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The genus *Pero* Herrich-Schäffer in Nicaragua (Lepidoptera:
Geometridae, Ennominae)

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Foto de la portada: *Pero amanda* (Lepidoptera: Geometriidae), de Nicaragua: Selva Negra, Reserva Natural El Arenal, foto Toivo Viidalepp.

The genus *Pero* Herrich-Schäffer in Nicaragua (Lepidoptera: Geometridae, Ennominae).

Jaan Viidalepp* & Jean-Michel Maes**

Abstract

Twenty-two identified species plus two additional females were collected by us in Nicaragua, during two collecting trips. The species and their male genitalia structures are illustrated. 19 species are recorded for the first time for the fauna of Nicaragua.

Resumen

En dos viajes de colecta hemos colectado 22 especies de Geometridae del genero *Pero*. Las especies así como los genitalia macho están ilustrados. 19 especies constituyen nuevos reportes para Nicaragua.

Introduction

The faunistics of Lepidoptera in the tropical America is poorly resolved, realizable in frames of some recently published revisions and reviews. Poole (1987) revised the most speciose nacophorine genus *Pero* Herrich-Schäffer, 1855. He presented an overview of the taxonomic characters and geographical distribution of the total of 294 species included. Poole dealt with morphospecies and avoided the usage of the category of subspecies. Pitkin (1996) merely referred to the monograph by Poole, and placed the genus *Pero* in the tribe Azelini. Poole recognized five species for the fauna of Nicaragua: *P. nigra* (Warren), *P. externa* (Warren), *P. fragila* Poole, *P. polygonaria* (Herrich-Schäffer) and *P. delauta* (Warren) and mentioned further seven species from adjacent, both northern and southern, areas - Guatemala or Honduras and Costa Rica which should occur in Nicaragua.

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Methods and material

We sampled geometrid moths in three ecologically different sites in Nicaragua 2008 and 2009, using the study trips organized by Dr. J.-M. Maes and by Entomological Museum in León, Nicaragua. The material was collected in following sites using light trapping at 160W mixed-light lamps:

- 1) Prov. Rio San Juan, Bartola Refuge at the river San Juan (a lowland wet tropical forest area), 02-06.06.2008, and 02-06.11.2009.
- 2) Prov. Granada, Domitila Private Forest (a dry tropical forest area), 28.05 - 01.06.2008 and 07-10.11.2009.
- 3) Prov. Matagalpa, Selva Negra Estate, 10-16.11. 2009 (a cloud forest and coffee plantations' area at 1200 - 1400 m above sea level).

In field, i.e. at the lamps in night time, the species of *Pero* may be selected out according to their planiform resting position with the posterior end of the abdomen upcurved, and by the characteristical shape of wings. The wing pattern is usually specific on species group level (Plate 1, Figs 1- 18). The species are identified according to the genitalic characters described and illustrated by Poole (1987) (Figs 19 - 41). The mounted moths are photographed on the same scale using a Canon 350D digital camera. For preparation of the genitalia slides, the posterior part of the abdomen of a moth was cut down, soaked in 10% solution of KOH at about 20°C for 24 hours, washed in pure water, cleaned (the deciduous hairscales brushed off). The genital slides were inspected in water or glycerol, dehydrated in some ethyl alcohol for 1-2 hours and embedded in Euparal solution. The genital armatures were photographed with Leica EC3 digital camera and Leica SDO microscope, on the same scale, and figured at the same scale again. Some slides (of large sized specimens) are figured in a part to maintain the proportions of the genitalia structures. The basal parts of the genital armatures are cut down from some pictures.

The monograph by Poole (1987) is distributed as black-and-white copies of the original text and illustrations. Most species are well illustrated on the BOLD Taxonomy homepage.

The material collected is mounted and deposited in the IZBE insect collection, now in Institute of Agronomy and Environmental Studies at the Estonian University of Life Sciences, Tartu, Estonia.

