A NEW SPECIES OF *OIDAEMATOPHORUS* (LEPIDOPTERA: PTEROPHORIDAE) FROM CHINGAZA NATIONAL NATURAL PARK IN COLOMBIA

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Abstract - *Oidaematophorus espeletiae*, **sp. nov.**, is described from the Chingaza páramo in Colombia. The life history, external characters of the adult, male and female genitalia, final instar larva, and pupa are described and illustrated. This moth species is widely distributed in the páramo. Larvae cause damage in meristem leaves of frailejones (*Espeletia* spp., Asteraceae). Identification and continuing studies of this moth are important to determine its potential role in the reported death of numerous frailejones in the area. The hosts, *Espeletia grandiflora* and *E. uribei* are some of the keystone species of the páramo ecosytem.

Resumen - Se describe *Oidaematophorus espeletiae*, **sp. nov** del páramo de Chingaza, Colombia. Se describen e ilustran la historia de vida, caracteres externos del adulto, genitalia de macho y hembra, último instar larval, y pupa. Esta polilla se encuentra ampliamente distribuida en el páramo. Las larvas ocasionan daños en las hojas del meristemo de los frailejones (*Espeletia* spp., Asteraceae). La identificación y futuros estudios de esta polilla son importantes para determinar su rol potencial en la mortalidad de estas plantas. Los huéspedes *Espeletia grandiflora* y *E. uribei*, son algunas de las especies fundamentales del ecosistema de páramo.

Key words: Chingaza, Colombia, *Espeletia*, frailejones, genitalia, life history, larvae, Neotropical, páramo, pupae

INTRODUCTION

Tribe Oidaematophorini is difficult to subdivide into genera and species, especially with regards to *Adaina* Tutt (1905), *Hellinsia* Tutt (1905), and *Oidaematophorus* Wallengren (1862). The latter genus contains 43 species (Gielis 2003) and is characterized by scale bristles on the mid legs at the base of spur pairs, forewing veins R_2, R_3, R_4, R_5 separate and R_1 absent, forewing Cu_1 arising from the posterior angle of the discal cell, and Cu_2 from the cell. Males possess asymmetrical valvae with spines and saccular processes and the female genitalia have a bell or widened funnel-shaped antrum and the bursa copulatrix is without signa (Gielis 1993, 2011).

This genus is distributed worldwide with most species found in the Neotropical and Nearctic Regions (Matthews 2008). Larvae of Pterophoridae have different habits and forms, e.g., "solitary feeders" when there is only one larva per plant, foliage and flower feeders, and stem borers. The majority of species feed on the angiosperm families Asteraceae, Lamiaceae, Fabaceae, and to a lesser extent, Solanaceae, Rosaceae, Boraginaceae, and others (Matthews and Lott 2005, Matthews 2008, 2010). Known hosts of the genus *Oidaematophorus* belong to the Asteraceae and Boraginaceae (Matthews and Lott 2005).

Pterophorid larvae can cause serious damage in different families of plants. In *Espeletia* Mutis ex Humb. & Bonpl. (Asteraceae), essential native plants in the trophic structure of the páramo, Salinas et al. (2013) reported that larvae of *Oidaematophorus* are borers of meristem leaves and cause a partial loss of tissue, as well as withering of the leaves, but do not directly cause mortality in plants. *Espeletia* species are part of the flora that characterizes the páramo ecosystem, the most species-rich zone located in the transition altoandino-subpáramo. Approximately 100 *Espeletia* species are found in the northwestern Andes (Fagua and Gonzalez 2007). *Espeletia*, commonly referred to as frailejones, have thick trunks and succulent pubescent rosette leaves, as well as marcescent leaves. The meristem leaves are especially pubescent, an adaptation for temperature extremes, UV exposure, and defense against herbivores (Cross 2001, Holt 2001).

In this study a new species of the genus *Oidaematophorus* is described and illustrated, including larvae and pupae collected from *Espeletia* in Calostros brook, Chingaza National Natural Park (Cundinamarca, Colombia), and some aspects of its life history and distribution are presented.

MATERIALS AND METHODS

Larvae and pupae were collected along Calostros Brook in Chingaza. Specimens were reared in the entomology laboratory of the Bio-Sistemas Center, Jorge Tadeo Lozano University (Chia-Colombia) at an average temperature 14±0.5 C°, relative humidity of 80%, and photoperiod of 12:12 h light: dark. Larvae were fed with *Espeletia* leaves and adults with a 10% honey solution.

Genitalia dissections were prepared following the methodology of Clarke (1941). Illustrations of dissections and slide preparations were prepared using a Nikon AW100 camera and KOZO Stereo Microscope. Descriptions and identifications are based on comparison with known reference specimens, genitalia preparations on slides, and published illustrations by Gielis (2011), including those of a similar species, *Hellinsia conjunctus* (Zeller, 1877) [1♂ lectotype, genitalia slide BM 18704 (National Museum of Natural History, London), 1♂ paralectotype, genitalia slide CG 3132 (Naturalis, Leiden)], from Bogotá, Colombia (Gielis 2011).

The holotype and paratypes are deposited in Chía, Centro de Bio-Sistemas, Jorge Tadeo Lozano University [CIAA] and preserved larvae and pupae at the McGuire Center for Lepidoptera and Biodiversity, Florida Museum of

Natural History, University of Florida [MGCL]. General setal nomenclature and specific terminology used in describing the immatures follow that of Stehr (1987) and Matthews (2006).

