

## Saying goodbye to monotypy in the poorly known genus *Austrophyto* Lopes, 1989 (Diptera: Sarcophagidae): new diagnosis and description of two new species

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### Abstract

The Argentinean endemic genus *Austrophyto* Lopes, 1989 is revised. The diagnosis of the genus is revised and circumscribed, especially focusing on the configuration of the male terminalia. The male of *Austrophyto cordobensis* is redescribed and two new species, *A. noa* sp. nov. and *A. mariluisi* sp. nov., are described. Structures of the male terminalia of all species are documented and compared. A key to the adult males of the species is presented. The genus *Austrophyto* Lopes is now represented by three species distributed in north-western Argentina.

**Key words:** Sarcophaginae, Oestroidea, taxonomy, Argentina

### Introduction

The Sarcophagidae fauna of the Neotropical Region is highly diverse in comparison to those of other biogeographical regions, hosting almost one third of the family's diversity. However, a large proportion of the genera are in need of revision or poorly defined. In some genera, presumably only a small portion of the existing species are known, especially in parts of tropical and subtropical South America that are almost unexplored for sarcophagids, such as the Amazon Basin, the Chaco forests, and the southern range of the tropical Andean slopes in Peru, Bolivia and Argentina.

The genus *Austrophyto* Lopes, 1989 belongs to the subfamily Sarcophaginae and was erected for a single new species, *A. cordobensis* Lopes, 1989, based on a single male from Argentina. This species shares several, but not all, of the characters given by Lopes (1969, 1982) to define the tribe Microcerellini: reduced rays on the arista, rows of frontal setae strongly diverging near lunule in fronto-dorsal view, parafacial plate with strong setae, presutural dorsocentral setae differentiated, and mid femur without a ctenidium. Lopes (1989) did not explicitly assign *Austrophyto* to the Microcerellini but implied this placement by comparing the morphology of *Austrophyto* to that of other genus-group taxa placed by Lopes (1982) in that tribe.

Since its original description, *A. cordobensis* has appeared in the literature mainly through brief citations and catalogue entries, and has remained unstudied. Pape (1996) kept *Austrophyto* as a monotypic genus in his world catalogue and did not include it within his broad redefinition of *Microcerella* Macquart, 1851, that was almost equivalent to Microcerellini *sensu* Lopes (1982). Pape (1996: 39) briefly diagnosed *Austrophyto* as having “terminalia red” (where terminalia = syntergosternite 7+8 and epandrium) and “phallus with three conducting styli” (i.e. with a well-developed median stylus and two lateral styli).

Within the framework of a wider revisionary project on the genera of Sarcophagidae of southern South America, a large number of specimens were studied from entomological collections in Argentina and Brazil. Several specimens of *Austrophyto* were found and they led to the present study, the aims of which were to redefine the generic limits of *Austrophyto*, redescribe the type species *A. cordobensis*, and describe two new species from the recently discovered material: *A. noa* sp. nov. and *A. mariluisi* sp. nov. Photographs and SEM images detailing the parts of the male terminalia are provided to separate the species and for a better understanding of phallic structures. A key to the males based on external and genitalic characters is also presented.

## Material and methods

The material examined is deposited in the following collections: Instituto y Fundación Miguel Lillo, Tucumán, Argentina (IFML); Instituto Nacional de Tecnología Agropecuaria, Castelar, Buenos Aires, Argentina (INTA); Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN); and Museu Nacional de Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ).

All specimens examined were found among the miscellaneous dry-pinned material held in the above-listed institutions. Male specimens were kept in a moist container for 24–48 hours before examination, and the terminalia were either exposed using the technique described by Dahlem & Naczi (2006) or detached and glued to a piece of card pinned below the source specimen.

