

A new species of *Apsil* Malloch (Diptera: Muscidae) from Argentina with detailed observations on male post-abdomen

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Abstract: *Apsil* Malloch is a small group of predaceous muscids endemic of the Andean biogeographic region with 12 known species recorded from Argentina and Chile. We present a new species, *Apsil extravagante* sp. nov., with detailed description of male pregenital and genital segments, and a brief discussion about pregenital segments among species of this genus.

Key words: Coenosiini, Patagonia, predator, pregenital segments

Resumen: Una nueva especie de *Apsil* Malloch (Diptera: Muscidae) de Argentina con observaciones detalladas sobre el post-abdomen del macho. *Apsil* Malloch es un pequeño grupo de mscidos depredadores endémicos de la región biogeográfica Andina con 12 especies conocidas para Argentina y Chile. Presentamos una nueva especie, *Apsil extravagante* sp. nov., con una descripción detallada de los segmentos pregenitales y genitales masculinos, y una breve discusión sobre los segmentos pregenitales entre especies de este género.

Palabras clave: Coenosiini, Patagonia, predator, segmentos pregenitales

INTRODUCTION

The genus *Apsil* Malloch, 1929 (Diptera, Muscidae) is a small group of predaceous muscids distributed from sea level to the highlands, and is considered endemic of the Andean biogeographic region (Morrone, 2015). Some isolated records extend the distribution of these flies to the Malvinas/Falkland and Beauchene Islands (Robinson, 1984). Furthermore, a male specimen of *Apsil* was recently recorded at 4700 m. a. s. l. in Colombia, outside the endemic area of the genus (Perez & Carvalho, 2016).

Apsil was erected with a single species, *Apsil maculiventris* Malloch, 1929. Later, Malloch (1934) added seven new species and characterized the genus by a very flat and quite wide head, a single reclinate orbital seta, lower calypter larger than upper, and males with a striking sternite 5. Couri (2000) presented the first revision of this genus and observed some remarkable structures of the male post abdomen (abdominal segments 6 to 8 or pregenital segments) in *Apsil apicata* Malloch, 1934 and *Apsil atripes* Malloch, 1934. More recently, Couri and Pont (2000), in

a cladistic analysis of Coenosiini, found that the partial fusion of tergite 6 with syntergosternite 7+8 was a synapomorphy of *Apsil* and the monotypic *Raymondomyia* Malloch, 1934, and consequently synonymized *Raymondomyia* with *Apsil*. Afterwards, Couri (2002) and Couri (2006) added two new species, *Apsil diminuta* Couri, 2002 and *Apsil mallochi* Couri, 2006, both also with striking structures in the male pregenital abdominal segments. Patitucci & Couri (2013) redescribed *Apsil pennata* Malloch, 1934 and presented detailed images of the male pregenital and genital segments. Pregenital segments are difficult to interpret because of their highly derived nature (O’Hara, 1983), and there are few studies that analyze these structures (Tschorsnig, 1985; Ovtshinnikova & Sorokina, 2020). Currently the genus includes 12 species recorded from Argentina and Chile (Couri, 2006).

The aim of this contribution is to present a new species of *Apsil* with a detailed description of the male pregenital and genital segments, and a brief discussion about pregenital segments of the post-abdomen among species of this genus.

MATERIAL & METHODS

Study area and sampling methods

The specimen was collected in “Parque Nacional Lanín” (PNL). A detailed description of the study area was presented in Patitucci *et al.* (2016). The specimen was collected through active capture with an entomological net over vegetation and stones in rushing mountain streams.

Specimen studied

The collected specimen was identified using the original descriptions of the remaining species of the genus and the keys by Malloch (1934) and Couri (2006). To study the morphology of the terminalia, the abdomen of the specimen was dissected and transferred to 90% lactic acid at room temperature for two weeks. After clearing, the genital structures were removed and temporarily mounted on concave glass slides in glycerine. After the study, the dissected parts were placed in a plastic micro vial with glycerine and pinned with the respective specimen. The terminology used for the external morphology followed Cumming & Wood (2017). Abdominal sclerites are designated following the terminology in Tschorsnig (1985) and Ovtshinnikova & Sorokina (2020).