Oidaematophorus espeletiae, Hernández, Fuentes, Fajardo & Matthews, sp. nov. (Figures 1-5, 7-8, 13, 14-15)

Diagnosis. The maculation of the new species differs slightly from that of *Hellinsia conjunctus* in that the forewing has a triangular/oblique dash basad of the cleft that is not contiguous with the costal dash, and dark spots scattered on the dorsum of the second lobe. Similarly, the cell area basad of the triangular/oblique dash is gray whereas in *H. conjunctus* it is white with black spots. The contrast between the fore- and hindwings is also greater in *O. espeletiae*, which has no dark scale tuft on the tip of the first lobe of the hindwings.

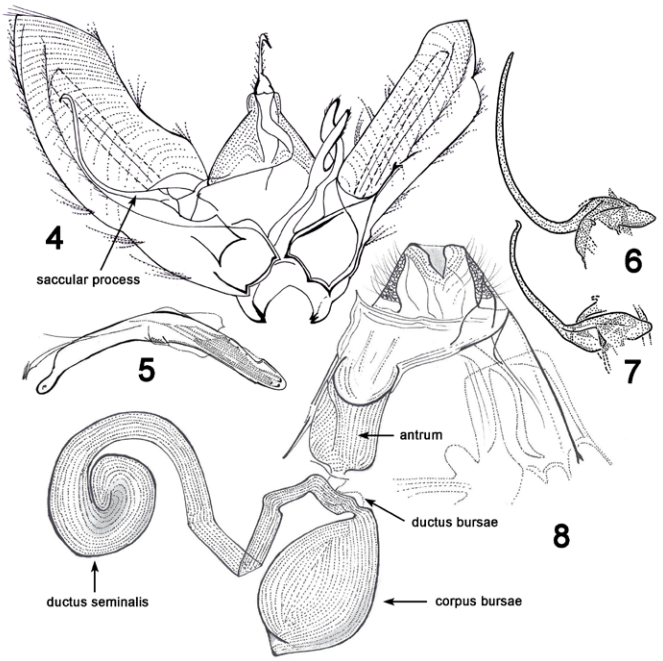
The male genitalia of *O. espeletiae* (Fig. 4-5, 7) are distinguishable from the aforementioned species based on the length and curvature of the left valve and saccular process (Fig. 6-7). The saccular process extends laterally from a thickened base near the juncture of the tegumen and vinculum. The curved portion of this spine-like process extends over about 3/4 of the valve length. Its apex is hooked in contrast to that of *H. conjunctus* (Fig. 6) which is simply pointed and straight. In addition, in *O. espeletiae* the base of the saccular process has a small hump, the right valva is more slender, and both valvae have distinct folds in the middle.

Description (male, female). Based on the holotype (male) (Fig. 1) and paratypes (12 males and 7 females). Head with prominent compound eyes, labial palpi with cream colored scales, slender and directed forward, length exceeding eye diameter. Front and vertex with chestnut and cream scales respectively. Occiput with tuft of linear chestnut-brown scales, not reaching eye diameter in length. Antenna filiform, extending to about 1/3 length of forewing; dorsal surface covered with longitudinal rows of cream and chestnut scales along entire length. Thorax with tegulae cream (Fig. 2), grading to white caudodorsally. Foreleg coxa with scales cream basally to chestnut at tips; femur light brown to dark brownish laterally and medially; tibia light chestnut with cream at base and light chestnut at tip of scale tuft; tarsomeres chestnut, basal segment flecked with cream scaling medially. Mesothoracic coxa cream at base of scales to dark chestnut at tip; femur chestnut and tibia dark brownish with cream stripe along anterolateral margin and cream posterior internal margin with light chestnut at tip of scales; tibia with one pair of unequal spurs and with medial and terminal scale tufts at base of spurs; tarsomeres I-V cream ventrally and I-II chestnut dorsally. Metathoracic leg with coxa and tibia as on midleg; femur chestnut along anterolateral margin and cream on posterior internal margin; tibia with one pair of spurs: proximal pair longer with medial spur slightly longer than lateral spur; distal spurs longest; spurs light gray at base and black at tip with terminal scale tuft light gray with cream; tarsomeres cream, faint light chestnut at base. Forewing length 3.0 - 4.0 mm, mean (n=12, Holotype= 4.0 mm); cleft origin at about 2/3 from wing base; dorsal surface gray at base and apically cream with black scales scattered along anal margin including second lobe; costa with transverse black dash basad of apex (between R_2 and R_3); cleft base with diffuse black triangular dash; with longitudinal light gray line on fringes; cell light gray until middle of wing; fringe cream on second lobe (Cu_1 and Cu_2) with spots scattered along the lobe, with gray scales at wing base; fringe scales filiform, light chestnut along posterior margin and distally on both lobes. Hindwing trilobed, cream dorsally, chestnut ventrally; fringe scales chestnut. Abdomen variable (Fig. 1, 3), dark chestnut, with diffuse variable cream, lateral lines with dark spots and cream, midventral line with dark spots.