The terminology of external morphology follows McAlpine (1981) and Cumming & Wood (2009). Abbreviations used in the text are as follows: ST, sternite; T, tergite. The terminology of phallic structures follows Giroux *et al.* (2010), with the exception of the terms “harpes” and “paraphallus”, which are used as proposed by Mulieri & Mello-Patiu (2013) and Whitmore *et al.* (2013), respectively. Head measurements are expressed as ratios. Body length was measured from the antennal base to the posterior margin of abdominal tergite 5, following the procedure used by Giroux & Wheeler (2009). Distance measurements between two points were obtained digitally, using the software Leica Application Suite EZ Version 2.1.0. Habitus and terminalia were photographed using an Olympus DP 25 digital camera mounted on an Olympus SZX 16 stereomicroscope. Scanning electron micrographs were taken under high vacuum with a Philips XL30 after gold-palladium coating.

Type specimen labels are quoted verbatim, with lines separated by a forward slash, labels separated by a semicolon, and comments given in square brackets.

## Taxonomy

### *Austrophyto* Lopes, 1989

*Austrophyto* Lopes, 1989: 826. Type species: *Austrophyto cordobensis* Lopes, 1989, by original designation. References: Pape (1996: 39, 176) (diagnosis, world catalogue); Mello-Patiu *et al.* (2014) (key to genera and list of species from Argentina). *Autrophyto*: Lopes (1989: 826); incorrect original spelling of *Austrophyto*. Lopes (1989) used two original spellings, *Austrophyto* (p. 826) and *Autrophyto* (p. 826). By subsequent usage (ICZN Code Article 24.2.4), Pape (1996: 39) acted as First Reviser and selected *Austrophyto* as the correct original spelling.

**Generic diagnosis (males).** Rows of frontal setae diverging strongly anteriorly at level of pedicel; proclinate orbital setae lacking; one row of parafacial setae near eye, increasing in length and thickness ventrally; genal setae dark; arista with reduced rays restricted to basal half; 0 + 1 acrostichal setae; postalar wall setulose; two pairs of lateral scutellar setae; apical scutellar setae present; 3 katepisternal setae; third costal sector without ventral setae; cell  $r_{4+5}$  open; male mid femur without an apical, posteroventral ctenidium; abdominal T4 with one pair of median marginal setae; T5 with a complete row of marginal setae; ST5 with a deep posterior cleft (V-shaped); arms of ST5 with basal rounded lobes; basal part of ST5 with a median desclerotized area (‘window’). Terminalia: epandrium reddish; syntergosternite 7+8 without a well-differentiated row of marginal setae; surstylus not flattened and curved inwards in posterior view; postgonite with two long setae; phallus short; basi- and distiphallus fused ventrally, and with an incomplete dorsal hinge; distiphallus noticeably broadened; distiphallus with a swollen, desclerotized ventral area proximal to vesica; dorsal surface of paraphallus curved apically; vesica short and weakly sclerotized, with a micro serrated margin; harpes well developed, sclerotized and with a roughened surface, projecting from the ventral surface of the distiphallus; juxta scarcely developed, with apico-lateral membranous lobes and a medial sclerotization (= medial juxtal sclerite) between them; acrophallus not exposed; median stylus and lateral styli slender and tubular; lateral styli with micro serrations.

**Generic monophyly.** The monophyly of this genus is tentatively supported by the unique morphology of the male terminalia. The distiphallus is noticeably broadened in both its ventral and dorsal parts. It has a swollen, desclerotized ventral surface proximal to the vesica (Figs 12, 14). Also, the dorsal surface of the paraphallus is curved, producing a distal expansion of the distiphallus. The juxta is not projected ventrally, as a cap-like structure, as occurs in many other genera of Sarcophaginae. Hence, the acrophallus is located within the “bell-shaped”

distiphallus and is laterally covered by the strongly developed harpes, with the styli only exposed apically by the widely open tip of the distiphallus (Figs 7–9). The connection between basi- and distiphallus, fused ventrally and with an incomplete dorsal hinge (Figs 2, 17), is similar to the condition found in *Microcerella* and *Boettcheria* Parker, 1914. The reduced arisal rays (Figs 28–29) are similar to those found in *Microcerella* and in a few *Boettcheria* (e.g., *B. mundelli* Blanchard, 1939). The shape of the surstylus and the poorly developed juxta resemble those of *Boettcheria*, but the vesica is much less developed in *Austrophyto*. Additionally, the absence of a well-differentiated row of marginal setae on syntergosternite 7+8 and postgonite with two setae are also possible autapomorphic characters of *Austrophyto*.