The holotype is deposited at Entomological National Collection of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN_En).

The labels of the type specimen are cited verbatim, lines separated by a slash, different labels by semicolon.

Images, measurements, and maps

Digital photographs were taken using an Olympus DP25 digital camera mounted on an Olympus SZX16 stereomicroscope, and a Touptek TC digital camera mounted on a Lancet XSZ-146AT microscope. The image processing software was Olympus cellSens Standard software and CombineZM (Alan Hadley, UK).

Measurements were digitally obtained with the software Leica Application Suite EZ Version 2.1.0. Measurements were expressed as follows: body length: anterior margin of head (frons), excluding antennae, to apex of abdomen. Maps were created with the QGIS software 3.26.1 (<http://www.qgis.org/pl/site/>) and Google Earth images. The shapefiles used are available at ‘Instituto Geográfico Nacional de Argentina’ (<http://www.ign.gov.ar>) and ‘Administración Parques Nacionales’ (<https://mapas.parquesnacionales.gob.ar>).

TAXONOMY

Apsil Malloch, 1929

Type-species. *Apsil maculiventris* Malloch, 1929

Apsil extravagante sp. nov.
(Figs. 1–6)

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Diagnosis. *Apsil extravagante* sp. nov. can be differentiated from its congeners by the following combination of characters: tarsomeres 2–5 light brown, expanded and flattened, palpi dilated at apex, thorax grey with lavender pollinosity and with four dark-brown vittae, and sternite 5 with lobes projected towards the inner surface with small yellow hairs, giving the lobes a plush appearance.

Description

Male (Figs. 1–6).

Length (Fig. 1A). Body: 5.87 mm, wing: 5.58 mm.

Head (Figs. 1B–C). Head flattened, higher (dorsal-ventral) than wide (anterior-posterior), and with gena high, in lateral view. Dichoptic, frons at vertex about one third or more of the head width; eyes with anterointernal facets larger than posteroexternal and with short hairs. Frontal vitta black with shiny brown pollinosity; frontal triangle black, extending to the lunule and visible by birefringence; 2 ocellar setae longer than ocellar triangle; fronto-orbital plate brown, setulose; parafacial and gena orange dusted with some fine black hairs close to the face; lateral and posterior portions of the head black with lavender grey pollinosity; 3 pairs of frontals and 1 pair of reclinate orbital setae. Outer and inner vertical setae developed, inner one longer than outer setae. Antenna black with dark brown pollinosity, apex of pedicel orange, in lateral view inserted at the mid-level of the eye; arista bare. Palpus orange, dilated at apex.

Thorax (Fig. 1D). Grey with lavender pollinosity, with four dark-brown vittae placed between acrostichal setae and dorsocentral setae; prescutum with a transverse brown band located posterior to the second pair of presutural dorsocentral setae and extending over scutum to the second pair of posterior dorsocentral setae; scutellum dark-brown; anepisternum and notopleuron grey with a dark-brown spot; anepimeron, katepimer-

