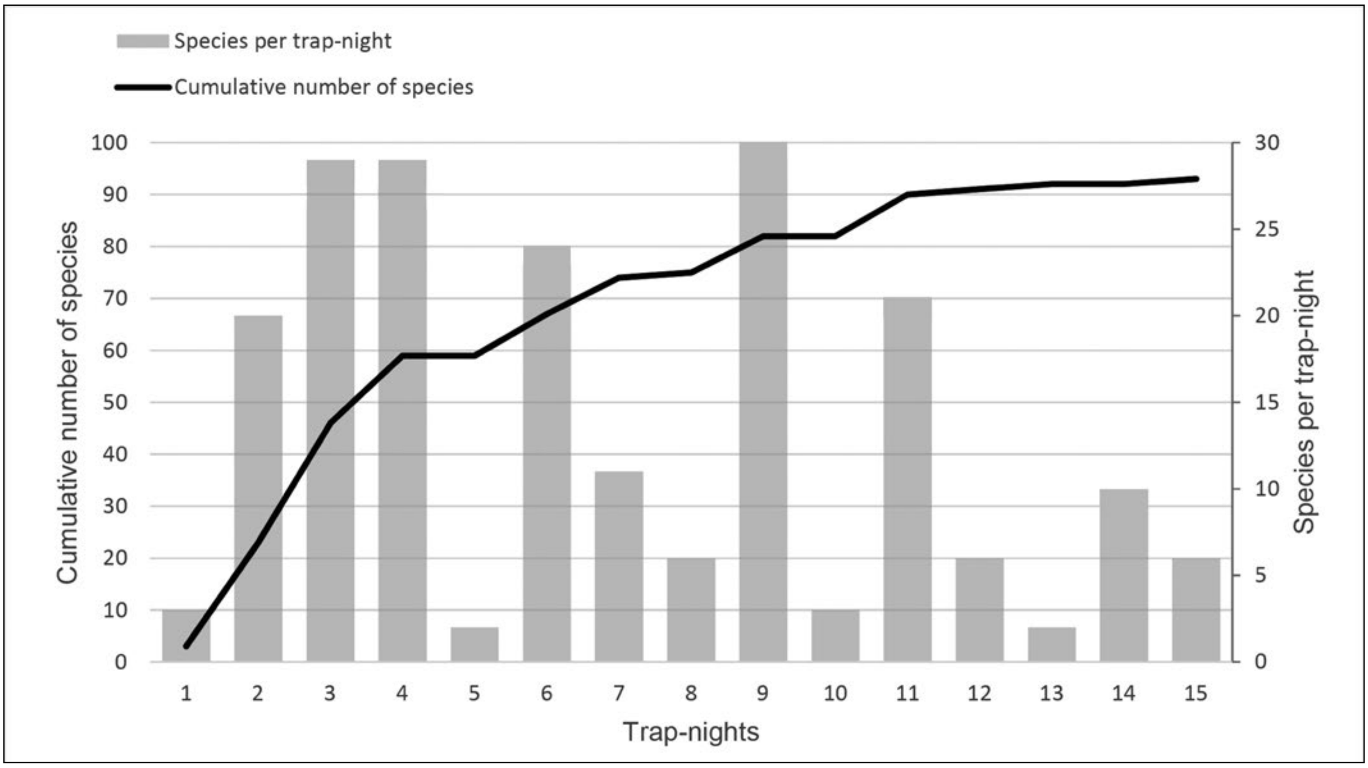


**Fig. 2:** Cumulative number of Saturniidae species vs. trap-nights. There was a New Moon at day 8.

hand, light-trapping was done only in primary or secondary forests at a few localities within a few ecological and elevation zones. Other habitats will be inhabited by other species. On the other hand, we only sampled during a short time period of one year. Because of different phenologies the adults of different species will occur in different months of the year. Also, the species composition and abundance is effected by meteorological factors, the lunar phase (Yela & Holyoak 1997) as well as El Niño and La Niña events (Basset et al. 2017). And anyway, populations of insects generally tend to oscillate in wide spans from year to year, meaning that the probability to find a given species is very different in every year. Concluding, the presented list can be seen as an underestimation of the species present in Oxapampa. Therefore, additional data were already collected in 2016 and 2018. An update of the current list is in progress. I expect the updated list to contain a total of at least 100 to 150 species in the province Oxapampa, Peru.