Poole (1987) has defined parts of the male genitalia of the genus *Pero* as follows: The uncus has a distal process which varies in the shape and length. The valva is well ornamented: the apical, heavy setose part is named the costal fold, the dorsal margin of a valva, costa, is short, but sometimes projecting as long as the costal fold (Figs 20, 21); a ventral process, if present, is usually ventral to the base of the costal fold (Fig. 19 a.o.). These parts of a valva bear a long and dense but deciduous vestiture. The subscaphium is often a membranous tube but it may have a flat, plate-like ventral sclerotization in some groups of species (Figs 21, 25, 41). The subscaphium is jointed between the uncus and the gnathos. The juxta is sited ventrally between the bases of valvae and the vinculum. It is usually bipartite, with the proportions of parts and the configuration of its dorsal edge having some diagnostic value.

A checklist of the species of *Pero* collected in Nicaragua.

Pero astapa (Druce, 1892) (Plate 1, 1; Plate 2, 19)

Poole, 1987: 6.

A dry forest species, widespread from Grenada and Texas to North Venezuela. New country record: Nicaragua, Domitila. The slender costal fold and the sharp ventral process of one-half the length of the fold are diagnostic. The valva is slightly S-shaped in its apical part.

Pero afuera Poole, 1987 (Plate 1, 2; Plate 2, 20)

Pero afuera is distributed from Mexico to Venezuela and Colombia (Poole, 1987: 11). New country record: Nicaragua, Selva Negra. The species has longer and slenderer uncus than *P. lignata*, and some external ornamentation on aedeagus. The shapes of the costal fold, costal projection and dorsal ornamentation of the juxta are specific.

Pero lignata (Warren, 1897) (Plate 1, 3; Plate 2, 21)

Poole, 1987: 10.

A widespread (from Mexico to Argentina) lowland species. New country record: Nicaragua: Bartola, Domitila. The stouter shape of the forked uncus and the long dorsal process to valva distinguish this species from similar *P. afuera*. However, the shape of uncus is different if compared to Fig. 454 in Poole (1987).

Pero nigra (Warren, 1904)

Poole, 1987: 17.

The species is distributed from Mexico to Amazonas. Poole, 1987: 18: „Jinotega, 3400 ft.” The long, acute process to the ventral edge of valva is specific.

Pero sp. nr. *nigra*? (Plate 1, 4; Plate 2, 22)

The male genitalia of this unique specimen resembles *P. nigra* (Poole, 1987: Fig. 469) in the shape of the uncus (smoothly tapering to the tip) and that of the free ventral process to valva, but differs in the shape of the process attached ventrally to the costal fold that is solid and oval. Locality: Nicaragua: Selva Negra.

Pero stuposaria (Guenée, 1857) (Plate 1, 5; Plate 2, 23)

Poole, 1987: 20.

A widespread species (from Guatemala to Uruguay and Bolivia). New country record: Nicaragua, Bartola. The tridentate shape of the basal half of the costal fold is specific.

Pero externa (Warren, 1896) (Plate 1, 18; Plate 2, 24)

Poole, 1987: 35.

P. externa is distributed from southern Mexico to Brazil and Bolivia. New locality record: Nicaragua, Domitila. The genitalia are similar in this species and in following *P. incisa* and *P. fragila*; the shape of valva apex, obtuse and tapering to tip, is distinctive for *P. externa*. The short and medially bulbous uncus is shared by these three species. *P. externa* has its both wings almost blackish brown with white discal marks, less variegated than in the related species.

Pero registrada Poole, 1987 (Plate 1, 10; Plate 3, 25)

Poole, 1987: 40.

The species is alike *P. incisa* but with its wing pattern relatively more variegated. The unique shape of the costal fold, the stout rounded ventral process to valva and the shape of juxta are characteristic. *P. registrada* was described from Panama and is illustrated on the BOLD Taxonomy homepage from Costa Rica. New country record: Nicaragua.