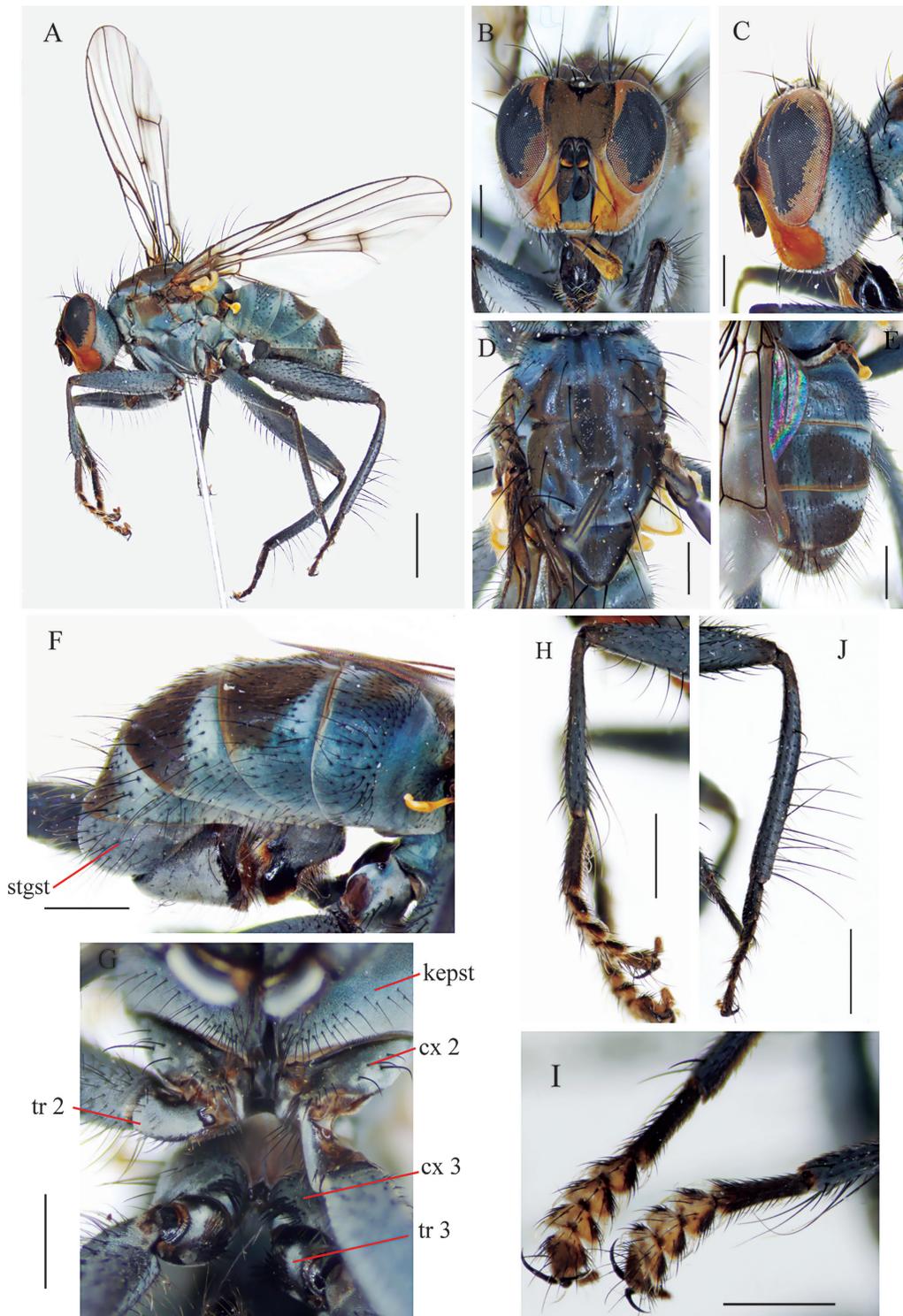


Fig. 1. *Apsil extravagant* sp. nov. (A) Lateral view. (B), (C). Head (B) frontal view; (C) lateral view. (D), (G). Thorax, (D) dorsal view; (G) ventral view. (E), (F). Abdomen, (E) dorsal view; (F) lateral view. (H) Fore tibia and tarsus, lateral view. (I) Fore tarsus, dorsal view. (J) Hind tibia and tarsus, lateral view (Abbreviations: cx, coxa; kepst, katepisternum; stgst, sytergosternite 7+8; tr, trochanter). Scale bars = 1 mm (A), 0.5 mm (B–H).