Compared with studies in neighbouring countries, Oxapampa seems to show a rather high species richness. Decaëns et al. (2007), for example, published a list of 46 Saturniidae species for two sites in North Colombia. 78 species have been found by Racheli & Racheli (2005b) for two sites in Eastern Ecuador. Their list of 78 species is a result of several years of light-trapping. Much more species are listed in a study in Southern Brazil: Siewert et al. (2010) compiled a list of 149 species which have been collected over 30 years. These studies have been conducted before the description of many species new to science (see introduction). Even by increasing these values by one third, the species richness presented for Oxapampa would be nearly similar or only slightly lower than that presented in most of the other studies conducted in South-America. Especially, in regard of the sampling effort of the mentioned studies. Most of them conducted light-trapping for several years.

This is the first published study about the species richness of the Saturniidae in Pasco. Based on my results, we account for a comparably high species richness which will increase trough further investigations. The region of Oxapampa, one of the Conservation International's 35 global biodiversity "hotspot" areas (Conservation International 2017), exhibits a high species richness in the group of Saturniidae. The region has been stated as the richest and most diverse in biodiversity on earth (Young et al. 2015). However, according to Valqui et al. (2015), between 11.3% and 13.4% of the original forest area of Peru has been deforested already by 2014. With the exception of the Oxapampa valley comparably few amounts of primary forest have been deforested in Pasco, compared to other departments (Valqui et al. 2015). Also, since 2000 the protected area network within the Tropical Andes has been expanded by 60% by the Peruvian government (Bax & Francesconi 2018).

Moths are sometimes used as indicator species. Thus, high species richness indicates good habitat quality and a high species richness also in other groups (e.g., Braga & Diniz 2018). As a result, the comparably high observed species richness in the group of Saturniidae highlights the importance of the protection and conservation of these primary and secondary forests in Oxapampa and Pasco as well as in overall Peru.

However, further studies are needed to evaluate distribution patterns, habitat change and richness in other

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regions of Peru. Also, a compilation of an actual countrywide species list is needed to assess regional species richness and to improve allocation of resources, especially in regard of conservation management actions. And, for tropical insects in general, we do not yet know much about the species' ecology, preimaginal instars, larval foodplants and so on, which would enable us much more to estimate their needs to survive.

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## References

Basset, Y., Lamarre, G. P. A., Ratz, T., Segar, S. T., Decaëns, T., Rougerie, R., Miller, S. E., Perez, F., Bobadilla, R., Lopez, Y., Ramirez, J. A., Aiello, A., & Barrios, H. (2017): The Saturniidae of Barro Colorado Island, Panama: A model taxon for studying the long-term effects of climate change? — Ecology and Evolution, Hoboken, New Jersey, **7** (23): 1–14.

Bax, V., & Francesconi, W. (2018): Environmental predictors of forest change: an analysis of natural predisposition to deforestation in the Tropical Andes Region, Peru. — Applied Geography, Amsterdam, **91:** 99–110.

Braga, L., & Diniz, I. R. (2018): Can Saturniidae moths be bioindicators? Spatial and temporal distribution in the Brazilian savannah. — Journal of Insect Conservation, Basel, **8:** 194–204.

Brechlin, R. (2017a): Drei neue Arten der Gattung *Ptiloscola* Michener, 1949 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **10** (3): 26–31.

—— (2017b): Drei neue Arten der Gattung *Citioica* Travassos & Noronha, 1965 aus Ecuador und Kolumbien (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **10** (3): 38–44.

—— (2017c): Acht neue Arten der Gattung *Syssphinx* Hübner, 1819 ("1816") (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **10** (3): 53–62.

—— (2018a): Zwölf neue Arten der Gattung *Periga* Walker, 1855 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **11** (1): 5–22.

—— (2018b): Neun neue Arten der Gattung *Cerodirphia* Michener, 1949 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **11** (1): 23–37.

—— (2018c): Siebenundzwanzig neue Arten der Gattung *Gamelia* Hübner, 1819 („1816") (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **11** (1): 38–73.

—— (2018d): Zwei neue Arten der Gattung *Copaxa* Walker, 1855 aus Peru (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **11** (1): 106–110.

——, Käch, H., & Meister, F. (2013): Vier neue Arten der Gattung *Pseudautomeris* Lemaire, 1967 aus dem Nordwesten Südamerikas (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **6** (3): 72–77.