### ***Austrophyto cordobensis* Lopes, 1989**

(Figs 4, 7, 10–13, 27–28, 35)

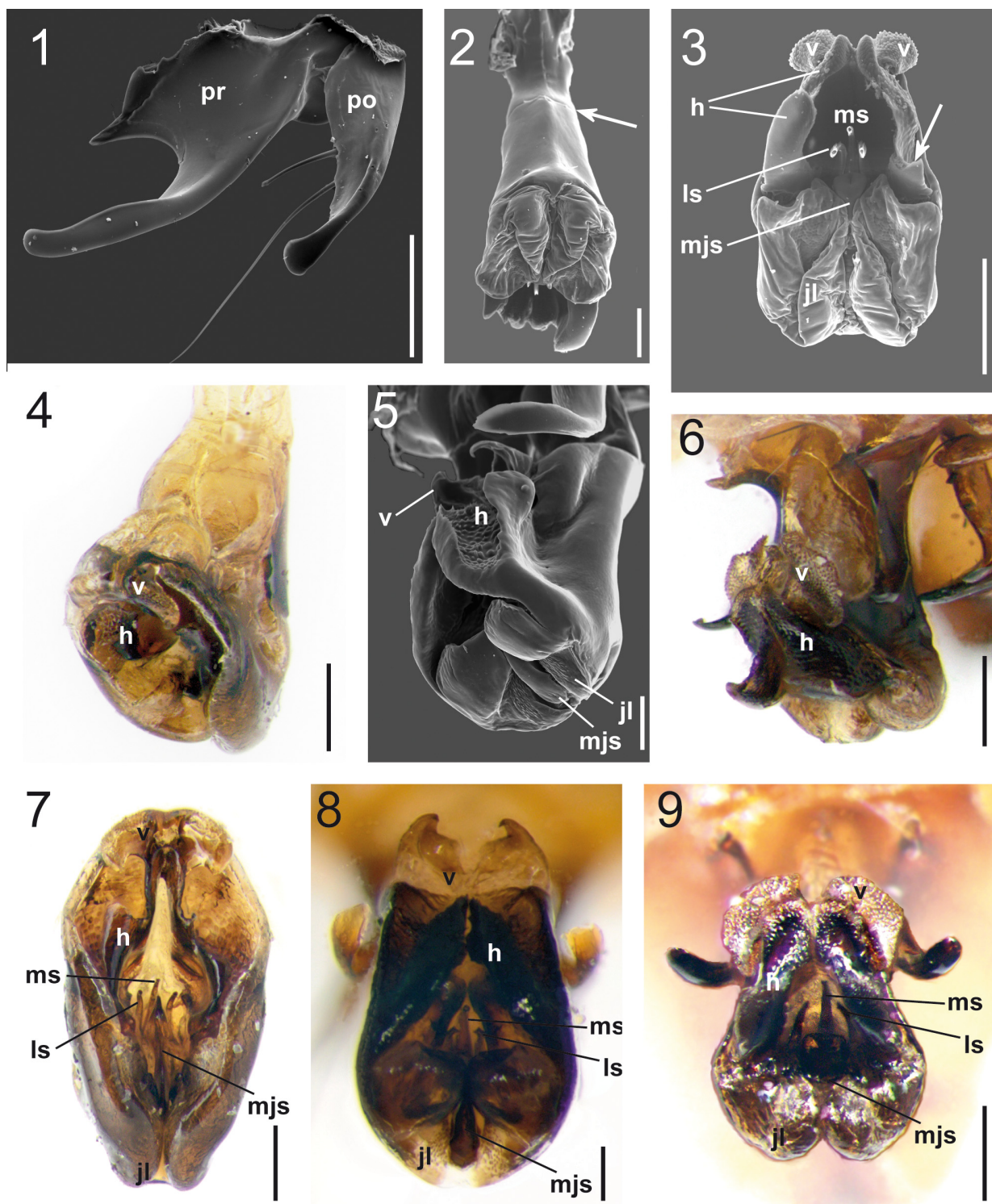
*Austrophyto cordobensis* Lopes, 1989: 826. Holotype male (Lopes 1989; figs 1–6). Type locality: Argentina, Córdoba [as “Cordova (Cordoba)”]. References: Pape (1996) (world catalogue); Mello-Patiu *et al.* (2014) (figure of phallus, list of species from Argentina).