Pero fragila Poole, 1987 (Plate 1, 11; Plate 4, 26)

The species is widespread from Mexico to Uruguay and Bolivia. Nicaragua: Domitila. The inward projection of the ventral process of the valva is characteristic, the tip of the ventral process is tapered to tip in *P. fragila*, but rounded apically in the similar species *P. incisa*.

Pero albivena (Warren, 1897) (Plate 1, 6; Plate 3, 27)

Poole, 1987: 48.

The species has a wide distribution from Belize to Bolivia (new country record: Nicaragua, Domitila). The apex of the valva is characteristically shaped and protruding.

Pero bulba Poole, 1987 (Plate 1, 7; Plate 3, 28)

The species is distributed from tropical Mexico to northern Peru (new country record: Nicaragua, Selva Negra). The shapes of valva apex and uncus (slightly broadening to the truncate tip) are distinctive. The asymmetry of the juxta is slight.

Pero plagodiata (Warren, 1897) (Plate 1, 17; Plate 3, 29)

Poole, 1987: 54.

Pero plagodiata is distributed from southern Mexico to Bolivia. New country record: Nicaragua: Selva Negra. The species is distinctive in yellow color of wings with a fine striation, and in the large distal lobes of juxta. The Nicaraguan sample has the costal fold relatively longer and the valva shorter than figured by Poole, 1987, Fig. 588.

Pero polygonaria (Herrich-Schäffer, 1858) (Plate 1, 8; Plate 3, 30)

Poole, 1987: 55.

The species is distributed from Mexico to Peru and Bolivia, and listed for Nicaragua from Eden by Poole. The shape of the costal fold of valva differentiates *P. polygonaria* from very similarly marked moths of *P. otra* Poole. The shape of juxta is also characteristic.

Pero cruza Poole, 1987 (Plate 1, 9; Plate 4, 31)

P. cruza, described from one male from Orizaba, Mexico, is here recorded from Nicaragua (Matagalpa prov., Selva Negra). The shape of the ventral process to valva and that of the dorsal part of juxta, are diagnostic.

Pero speciosata (Guenée, 1857) (Plate 4, 32)

Poole, 1987: 60.

The species was known from Colombia to Peru. New country record: Nicaragua, Selva Negra. The shape of valva and that of the broad ventral process are characteristic for this species. The dorsal part of the juxta is rectangular, broader than in the previous species.

Pero delauta (Warren, 1897)

Poole, 1987: 62.

The distribution of this species ranges from southern Mexico to Bolivia (recorded from Jinotepe, Nicaragua by Poole). The shape of valva is diagnostic for this species, the dorsal part of the juxta rectangular like in the two preceding species but much broader.

Pero vecina (Schaus, 1901) (Plate 1, 12; Plate 4, 33)

Poole, 1987: 64.

P. vecina ranges from southern Mexico to Venezuela and Colombia. New country record: Nicaragua, Selva Negra. The shape of the broad and short-tipped uncus is characteristic.

Pero melissa (Druce, 1892) (Plate 4, 34)

Poole, 1987: 62.

P. melissa is predominantly a Mesoamerican species: it ranges from Mexico to Colombia (new country record: Nicaragua, Selva Negra). The short finger-like process to the ventral side of the costal fold is diagnostic. *P. melissa* is similar with *P. rotundata* in facies, differing in the linear discal mark in the forewing.

Pero rotundata (Warren, 1900) (Plate 1, 13; Plate 4, 35, 36, 41)

Poole, 1987: 67.

The species is distributed from southern Mexico to Colombia (new country record: Nicaragua, Selva Negra). The subscaphium is characteristic: bipartite basally, the tips broadly rounded. The subscaphium is shaped like in the species of the *Pero xyliina* species group. Also the last abdominal sternite in a male is strongly modified (Pl. 5, 41). The Fig. 36 is to show the necessity of brushing off the deciduous hairscales to see the diagnostic features of a moth.