——, & Meister, F. (2008a): Vier neue Arten der Gattung *Pseudodirphia* Bouvier, 1928 aus Argentinien und Peru (Lepidoptera: Saturniidae, Hemileucinae). — Entomo-Satsphingia, Pasewalk, **1** (1): 5–10.

——, & —— (2008b): Drei neue Hemileucinae aus Südamerika (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **1** (1): 11–16.

——, & —— (2008c): Zwei neue Arten der Gattung *Molippa* Walker, 1855 aus Peru (Lepidoptera: Saturniidae, Hemileucinae). — Entomo-Satsphingia, Pasewalk, **1** (1): 17–20.

——, & —— (2008d): Neue Arten der Gattung *Ptiloscola* Michener, 1949 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **1** (1): 21–26.

——, & —— (2008e): Zwei neue Arten aus der Gattung *Janiodes* Jordan, 1924 aus Peru (Lepidoptera: Saturniidae, Cercophaninae, Janiodini). — Entomo-Satsphingia, Pasewalk, **1** (1): 30–33.

——, & —— (2011a): Neue Taxa der Gattung *Automeris* Hübner, [1819] (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **4** (1): 5–89.

——, & —— (2011b): Fünfzig neue Ceratocampinae (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **4** (3): 5–58.

——, & —— (2011c): Anmerkungen zur Gattung *Molippa* Walker, 1855 s. l. mit Beschreibungen von acht neuen Arten und zwei neuen Gattungen (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **4** (4): 48–63.

——, & —— (2011d): Neue Taxa der Gattung *Pseudodirphia* Bouvier, 1928 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **4** (5): 30–71.

——, & —— (2012a): Zwölf neue Taxa der Gattung *Copaxa* Walker, 1855 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **5** (2): 5–26.

——, & —— (2012b): Neue Taxa der Gattung *Rothschildia* Grote, 1896 (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **5** (3): 5–37.

——, & —— (2014): Vierzehn neue Arten der Gattung *Automeris* Hübner, 1819 ("1816") (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **7** (1): 12–28.

——, ——, & van Schayck, E. (2016): Anmerkungen zur Gattung *Hylesia* Hübner, [1820] mit Beschreibungen von neuen Untergattungen und Taxa (Lepidoptera: Saturniidae). — Entomo-Satsphingia, Pasewalk, **9** (3): 5–114.

Catchpole, D. (2012): Orographic gradients in climate and forest cover at the Cordillera Yanachaga, Peru. — PhD Thesis. University of Tasmania, Hobart, 252 pp.

Conservation International (2017): Hotspots: Targeted investment in nature's most important places. — URL: www.conservation.org/how/pages/hotspots.aspx (last accessed 24. iv. 2018).

Decaëns, T., Rougerie, R., Bonilla, D., & Ramirez, L. D. (2007): Contribution to the knowledge of the Saturniidae fauna of Muzo (Boyaca, Colombia), with the redescription of *Copaxa apollinairei* Lemaire, 1978 (Lepidoptera, Saturniidae). — Nachrichten des Entomologischen Vereins Apollo, Frankfurt am Main, **28** (1/2): 69–75.

Grados, J. (1999): Lista preliminar de los Sphingidae y Saturniidae (Lepidoptera) de la Zona Reservada de Tumbes, Tumbes, Perú. — Revista Peruana de Entomología, Lima, **41:** 15–18.

Hawes, J., da Silva Motta, C., Overal, W. L., Barlow, J., Gardner, T. A., & Peres, C. A. (2009): Diversity and composition of Amazonian moths in primary, secondary and plantation forests. — Journal of Tropical Ecology, Cambridge, **25** (3): 281–300.

Ignatov, I. I., Janovec, J. P., Centeno, P., Tobler, M. W., Grados, J., Lamas, G., & Kitching, I. J. (2011): Patterns of richness, composition, and distribution of sphingid moths along an elevational gradient in the Andes-Amazon region of south-eastern Peru. — Annals of the Entomological Society of America, Oxford, **104** (1): 68–76.

Kitching, I. J., Rougerie, R., Zwick, A., Hamilton, C. A., St. Laurent, R. A., Naumann, S., Ballesteros Mejia, L. & Kawahara,

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A. Y. (2018): A global checklist of the Bombycoidea (Insecta: Lepidoptera). — Biodiversity Data Journal, Sofia, **6:** e22175.