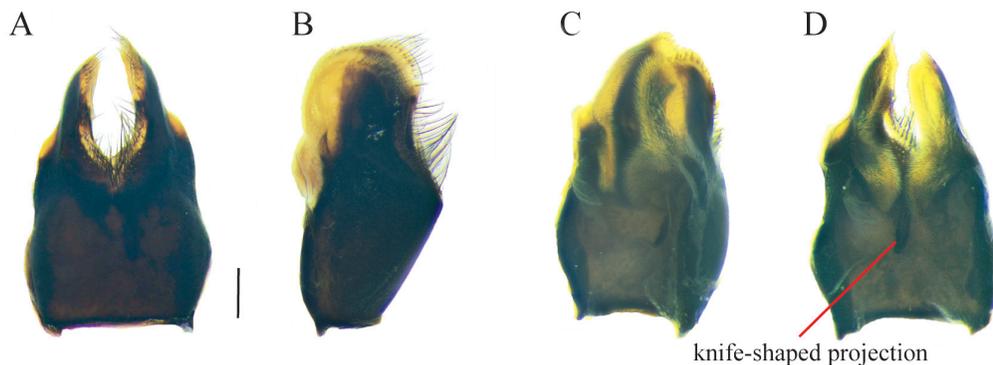


Fig. 2. *Apsil extravagant* sp. nov. (A–D) Sternite 5, (A) ventral (external) view; (B) lateral view; (C) latero-internal view; (D) inner view. Scale bars = 0.2 mm.

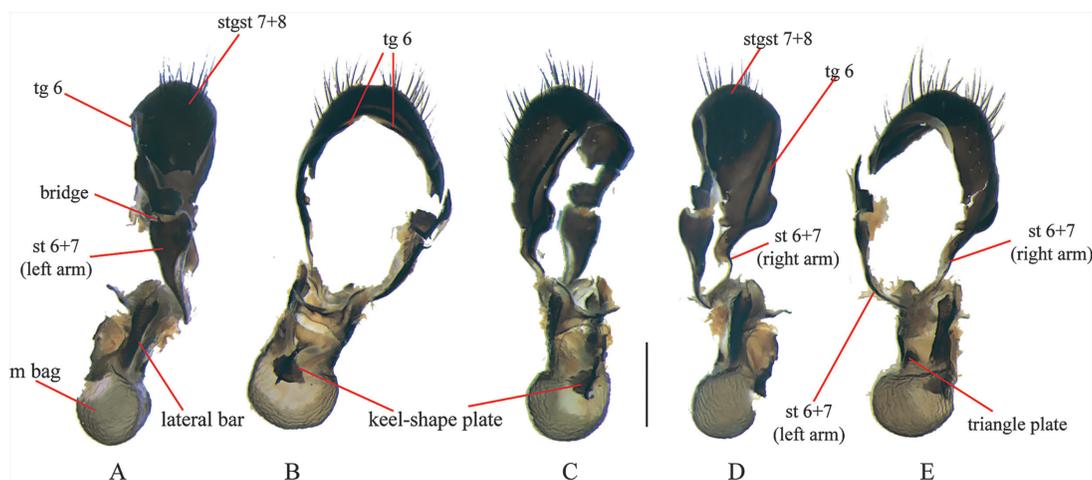


Fig. 3. *Apsil extravagant* sp. nov. (A–E) Pregenital abdominal segment, (A) left lateral view; (B) anterior view; (C) antero-right lateral view; (D) right lateral view; (E) posterior view. (Abbreviations: m bag, membranous bag; st 6+7, sternite 6+7; stgst, syntergosternite 7+8; t6, tergite 6). Scale bars = 0.5 mm.

on, katapisternum, proepisternum, proepimeron and meron grey with lavender pollinosity; anterior and posterior spiracles brown. Chaetotaxy: acrostichal setae very thin and short; dorsocentral setae 2+3; postpronotal setae 2; intra-alar setae 1+2; postpronotal seta 1; notopleural setae 2, the posterior being a little shorter than the anterior one. Prealar absent. Scutellum with one long basal and one long apical pair of setae, similar in size. Anepisternum with a series of 4 strong setae; katapisternals 1+1+1, forming an equilateral triangle, the posterior one longest, several long hairs between katapisternals setae which are continued in two rows towards the ventral surface of the plate (Fig. 1G); anepimeron, katepimeron, and meron bare; proepisternals 2; proepimeral 1. Prosternum bare.

Wing. Hyaline; with black marks on both cross veins, veins bare. Both calypters whitish hyaline

with yellow margins; lower calypter slightly longer than upper; halter yellow.