Pero amanda (Druce, 1898) (Plate 1, 16; Plate 5, 37)

Poole, 1987: 56.

The distribution area of *Pero amanda* reaches from Cuba and Mexico to Peru and Bolivia. New country record: Nicaragua, Domitila. The shape of the valva with a stout ventral process to it, and the slightly expanded uncus are characteristic for this species.

Pero asterodia (Druce, 1892) (Plate 5, 38)

Poole, 1987: 106.

The species is Mesoamerican, distributed from Mexico to Panama. New country record: Nicaragua, Selva Negra. The shape of the costal fold, oblique and projecting sharp to its ventral edge, is specific.

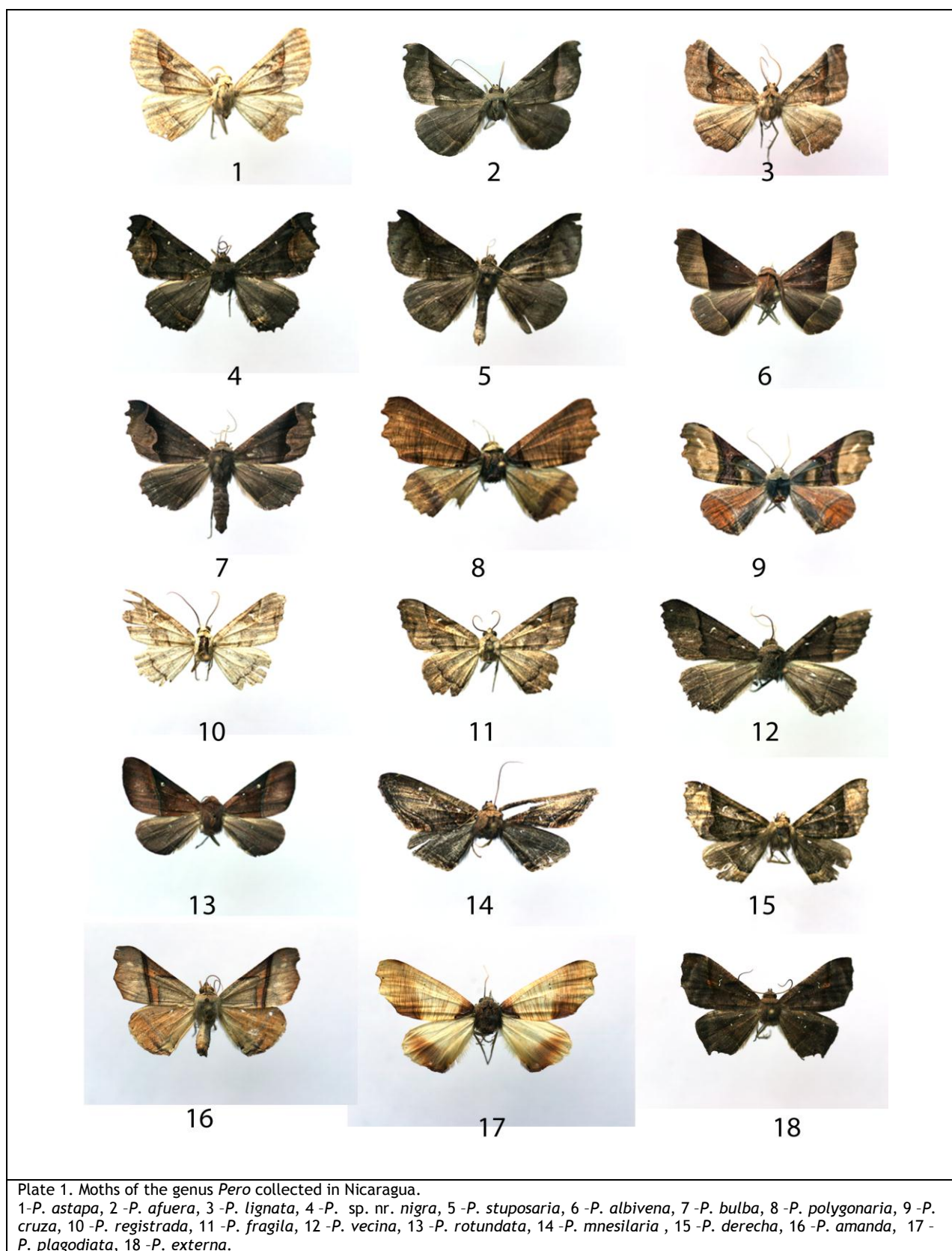
Pero mnesilaria (Oberthür, 1912) (Plate 1, 14; Plate 5, 39)