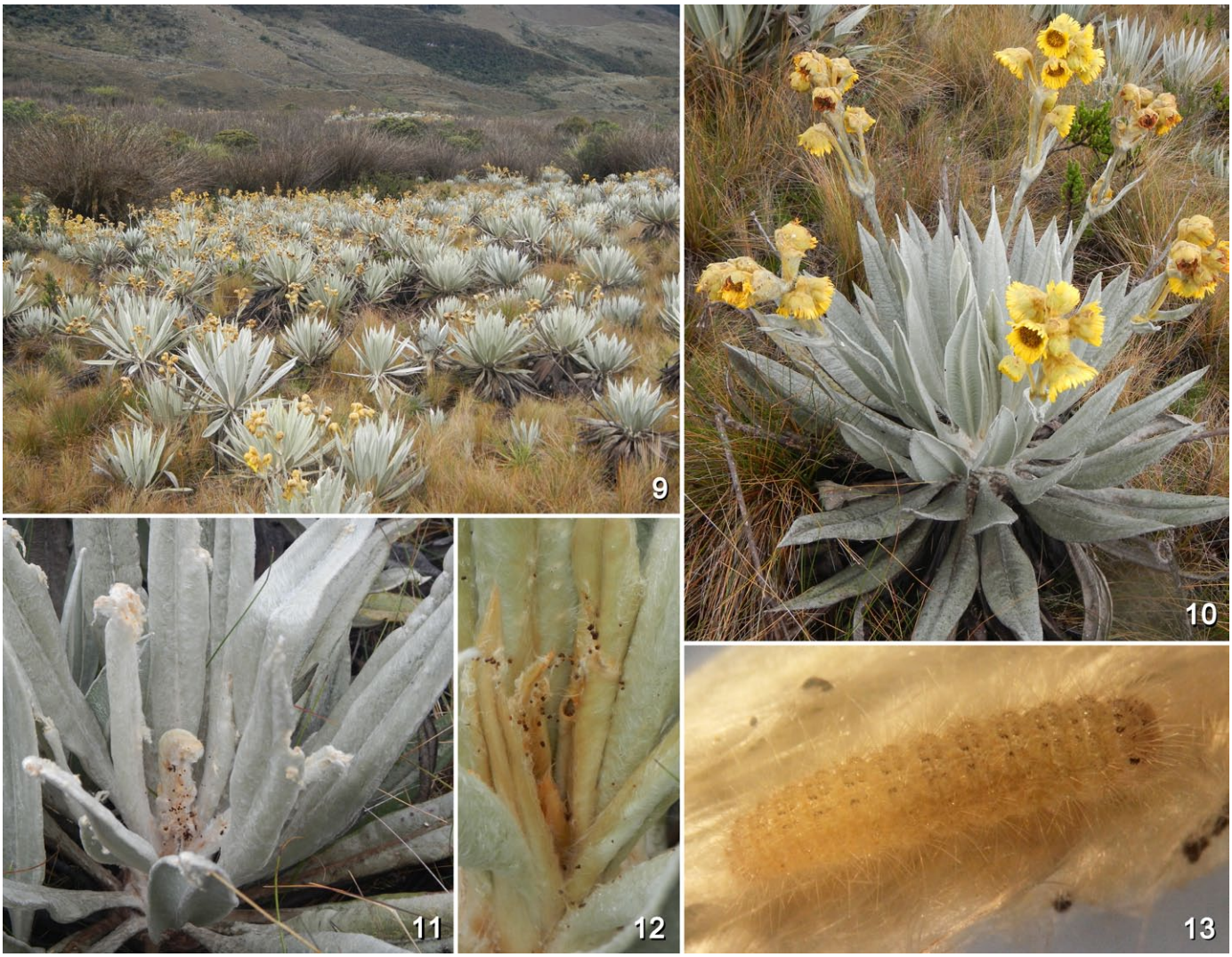
Male genitalia (Figs. 4-5, 7). Uncus well-developed, sclerotized, strongly curved and slender. Tegumen bilobed. Valvae asymmetrical, both with distinct fold in middle (Fig. 4); left valva elongated, broader, slightly swollen, with curved, spinose saccular process in middle; spine of saccular process extending laterally from thickened base near juncture of tegumen and vinculum; curved portion occupying more than half valva length; apex with hooked tip (Fig. 4, 7); base with small dorsal hump. Right valve with pair of minute dentate processes along sacculus; basal process directed anterad, distal process projecting caudad. Juxta stout, with asymmetrical thickened anellus arms, the right arm extending beyond the left. Saccus narrow, moderately sclerotized. Phallus curved (Fig. 5), cornuti present as fibrous bundle.

Female genitalia (Fig. 8). Papilla analis with weakly sclerotized band along anterior margin. Apophysis posterioris connected to papilla analis at anterior margin of tergite VIII. Ostium round, ventral margin well-defined, dorsal margin obscure. Antrum strongly sclerotized, covered with small setae or minute hairs; broad, width greater anteriorly, with sclerotized short constriction before ductus bursae 0.5× ostium diameter. Ductus bursae narrow; length at least 0.25× that of corpus bursae; inception of ductus seminalis midway between sclerotized extension of antrum and corpus bursae. Corpus bursae

Figures 1-2. Adult *Oidaematophorus espeletiae*, **sp. nov.**: **1)** holotype; **2)** paratype specimen prior to pinning, showing scale patterns on head and thorax; **3)** same specimen showing scale pattern on abdomen dorsum.



Figures 4-8. Male and female genitalia: **4)** *O. espeletiae* male genitalia with phallus removed; **5)** aedeagus (phallus) of same individual; **6)** saccular process of left valva of *Hellinsia conjunctus*; **7)** saccular process of left valva of *O. espeletiae*; **8)** *O. espeletiae* female genitalia.