Legs (Fig. 1). All legs black with grey pollinosity. Fore coxa with several strong spines on anterior and posterior surfaces; fore femur with a row of posterodorsal setae, a row of posteroventral setae, and a row of anteroventral setae on basal middle; fore tibia with 4 long and undulated setae on posterodorsal to dorsal surfaces, one preapical seta on dorsal and posterior surfaces; first tarsomere brown, half the length of the tibia; tarsomeres 2–5 light brown, expanded and flattened, all tarsomere with latero-ventral curly yellow hairs and short black hairs on dorsal surface (Figs. 1H–I). Mid coxa unarmed; mid femur with a row of fine posteroventral setae, and 2 preapical setae on posterior surface; mid tibia with one anterodorsal, two posterior median setae, and 3 preapical setae (anterior, dorsal,

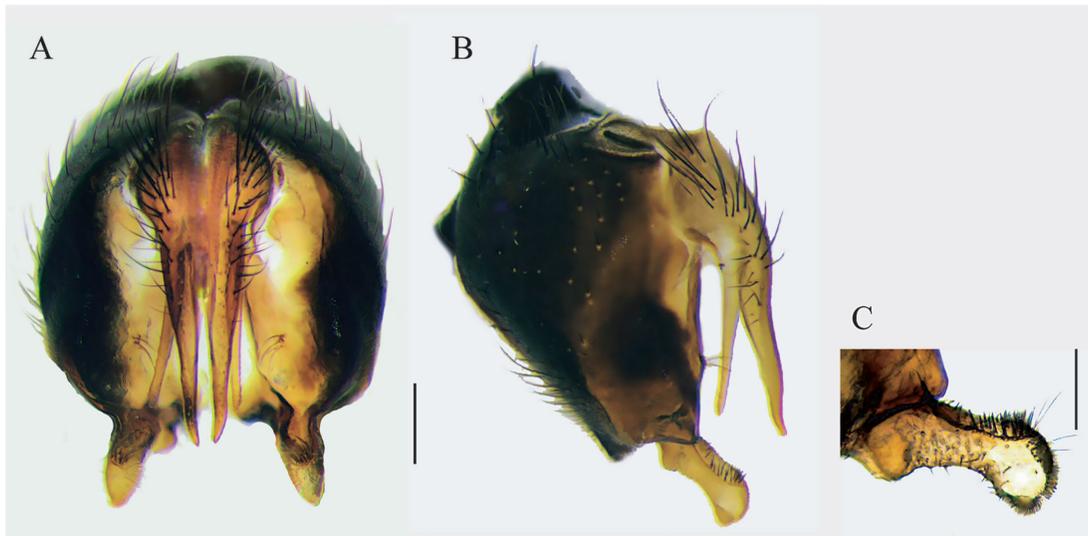


Fig. 4. *Apsil extravagante* sp. nov. (A–C) Epandrium, cercus and surstylus, (A) dorsal view; (B) lateral view; (C) epandrium clasper-like detail Scale bars = 0.2 mm (A–B), 0.1 mm (C).

and posterior); mid tarsomere brown, regular form, first tarsomere with short black spines on ventral surface, tarsomeres 2–5 bare on ventral surface. Hind coxa with a tuft of strong spines on ventral surface, one spine longer than the others (Fig. 1J); femur with a complete row of anterodorsal and a row of anteroventral setae; hind tibia with 2 rows of long setae on anterodorsal and anteroventral surfaces, and a row of short setae on posterodorsal surface; first tarsomere short, less than one fifth of the length of the tibia, first and second tarsomere with a pad-like structure on ventral surface.

Abdomen (Figs. 1E–F, 2). Grey with lavender pollinosity, with sub-triangular lateral dark brown marks on tergites 1+2–5; tergite 6 reduced, not visible in lateral view; syntergosternite 7+8 without spots, visible in lateral view. Sternite 1 bare. Sternite 5 strongly sclerotized, longer than wide; basal margin straight with two small points on the lateral margin (Fig. 2A); apical margin concave (“U” shaped), with setae extending over the lobes (Figs. 2A–B). These lobes are projected towards the inner surface with small yellow hairs, giving the lobes a plush appearance (Figs. 2C–D). With a knife-shaped projection on the inner surface of sternite 5, towards the midline (Fig. 2D).