The species ranges from Mexico to Peru. New country record: Nicaragua, Selva Negra. The cupola-shaped and apically bidentate subscaphium, as well as the shape of the ventral process to the valva, are characteristic.

Pero derecha Poole, 1987 (Plate 1, 15; Plate 5, 40)

Poole, 1987: 98.

This species has a wide distribution range from southern Mexico to Bolivia (new country record: Nicaragua, Selva Negra). Its male genitalia, esp. the cupola-shaped distal projection of the uncus and the asymmetrical dorsal part of the juxta are characteristically shaped.



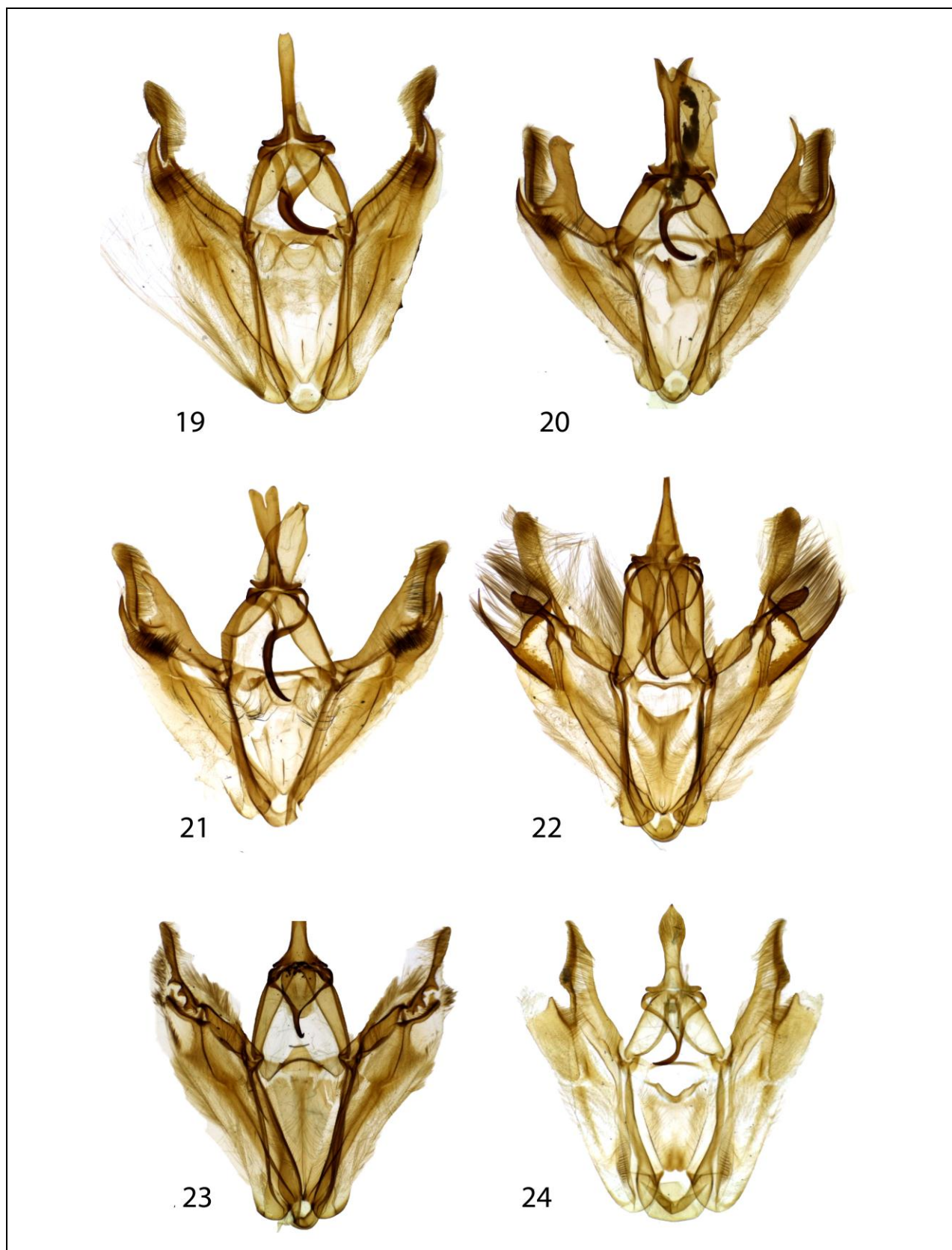


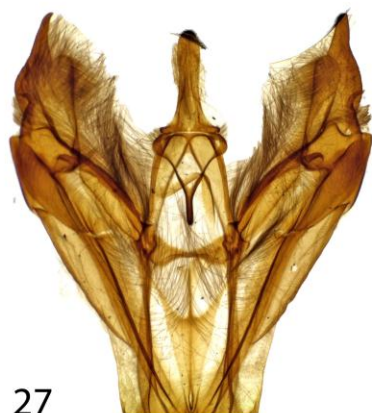
Plate 2, Figs 19-24. The male genital armatures of *Pero* moths.