**Diagnosis.** Parafacial and fronto-orbital plates with silvery microtomentum, genal dilation with silvery microtomentum; postgena with pale setae on posterior part; dorsocentrals 4 + 4 (the posteriormost larger); notopleuron with silvery-grey microtomentum; T3 with a pair of median marginal setae; T5 with lateral spots of silvery microtomentum; ST2–ST4 with short setulosity; syntergosternite 7+8 reddish-orange; cercal base flattened in profile; cercus with apex truncated (dorsal view); vesica membranous, downward and laterally projected and with a micro serrated surface.

**Redescription.** *Male.* Body length 16.69 mm ( $n = 1$ ).

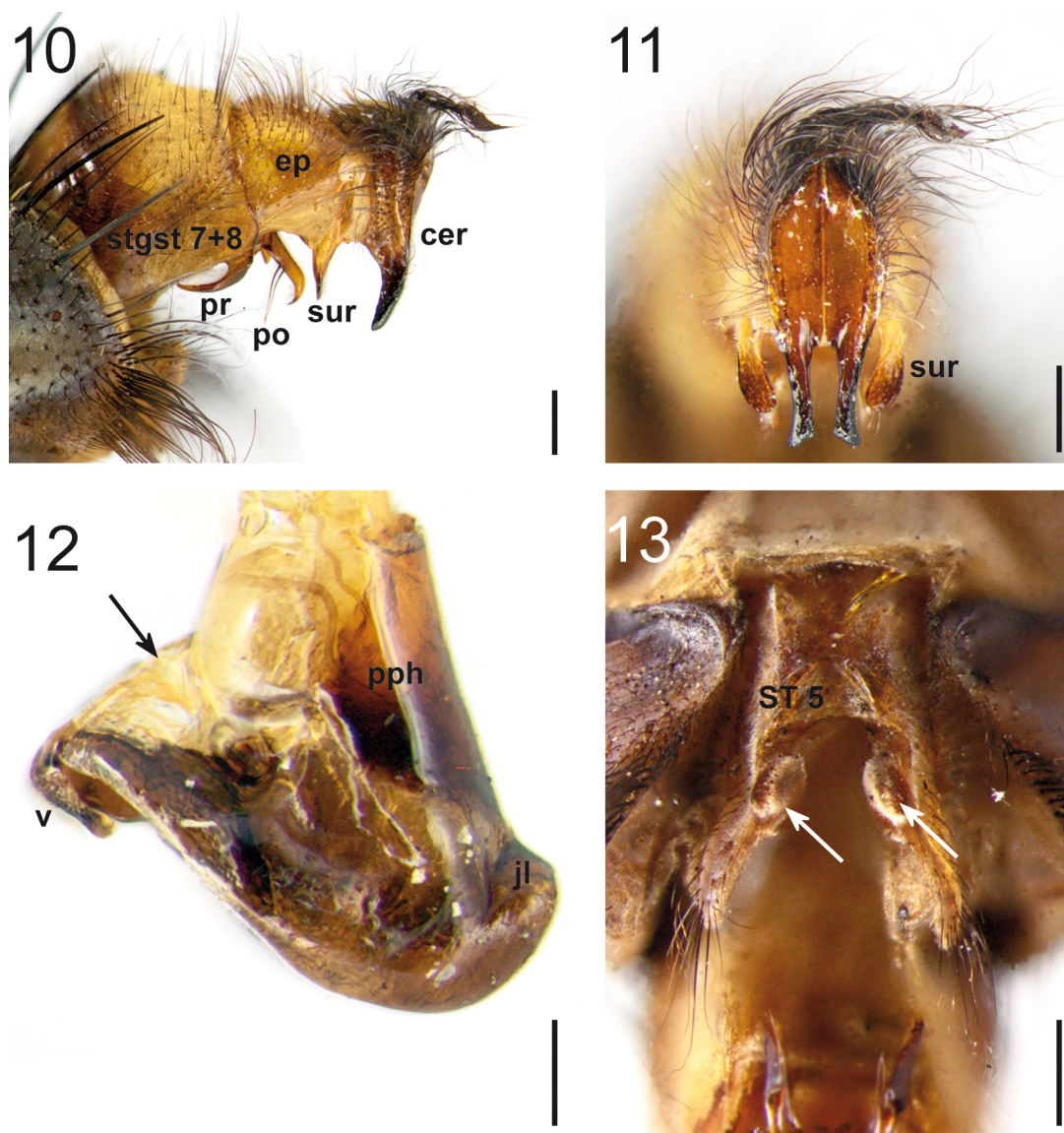
**Head.** Head length at antennal base 1.09x ( $n = 1$ ) head length at level of vibrissa; frons at its narrowest point 0.26x head width. Parafacial and fronto-orbital plates with silvery microtomentum; frontal vitta blackish; postocular area with silvery microtomentum; postcranium with silvery-grey microtomentum; ocellar triangle black, with silvery microtomentum; genal groove, genal dilation, postgena, face and facial ridge with silvery microtomentum; antenna brown; first flagellomere with grey microtomentum, 0.36x head height; arista short plumose on basal 0.5, with longest rays longer (2.86x) than maximum width of arista; palpus brown. Parafacial plate with a row of setulae close to eye, stronger in lower part; fronto-orbital plate with sparse setulae; postcranium with black setae on upper part and a few pale setae on lower part; eye bare; 9–11 frontal setae, the rows of frontal setae diverging strongly anteriorly at level of pedicel; 