Figures 9-13. *Oidaematophorus espeletiae* life history: **9)** *Espeletia* stand in páramo habitat near Calostros brook, Chingaza National Natural Park, Colombia; **10)** larval hostplant *Espeletia grandiflora*; **11-12)** larval frass and damage to meristem leaves of hostplants; **13)** final instar larva.

ovate with longitudinal striations, without signum. Ductus seminalis more than 6× length of corpus bursae, anterior part coiled.

Types. HOLOTYPE ♂, 'Colombia, Chingaza National Natural Park, 3600 m, Mina Palacios, Qda. Calostros, N04°40'40.4"W073°48'04.5", 12.x.2012, L. Hernández & L. Fuentes leg.' (slide LCHD 1014M). PARATYPES - 12♂ (slides LHCD 1004M–1010M, LCHD 1012M, LCHD 1014M–1017M), 7♀ (slides LCHD 1002F, LCHD 1006F, LCHD 1008F–1011F, LCHD 1015F), with same locality as holotype, 02.II.2013. The holotype and paratypes are deposited in Chía, Centro de Bio-Sistemas, Jorge Tadeo Lozano University (CIAA).

Etymology. *Oidaematophorus espeletiae* is named for the host plant genus, a native of the Andean páramo and a critical component of the ecology and biodiversity of this ecosystem.

LIFE HISTORY AND IMMATURES

Larvae of *O. espeletiae* feed on meristem leaves of frailejones (*Espeletia* spp., Asteraceae), principally *E. grandiflora* Humb. and Bonpl. and *E. uribei* Cuatrec. They are only in meristem leaves and it is uncommon to find two larvae on the same plant. As for their behavior, larvae move slowly and are sometimes sheltered within gall-like chambers caused by feeding damage. Larvae and pupae were found on new leaves of frailejones along Calostros brook, between 3100 and 3700 m.

Although first instar larvae were not collected, head capsule measurements of material examined indicate four instars with widths as follows: instar I (0.5-0.55 mm, n=8), II (0.96-1.1 mm, n=19), III (1.4-1.47mm, n=15), IV (1.6-1.65 mm). The following descriptions are based on fourth (final) instar larvae. Earlier instar larvae are generally similar to the final instar. The life cycle of this species has an average duration of 145 days.

Immature material examined. L= Larval, LS= Larval skin/exuvium, P= pupa, PC= pupa case/exuvium. Colombia: Chingaza National Natural Park, N04°40'45.9" W073°47'59.9", 3600 m, Mina Palacios, 28.xi. 2012, Qda. [Quebrada de] Calostros, in meristem leaves of *Espeletia* sp. (6 L, 6 LS, 4 P, 4 PC) [MGCL].

Larva (final instar, Figs. 13, 14). Maximum length 15 mm, $\bar{x}$ = 12.71 ±1.60 (n=6), maximum width 3 mm (excluding setae). Head yellowish brown, cranium without sclerotized markings. Thorax and abdominal segments cream colored with light reddish brown longitudinal stripes. Some specimens with posterior segment margins shagreened dorsally. Primary and secondary setae brownish tinged to clear, spiculate, arranged on verrucae. Dorsal and subdorsal verrucae brownish tinged. Dorsal verrucae bordered medially by small brown sclerites. Setae mostly short to medium length, longest setae present on lateral verrucae, about 0.75× maximum body width. Primary setae generally indistinguishable from secondary setae on verrucae.

Head: Adfrontals extending dorsally to epicranial notch, ventrally to about 0.6× adfrontal suture length, about even with seta F1. Pore AFa and setae AF1 and AF2 present. Adfrontal, F1, C1 and cranial setae relatively short, about