Pregenital segments (Fig. 3). Tergite 6 fused with syntergosternite 7+8. Tergite 6 thin, without sclerotization towards dorsal middle line (Fig. 3B), fused with a bridge with sternite 6+7 on lateral left view (Fig. 3A). This bridge is placed over

the articulation of syntergosternite 7+8 with sternite 6+7. Tergite 6 fused with a sternite 6+7 on lateral right view (Fig. 3D). Syntergosternite 7+8 width, three times wider than tergite 6, visible on lateral view (Fig. 1F); posterior half of syntergosternite 7+8 with setula and bare anterior half. Left and right arms of sternite 6+7 not forming a complete ring. Left arm of sternite 6+7 becoming thinner towards midline on ventral view of the body and connected there through a membrane with a thin apex of right arm of sternite 6+7 (Fig. 3E). Right arm of sternite 6+7 with a sinuous shape, placed on lateral right view of the body (Figs. 3C–E). The membranous bag is located dorsal to sternite 5, ventral to the hypandrium, and anterior to sternite 6+7. It holds two strongly sclerotized and striated lateral bars (Fig. 3A), a small sclerotized triangle plate on ventral surface (Fig. 3E), and a keel-shaped plate on the dorsal surface (Figs. 3B–D).

Genitalia (Figs. 4–5). Epandrium (Figs. 4A–B) subquadrate and setulose, with an articulated lateroapical clasper-shape lobes and a promontory with 4–5 setulae close to middle line of the body. Clasper-shape lobes (Fig. 4C) with short and strong spines on dorsal surface of clasper, and a tuft of short yellow hairs apical tip. Cercus longer than wide, sclerotized, setulose on basal middle, and with apical margin strongly cleft. Surstyli straight with few short setulae on apical tip, in lateral view of same length as the cercus (Fig. 4B). Hypandrium tubular, with an external lateral fold, which is corrugated (Figs. 5A,

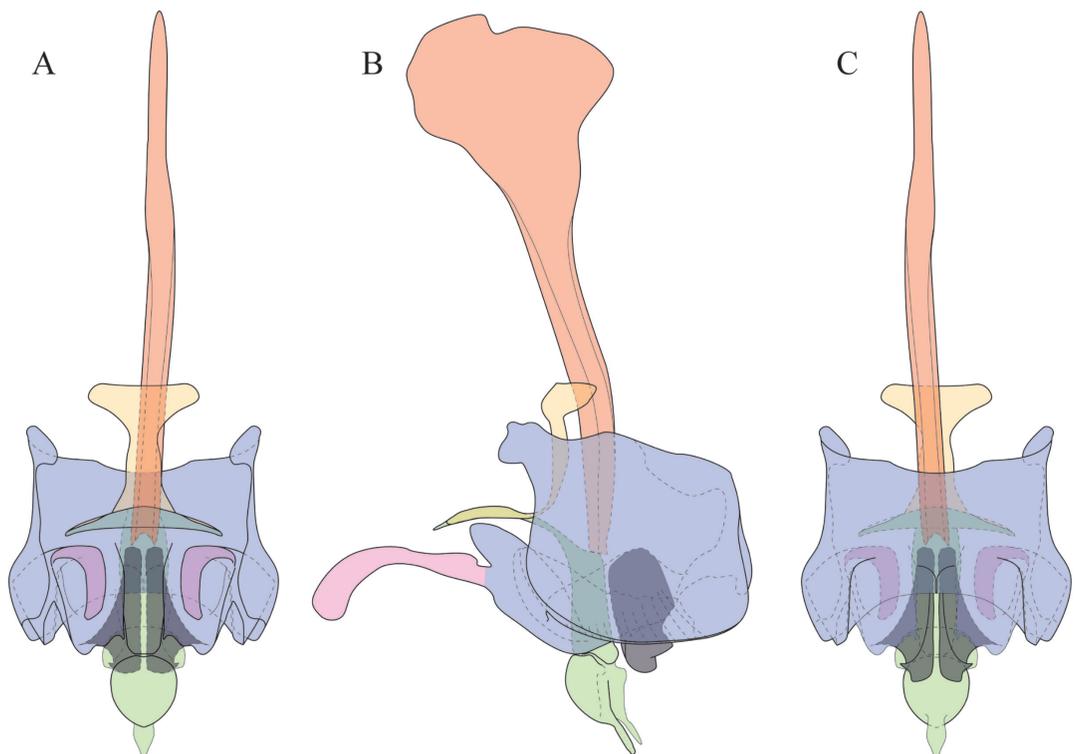


Fig. 5. *Apsil extravagante* sp. nov. (A–F) Schematic representation of the phallic complex, (A) posterior view; (B) lateral view; (C) anterior view. Distiphallus: green; epiphallus: yellow; hyandrium: blue; postgonite: pink; phallopodeme: orange; pregonite: grey. Scale bars = 0.2 mm.