Lamas, G. (1988): Lista preliminar de los Saturniidae, Oxytenidae, Uraniidae y Sematuridae (Lepidoptera) de la Zona Reservada de Tambopata, Madré de Dios, Peru. — Revista Peruana de Entomología, Lima, **31:** 57–60.

—— (1997): Lepidoptera of the Cordillera del Cóndor. — Pp. 90–93 *in:* Schulenberg, T. S., & Awbrey, K. (eds.), Rapid assessment program: The Cordillera del Cóndor Region of Ecuador and Peru. — Washington D.C. (Conservation International), 231 pp.

——, & Grados, J. (2001): Chapter 14: Lepidoptera of two sites in the northern Cordillera de Vilcabamba, Peru. — Pp. 147–148 *in:* Alonso, L. E., Alonso, A., Schulenberg, T. S., & Dallmeier, F. (eds.), Rapid Assessment Program: Biological and social assessments of the Cordillera de Vilcabamba, Peru. — Washington D.C. (Conservation International, Center for Applied Biodiversity Sciences, Dept. of Conservation Biology), 296 pp.

Lemaire, C. (1978): Les Attacidae Americains. The Attacidae of America (= Saturniidae): **1.** Attacinae. — Neuilly-sur-Seine (the author), 238 pp.

—— (1980a): Les Attacidae Americains. The Attacidae of America (= Saturniidae): **2.** Arsenurinae. — Neuilly-sur-Seine (the author), 199 pp.

—— (1980b): Saturniidae. — Pp. 4–5 *in:* Pearson, D. L. (ed.), Preliminary floral and faunal survey: Tambopata Reserve Zone, Madre de Dios, Perú. — National Geographic Society (USA, 1979); Pennsylvania State University, 35 pp.

—— (1988): Les Saturniidae Americains. The Saturniidae of America. Los Saturniidae Americanos (= Attacidae): **3.** Ceratocampinae. — San José (Museo Nacional de Costa Rica), 480 pp.

—— (2002): The Saturniidae of America. Les Saturniidae Americains (= Attacidae): **4.** Hemileucinae. — Keltern (Goecke & Evers), 688 pp. in 3 vols.

Meineke, T. (1995): Nachtfalter in der naturschutzrelevanten Raumplanung: Grundlagen, Methoden, Auswertung. — Schriftenreihe für Landschaftspflege und Naturschutz, Greven, **43:** 79–106.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A., & Kent, J. (2000): Biodiversity hotspots for conservation priorities. — Nature, London, **403** (6772): 853–858.

National Oceanographic and Atmospheric Administration (NOAA) (2016): Cold & warm episodes by season. — URL: origin.cpc.ncep.noaa.gov/ products/ analysis_monitoring/ ensostuff/ONI_v5.php (last accessed 21. ii. 2018).

Naumann, S., Brosch, U. & Wenczel, B. (2005): Some new Saturniidae species from Peru (Lepidoptera). — Galathea, Berichte des Kreises Nürnberger Entomologen e.V., Nürnberg, **16:** 81–171

Racheli, L. (2006): List of the Arsenurinae of Peru with taxonomic notes on *Titaea raveni* (Johnson & Michener 1948) stat. rev. and *Paradaemonia castanea* (Rothschild, 1907) stat. rev. (Lepidoptera: Saturniidae). — Galathea, Berichte des Kreises Nürnberger Entomologen e.V., Nürnberg, **22** (1): 41–47.

——, & Callegari, M. C. (1996): Lista preliminare dei Saturnidi del dipartimento di Loreto, Peru (Lepidoptera, Saturniidae). — Entomofauna, Ansfelden, **17** (35): 477–492.

——, & —— (1997): A new record of *Paradaemonia ruschii* May & Oiticica-Filho, 1943 from Peru with additions and corrections to the list of the Saturniidae of Loreto. — Atalanta, Marktleuthen, **28** (1/2): 149–151.

——, & —— (2005a): A provisional list of the saturniids of Oliva (Muyo area, department of Amazonas, Peru) with notes on an undetermined female of *Automeris* Hübner, [1819] (Lepidoptera: Saturniidae). — SHILAP, Revista de Lepidopterología, Madrid, **33** (130): 231–234.