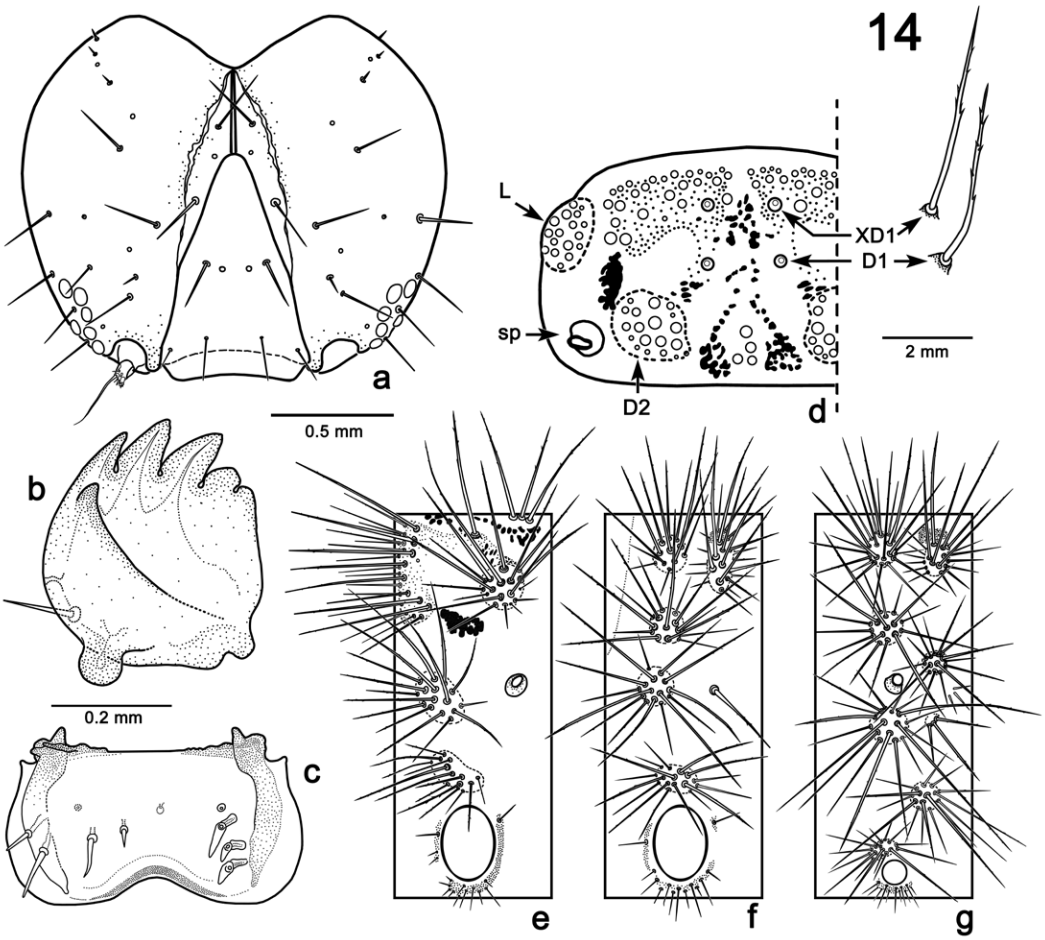


Figure 14. *Oidaematophorus espeletiae* larval morphology and chaetotaxy of final instar: **a)** head, frontal view; **b)** right mandible; **c)** labrum, epipharyngeal surface on right; **d)** dorsal view of prothorax (T1) showing distribution of setal sockets, D2 and L verrucae, aggregations of minute sclerites, and placement and morphology of primary setae XD1 and D1, sp = spiracle; **e)** chaetotaxic map of segment T1; **f)** segment T2; **g)** segment A3.

0.5× clypeal width. Setae C2, A1, and MD setae minute. Stemmata subequal, not conspicuously elevated or ridged. Labrum with shallow rounded notch bordered by narrow sclerite, without median fissure. Labral rod broad, base distinctly sclerotized and with multiple small lobes. Four minute setae present. Seta L2 longest, distad of L1 and M2. Mandible 6-toothed, width about equal to length. Distal seta replaced by pore, basal seta length just exceeding 0.3× mandible width.

Thorax: Pronotum (Fig. 14d) with shield area lightly sclerotized along anterior margin and surrounding XD, SD, and D1 setae. Anterior margin with dense fringe of spiculate short to medium length setae including primary setae XD1, XD2, SD1 and SD2. Primary XD and SD setae slightly longer and more robust but otherwise difficult to distinguish from secondary fringe setae. One pore posterad of seta XD2 and 2 additional pores irregularly present just anterad of seta D1. Seta D1 solitary, on slight rise near center of segment along midline. Seta D2 replaced by round verruca bearing about 20 minute to medium length setae. Middorsal rise bearing 2-4 setae present between D2 verrucae. Middorsal line and process flanked by irregular row of minute dark sclerites. Small cluster of minute sclerites also present between seta D1 and D2 verruca. Distinct aggregation of dark sclerites forming small spot between SD setae and spiracle. Lateral verruca round to oblong, with about 20 medium to minute setae. Spiracle exserted, with darkly sclerotized round to oblong peritreme. Subventral verruca oblong, with up to 20 minute to short setae. Thoracic leg banded, with dark claws and bearing multiple minute V setae. Segments T2-T3 dorsally subdivided by fold 0.25-0.33× from anterior margin. Anterior subdivision without setae, lightly shagreened in some specimens. Setae D1 and D2 represented by two verrucae. Primary setae on verrucae not distinctly central or otherwise individually distinguishable. Verruca D1 round, with about 15-20 minute to medium length setae. Verruca D2 oblong, with up to about 30 medium to minute setae. Minute setae mostly fringing margins of verruca. Medial margin of both D verrucae irregularly bordered by sclerite, more distinctly so on D2 verruca. Verruca SD directly laterad of D1 verruca, round with about 15 medium to minute setae. Verruca margin lightly sclerotized dorsally. Lateral verruca round with 15-20 minute to long setae. One solitary short seta or minute verruca with 2-6 short setae present posterad of L verruca. Subventral verruca oblong with about 20 medium to minute setae. Thoracic legs as on T1.