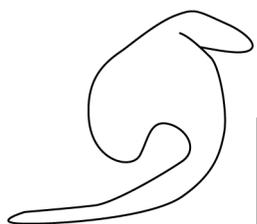


Fig. 6. *Apsil extravagante* sp. nov. Schematic representation of the ejaculator apodeme. Scale bar = 0.1 mm.

C). Phallopodeme straight, strongly sclerotized, strongly dilated at distal tip, and longer than hyandrium in lateral view (Fig. 5B); pregonite developed, kidney-shaped with a fold at the apical tip, completely merged with the hyandrium; postgonite developed, curved, longer than pregonite, and partially merged with the hyandrium; epiphallus strongly sclerotized, curved, and distiphallus globose and sclerotized, acrophallus very short, membranous. Ejaculatory apodeme comma-shaped, with dilated basal part and narrowing distal extreme towards apex (Fig. 6).

Female. unknown.

Type material examined. Holotype male, pinned, labels: red circle; “Arg. Neuquén, P.N. Lanín / L. Curruhué Ao. Los Pinos 1090 m / 39°52'36,26 S 71°27'12,16 W / 14-XII-2013 Mulieri leg. (transecta)” printed on white paper; “24” printed on white paper, black frame, “MACN-En / 38001” printed on white paper.

Distribution. ARGENTINA: Neuquén, Lanín National Park, Curruhué lake, (Fig. 7).

Etymology. The name of this species refers to a Spanish word that means excessively original. The presence of tarsomeres 2–5 expanded and flattened, with latero-ventral curly yellow hairs and short black hairs on dorsal surface, the chaetotaxy of the fore tibia and the shape of the 5th sternite give the species very striking characteristics that distinguish it from its congeners and other species of Muscidae.

Remarks. In Couri’s key (2006), *A. extravagante* comes close to *A. pennata*, but the coloration of the head, shape of the setae of the fore tibia and the shape of the fore tarsi can separate it from the latter.