——, & —— (2005b): The Saturniidae recorded in two montane forest areas in the Napo province, eastern Ecuador (Lepidoptera: Saturniidae). — SHILAP, Revista de Lepidopterología, Madrid, **33** (131): 375–381.

Schulenberg, T. S., & Awbrey, K. (eds.) (1997): Rapid assessment program: The Cordillera del Cóndor Region of Ecuador and Peru. Vol. **7.** RAP Working papers — Washington D.C. (Conservation International), 231 pp.

Scoble, M. J. (1995): The Lepidoptera: Form, function, and diversity. — Oxford (Oxford University Press), 424 pp.

Siewert, R. R., Silva, E. J. E., & Mielke, C. G. C. (2010): Saturniidae from Santa Catarina state, Brazil, with taxonomic notes (Lepidoptera). — Nachrichten des Entomologischen Vereins Apollo, Frankfurt am Main, **30** (4): 215–220.

Suyo Pomalía, J. P. (2018): Geo GPS Peru. — URL: www. geogpsperu.com (last accessed 21. ii. 2018).

Valqui, M., Feather, C., & Llanos, R. E. (2015): Revealing the hidden: Indigenous perspectives on deforestation in the Peruvian Amazon. The causes and the solutions. — Asociación Interétnica de Desarrollo de la Selva Peruana & Forest Peoples Programme. — Moreton-in-Marsh, 127 pp.

van Nieukerken, E. J., Kaila, L., Kitching, I. J., Kristensen, N. P., Lees, D. C., Minet, J., Mitter, C., Mutanen, M., Regier, J. C., Simonsen, T. J., Wahlberg, N., Yen, S. H., Zahiri, R., Adamski, D., Baixeras, J., Bartsch, D., Bengtsson, B. A., Brown, J. W., Bucherli, S. R., Davis, D. R., Prins, J. de, Prins, W. de, Epstein, M. E., Gentili-Poole, P., Gielis, C., Hättenschwiler, P., Hausmann, A., Holloway, J. D., Kallies, A., Karsholt, O., Kawahara, A. Y., Koster, S., Kozlov, M. V., Lafontaine, J. D., Lamas, G., Landry, J. F., Lee, S., Nuss, M., Park, K. T., Penz, C., Rota, J., Schintlmeister, A., Schmidt, B. C., Sohn, J. C., Solis, M. A., Tarmann, G. M., Warren, A. D., Weller, S., Yakovlev, R. V., Zolotuhin, V. V. & Zwick, A. (2011): Order Lepidoptera Linnaeus, 1758. — Pp. 212–221 *in:* Zhang Z.-Q. (ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. — Zootaxa, Auckland, **3148:** 237 pp.

van Swaay, C. A. M., van Strien, A. J., Aghababyan, K., Åström, D., Botham, M., Brereton, T., Carlisle, B., Chambers, P., Collins, S., Dopagne, C., Escobés, R., Feldmann, R., Fernández-García, J. M., Fontaine, B., Goloshchapova, S., Gracianteparaluceta, A., Harpke, A., Heliölä, J., Khanamirian, G., Komac, B., Kühn, E., Lang, A., Leopold, P., Maes, D., Mestdagh, X., Monasterio, Y., Munguira, M. L., Murray, T., Musche, M., Õunap, E., Pettersson, L. B., Piqueray, J., Popoff, S., Prokofev, I., Roth, T., Roy, D. B., Schmucki, R., Settele, J., Stefanescu, C., Švitra, G., Teixeira, S. M., Tiitsaar, A., Verovnik, R., & Warren, M. S. (2016): The European Butterfly Indicator for grassland species 1990–2015. — Wageningen (Butterfly Conservation Europe, De Vlinderstichting), 42 pp.

Yela, J. L., & Holyoak, M. (1997): Effects of moonlight and meteorological factors on light and bait trap catches of noctuid moths (Lepidoptera: Noctuidae). — Environmental Entomology, Oxford, **26** (6): 1283–1290.

Young, B. E., Josse, C., Stern, M., Vasconez, S., Olander, J., de Lozada, A. S., Zador, M., Smyth, R., Comer, P. J., Moull, K., Echavarria, M., & Hak, J. (2015): Ecosystem profile: Tropical Andes biodiversity hotspot. — Arlington (Conservation International), 481 pp.

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