Abdomen: Segments A1-A8 with D1 and D2 verrucae as on T1-T2 but with sclerite on dorsal margin of D2 verruca tending to be proportionally larger than on T2. Verruca SD also as on T2-T3 but dorsal sclerite, if present, more distinctly separate from verruca margin. Spiracles exserted, with dark bases and peritremes, slightly enlarged on A8. A small round verruca bearing about 15 setae posterodorsad of spiracle. Scattered minute setae sometimes present laterad of aforementioned verruca. Lateral (L1+L2) verruca slightly smaller and more ventral than L verruca on T3. A short solitary seta or minute verruca or setal cluster with up to 4 minute to short setae posterad of L1+L2 verruca, absent on A8 and sometimes also missing on A1. Verruca L3 smaller than L1+L2, posterolaterad of L1+L2, with about 5-15 minute to medium setae. Subventral verruca with about 4-16 minute to short setae, most developed and dorsad of proleg on A3-A6. Proleg length about 2× width, with 6-9 crochets in mesopenellipse. Multiple minute ventral setae present, 2 or more on A1-A2 and A7-A8, up to 9-12 on an elongate sclerite at proleg base on A3-A6. Posterior margin of A9-A10 with 1 large D and 1 large SD verruca bearing short to long setae. Minute sclerites irregularly present dorsad of each verruca, those dorsad of D verruca forming middorsal row on A9. Lateral L1+L2 verruca on A9 as on A8 but smaller, absent on A10. Verruca L3 present on A8 but smaller than that on A7, replaced by combined L3-SV setal cluster on A9. Ventral seta solitary or with 1-3 other minute setae on A7-A10. Anal proleg bearing multiple minute to medium length setae with longer setae clustered posterad. Posterior side of proleg sclerotized. Anal proleg with 7-12 crochets.

Pupa (Fig. 15). Maximum length 14 mm, $\bar{x}$=12.25 ±0.94 (n=6), maximum

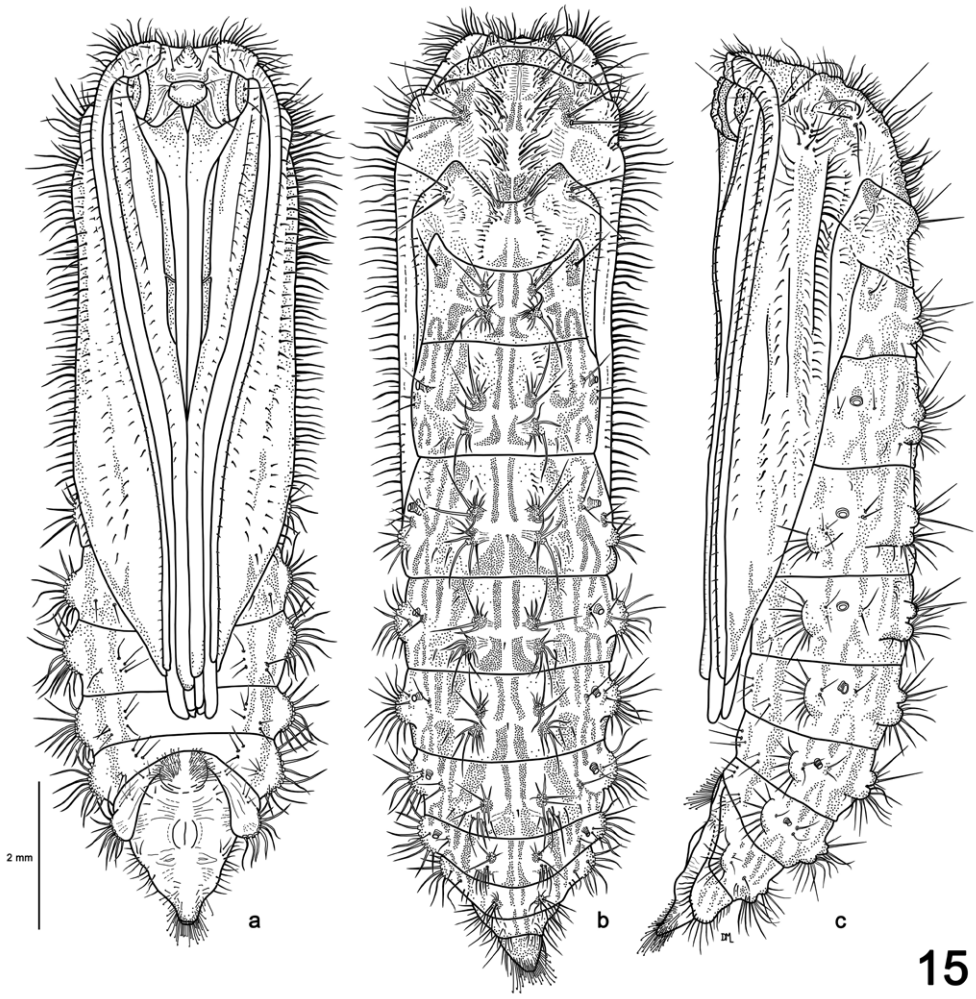


Figure 15. Pupa of *O. espeletiae*: **a)** ventral view; **b)** dorsal view; **c)** lateral view.

width 3.25mm at A4 (includes lateral verruca but not setae). Color cream with brown sclerotized longitudinal markings including a thin dorsal line and oblique sublateral dashes. Setae minute to medium in length, longest setae (D1 on T2, and SD setae on T1 and T2) not exceeding 0.5× body width. Setae clear or bright white, or brown where noted below. Primary and secondary dorsal setae clustered on tubercles. Some scattered secondary setae present, especially on thorax. Lateral fringe present on forewing and flange-like crescent-shaped verrucae on abdomen.