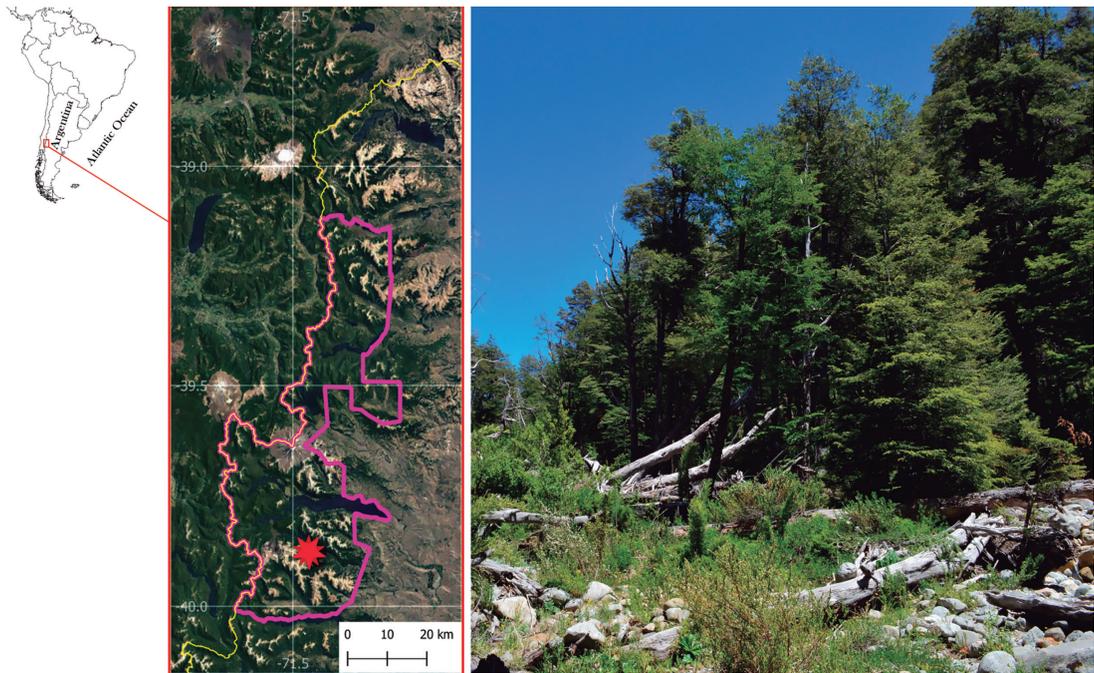


Fig. 7. Distribution of *Apsil extravagante* sp. nov. in PN Lanín, Curruhué lake, Los Pinos stream. The purple line delimits the PN Lanín.

DISCUSSION

Muscidae male pregenital segments (segments 6 to 8) are difficult to interpret because of their highly derived nature (O'Hara, 1983). Sclerites of these segments are partly reduced, modified, and fused in different ways, and the exact homologies of these sclerites are still obscure (Ovtshinnikova *et al.*, 2018; Ovtshinnikova & Sorokina, 2020).

In a cladistic analysis of Coenosini, Couri & Pont (2000) observed some variations in the position and shape of pregenital sclerites in the genus *Apsil*. These authors (*op. cit.*) highlight the presence of the sternite 6 with two arms (left arm complete, ring-shaped, and right arm incomplete, interrupted near the articulation with tergite 6), and tergite 6 and syntergosternite 8 partially fused. Following the nomenclature proposed by Tschorsnig (1985) and Ovtshinnikova & Sorokina (2020), sternite 6 (left and right arms or both arms fused) as described by Couri & Pont (2000), is considered here as sternite 6+7, and syntergosternite 8 as described by Couri & Pont (2000) is considered here as syntergosternite 7+8.

Through, regarding the published illustrations of pregenital segments of *Apsil* species (Couri, 2000, 2006; Couri & Pont, 2000; Patitucci

& Couri, 2013), it is possible to interpret the variation of sternite 6+7. A developed left arm and a strong but reduced right arm were observed in *A. apicata* (Couri, 2000: fig. 31), both arms developed and fused forming a ring with tergite 6 were observed in *A. atripes* (Couri, 2000: fig. 39), right arm developed extending to the left side, but not articulating with tergite 6 were observed in *A. diminuta* (Couri, 2002: fig. 9) and in *A. flavipalpis* (Malloch, 1934) (Couri & Pont, 2000: fig. 34). Herein we observed that both arms of sternite 6+7 are developed but not fused in the ventral midline in *A. extravagante* sp. nov., which is similar to what was observed in *Apsil mallochi* (Couri, 2006: fig. 28) and in *A. pennata* (Patitucci & Couri, 2013: figs. 15–16).

On the other hand, as observed by Tschorsnig (1985) for some Tachinidae and in *A. extravagante* sp. nov., a reduced tergite 6 and developed syntergosternite 7+8, are related to a retraction of the postabdomen (segments 9–10) anteriorly towards the preabdomen.

Another striking structure that was found in *A. extravagante* sp. nov. and which is extremely rare in the literature, is the membranous bag or sac. Tschorsnig (1985) reported this membranous bag for some species of Tachinidae but its functionality is yet unknown. The membranous

bag is located dorsal to sternite 5, ventral to the hypandrium, and anterior to sternite 6+7. In some species of Tachinidae, Tschorsnig (1985) observed sclerotized areas dorsally and laterally on the membranous bag that do not belong to any sclerite (apparently). For the genus *Apsil*, these membranous bags have been illustrated (without mention or identification) in *A. apicata* (Couri, 2000: fig. 32), *A. atripes* (Couri 2000: fig. 42), and *A. pennata* (Patitucci & Couri, 2013: figs 15–16). We observed 2 lateral bars and a well-defined strong dorsal sclerotization on the membranous bag in *A. extravagante* sp. nov.

A more comprehensive examination of more specimens and different species or genera sharing these structures could provide more information on this topic.

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