19-*P. astapa*, 20-*P. afuera*, 21-*P. lignata*, 22-*P. sp. nr. nigra*, 23-*P. stuposaria*, 24-*P. externa*.



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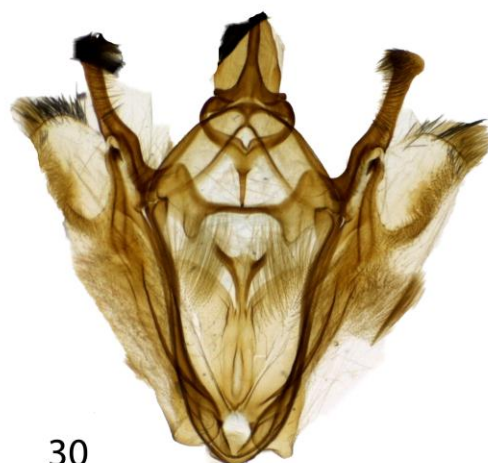
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Plate 3, Figs 25-30. The male genital armatures of *Pero* moths.
25-*P. registrada*, 26-*P. fragila*, 27-*P. albivena*, 28-*P. bulba*, 29-*P. plagodiata*, 30-*P. polygonaria*.



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34



35



36

Plate 4, Figs 31-36. The male genital armatures of *Pero* moths.
31-*P. cruza*, 32-*P. speciosata*, 33-*P. vecina*, 34-*P. melissa*, 35, 36-*P. rotundata*.