Head: Venter of front with oblique lateral ridges contoured along slight median apical prominence at cephalic margin. Seta F1 distinct, length similar to clypeal width. Frontoclypeal boundary distinct, 1 clypeal seta present. Cephalic margin with about 6 short setae laterad and some minute medial setae. Dorsum of front depressed along midline. Seta AF1 and AF2 present, sometimes difficult to distinguish from surrounding short to minute secondary setae but generally longer, with distinct base. Pilifers rugose, subdivided by oblique suture, separated medially by labial palpus. Gena rugose, moderately sclerotized in contrast with adjacent smooth eye and clypeal sclerite, 1 seta present near maxilla base. Sculpted eyepiece similarly sclerotized, both setae present. Maxilla base reaching middle of A2. Apex of maxilla distally exposed to T1 leg apex, between T2 leg tips. Antenna extending to forewing apex and with row of minute setae along entire length. Setae longer near antenna base and with additional setae on scape forming cephalic fringe.

Thorax: Pronotum moderately sclerotized (brown), paler along margins and middorsal suture. Primary setae D1, D2, and SD1 present with SD1 longest, at anterolateral angle. Seta SD2 irregularly present and adjacent to SD1. Scattered minute setae present, most near seta D1. Foreleg extending just short of forewing apex to at least anterior margin of A5. Anterior third with protruding lateral ridge. A row of minute setae extending along anterior two-thirds of leg. Coxa and trochanter exposed along maxilla. Mesonotum with dense fringe of minute to medium length secondary setae along dorsum, including setae D1 and D2. Secondary setae darker on posterior third of segment and adjacent area darkly sclerotized. Setae SD1 and SD2 together with minute to medium length secondary setae on slightly elevated pale area laterad of D setae. A darkly sclerotized trapezoidal spot anterad of SD area. Forewing and midleg reaching to at least A5. Midleg apex exceeding that of forewing. Midlegs not joined along meson and without setae. Forewing with several rows of setae, dorsalmost rows forming lateral fringe. Metanotum with setae D1 and D2 clustered with shorter secondary setae on rise near anterior margin. Setae SD1 and SD2 on slightly elevated tubercle with 6 or more minute setae. A dark sclerotized triangular spot anterad of SD tubercle, filling anterolateral angle of segment margin. Scattered minute setae present along dorsum and as small patch laterad of SD tubercle (at hindwing base). Metanotum variously sclerotized and patterned, generally darker than on adjacent segment A1. Hindwing more darkly sclerotized than forewing, with an incomplete longitudinal row of minute setae. Hindleg apex completely concealed or slightly exposed beneath maxilla tip.

Abdomen: Segments A1-A8 with two distinct, sclerotized D tubercles. Tubercles longitudinally aligned on middle third of segments except closer together and more posteriorly placed on A7-A8. Anterior tubercle with 2 subequal medium length socketed setae and up to about 10 shorter setae. Shorter setae mostly white, contrasting brown sclerotized tubercle. Neither medium length seta morphologically distinguishable as primary seta D1. Posterior (D2) tubercle with apical fan or longitudinal fringe of up to about 15 short to minute white setae. Primary seta D2 laterad on D2 tubercle, short, clear, socketed, and directed posterad. A thin brown dash dorsad of D1 tubercle, followed posterad by diffuse triangular spot dorsad of D2 tubercles and extending to segment margin. Area laterad of D1 tubercle with paired brown oblique dashes, with medial dash widest. Area laterad of D2 tubercle with dark brown rectangular spot, sometimes contiguous with aforementioned wide dash. One or 2 white secondary setae within rectangular spot trailing from D2 tubercle. Seta SD1 short, on minute sclerotized tubercle. Second adjacent shorter seta irregularly

present on tubercle. With diffuse brown spot usually anterad of tubercle. Spiracles on A2-A7 darkly sclerotized, distinctly exserted, slightly constricted just basad of opening to resemble lipped bottleneck. Segments A2-A8 with 1-4 short setae laterad of spiracle (or spiracular scar on A8). Area bearing setae lightly sclerotized. Light brown sclerotized spot also usually present anterad of short seta cluster. With crescent-shaped lateral flange verruca on A3-A8 bearing fan of up to about 15 short to medium length setae; smaller, with fewer setae on A3. Segment A9 dorsum with thin dorsal contiguous or broken brown dash along midline. Seta D1 and D2 solitary or with associated secondary setae. Fringe of short to medium setae present along posterior and lateral margins of segment; one lateral dark spot also present. Segment A10 dorsum tapered, apex with fan of short hooked hamuli. Venter of lateral verrucae pale except for darkly sclerotized setal sockets. Venter of segments A4-A8 with broad longitudinal band comprised of arcs mediad of flange verrucae. One to 3 short setae adjacent to ventral margin of band (L3 position). One SV seta present on A4, 3 on A7 (longitudinally aligned). Venter of A8 with 1-3 SV setae and 1 minute seta in L3 position. Venter of A9-A10 forming plate. Lateral margins of plate fringed with short setae. Dense anterior and posterior hamuli patches present. Hamuli hooked.

Distribution, habitat and host. This plume moth occurs in Chingaza and Sumapaz. It has also been observed in other National Natural Parks such as Las Hermosas and El Cocuy. The host, *Espeletia*, is restricted to the northwestern Andes, where it is found in cloud forest, páramo and periglacial habitats (Fagua and Gonzalez 2007) and has a wide elevational range from 2600 to 4200m. *Espeletia grandiflora* is one of the most common species of frailejon in central Colombia. The average growth rate of juvenile and adult plants is 7.6 cm/year (Fagua and Gonzalez 2007). The other host species, *E. uribei*, can be found in the lower limits of Chingaza páramo (Madriñan 2010). The Chingaza specimens were reared from larvae collected from meristem leaves of *Espeletia grandiflora*.

DISCUSSION

Páramos are located in tropical regions of Central and South America, between 3200 and 4100 m. Because of their limited area and ecological and historical isolation, they are essentially islands of endemism in fauna and flora within the tropical Andes. These ecosystems are characterized by their vulnerability and are thus considered among the world's "hyper-hot" biodiversity mini hotspots of great interest for conservation priority, ecological, biogeographic, and other scientific studies (Myers et al. 2000, Hofstede 2004, Londoño et al. 2014). Páramo ecosystems are considered strategic as critical regulators of watershed hydrology, atmospheric carbon retainers in the soil, biological corridors, and providers of an important hydrological service to human populations in domestic use, industrial consumption, and generation of hydropower (De Brievre and Calle 2011). Their careful management is necessary to achieve a sustainable balance between their ever increasing use in agriculture (e.g., growing low temperature crops such as potatoes and use as rangeland for livestock grazing), conserving biodiversity and hydrological services.

Colombia has approximately 34 páramos distributed in three Cordilleras equivalent to 1.3% of the territory (Hofstede et al. 2002). Among these, there are several natural reserves including large extensions of páramo which are important reservoirs and water sources (Sturm and Rangel 1985, Van der Hammen et al. 2002, Buytaert and Beven 2011). However, despite their high biodiversity and ecosystem services, these areas are threatened by different factors such as soil use change (agricultural expansions, mining activities) and global warming (Smith and Cleef 1988, Van der Hammen 1998, Hofstede et al. 2002, Anderson et al. 2010, De Brievre and Calle 2011).

The documentation and study of the biodiversity and relationships of all organisms within the páramo is important in light of the enviromentally sensitive status of these ecosystems. Knowledge on the arthropods is especially important because such bioindicator species can help to assess the health status of páramos, hence our studies of Lepidoptera associated with *Espeletia*. Because the Chingaza páramo provides freshwater to Bogotá and 11 other municipalities (Gómez 2013), monitoring impacts to its native vegetation and establishing management plans are of extreme importance to the local human population. Thus, there is a direct need to identify, describe, and study the associated organisms of this páramo.

Oidaematophorus espeletiae has a wide distribution along Calostros brook in Chingaza páramo, at elevations ranging from 3200 to 3900m. The larvae feed on the meristem shoots where they cause severe damage to plant structures (Salinas et al. 2013) but do not directly kill the plants. Since 2009, many individual *Espeletia* plants in this area (some more than 40 years old) have died as a result of fungal infections. The question of whether or not *O. espeletiae* or other insects associated with the plants (including an undetermined noctuid) are contributing to the spread of the fungus is currently under study at Universidad Jorge Tadeo Lozano.

In the adult stage *O. espeletiae* appears to be closely related to *H. conjunctus*. However, they differ in wing maculation and the shape of the saccular process of the male genitalia. While the female genitalia of *H. conjunctus* are unknown, the broad bell-shaped antrum indicates that the new species belongs in genus *Oidaematophorus* as redefined by Gielis (1993). In the report of Salinas et al. (2013), this pterophorid was identified as *Hellinsia* sp. The genus *Hellinsia* is currently a "catch-all" taxonomic group that contains a variety of morphotypes of immatures. It was not until the female genitalia were examined that we were able to more definitively place the species in genus *Oidaematophorus*. Larval and pupal characters of the new species are consistent with *Oidaematophorus* as well as some of the externally feeding *Hellinsia*. Larval characters shared by *Oidaematophorus* and the *Hellinsia* external feeders include setae arranged on verrucae, a middorsal process of the prothorax (A1), and 6-toothed mandibles, among others. No particular character stands out as unique for this species, rather a whole suite of characters are used in identification. One feature not previously noted in the new species versus other *Oidaematophorus* examined is that the dorsal (D) verrucae have relatively short setae and lack a distincly enlarged central primary seta distinguishable from surrounding secondary setae on the structure. In this situation, all setae are socketed and the structure is referred to as a true verruca as opposed to a verruca-like tubercle bearing both primary and secondary setae. Shorter setae may be adaptive in the case of external feeders transitioning to shelters within plants such as the gall-like chambers within the lower meristem.

During the course of fieldwork, two other species of Pterophoridae were found associated with *Espeletia* plants, one adult resting on a plant, and another species reared from a larva. Collection of additional material will be necessary to allow identification of these species, tentatively determined as *Hellinsia* or *Adaina*. It is not unusual to encounter two or more

pterophorid species associated with the same composite host. For example, *Oidaematophorus eupatorii* (Fernald, 1891) and *Hellinsia elliottii* (Fernald, 1893) commonly occur on the same individual plants in the northeastern United States (Matthews 2006). As our studies of *Espeletia* continue, additional species will undoubtedly be documented.

Although we present a full description of the morphology of the final instar larva, pupa, and adult, it is necessary to obtain further information about oviposition, reproduction, and other patterns associated with the ecology and biology of this species. Adult nectaring habits and oviposition have not been observed but may be synchronized with the *Espeletia* flowering stage.

Finally, in addition to continuing studies of the autecology, further studies of this new plume moth species could also include molecular analysis. Such studies may contribute to our understanding of the systematics and biogeography of the family, as well as in aiding identifications of distinct pterophorid populations, and in the discovery of additional new species isolated in high Andes ecosystems.

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