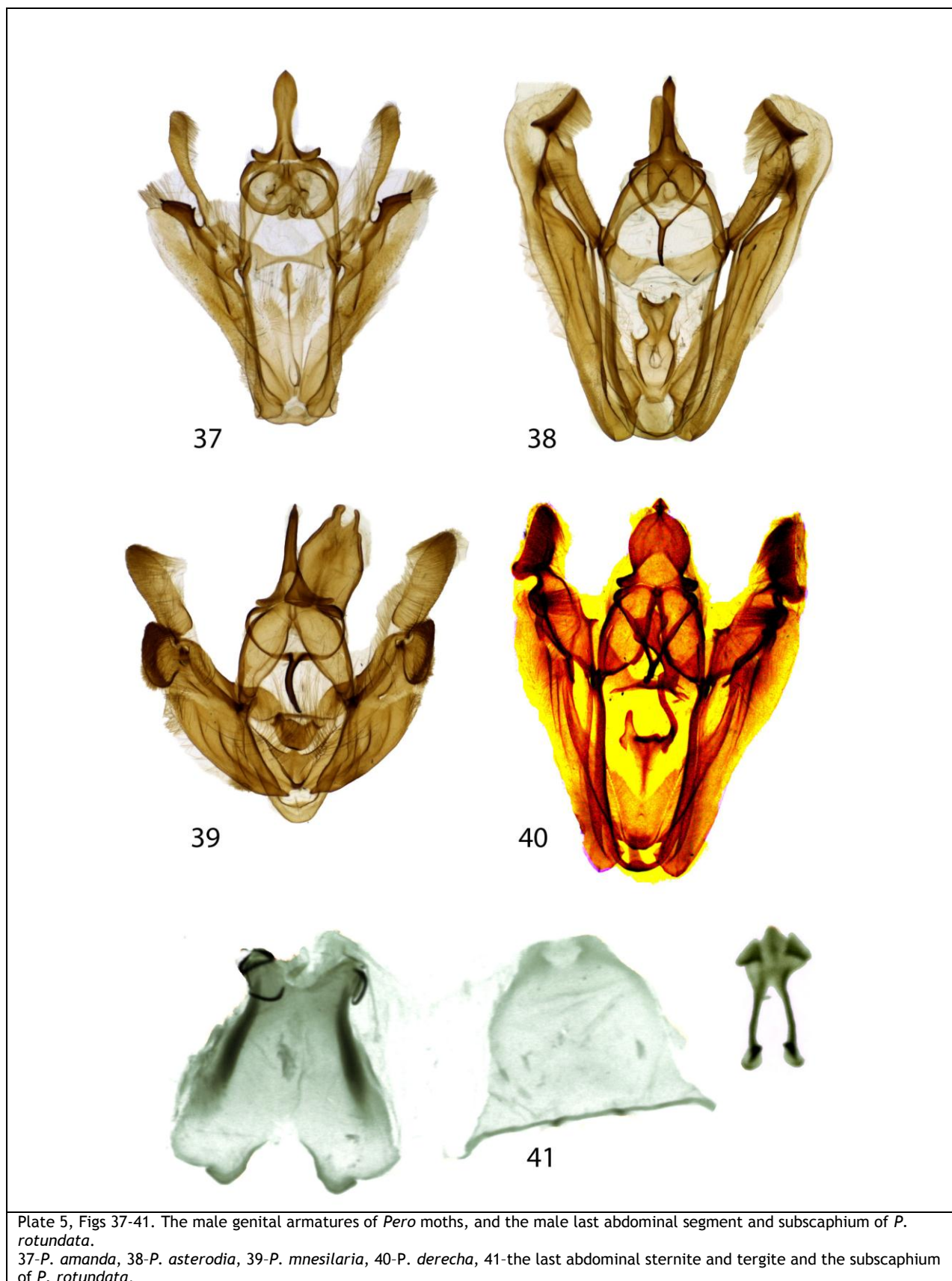


Plate 5, Figs 37-41. The male genital armatures of *Pero* moths, and the male last abdominal segment and subscaphium of *P. rotundata*.

37-*P. amanda*, 38-*P. asterodia*, 39-*P. mnesilaria*, 40-*P. derecha*, 41-the last abdominal sternite and tergite and the subscaphium of *P. rotundata*.

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