1 reclinate orbital seta; inner vertical seta strong and reclinate, outer vertical setae 0.3x the inner verticals and divergent; ocellar triangle with 1 pair of divergent and proclinate ocellar setae and supplementary setulae; postocellar and paraverticlar setae present; gena with black setae, postgena with pale setae on posterior part; facial ridge with setae close to vibrissa and setulae on lower half; 9–11 subvibrissal setae; palpus with black setae on apical half.

**Thorax.** Black, with silvery-grey microtomentum; prescutum and scutum with dorsal and lateral stripes of silvery-grey microtomentum and three black stripes; postpronotal lobe, notopleuron, katapisternum and anepimeron with spots of silvery-grey microtomentum; anepisternum with golden microtomentum; proepisternum silvery, bare. Chaetotaxy: 1 strong proepisternal seta plus 1 weaker and shorter supplementary seta; 1 proepimeral seta plus one or two weaker and shorter supplementary setae; katapisternals 3; postalar wall setulose; acrostichals 0 + 1, dorsocentrals 4 + 4 (the posteriormost larger), intra-alars 1–2 + 2–3, supra-alars 2 + 3 (the middle one stronger), anterior postpronotals 1, basal postpronotals 2, postalars 2, notopleurals 4 (two larger and two smaller). Scutellum with 2 pairs of lateral setae, 1 pair of crossed apical setae and 1 pair of weak, not well-differentiated discal setae. Wing hyaline, tegula brown, basicosta whitish and veins brown; vein  $R_1$  bare; vein  $R_{4+5}$  setulose in proximal 0.4–0.6 of distance to crossvein R-M; costal spine differentiated; third costal sector without ventral setae; cell  $r_{4+5}$  open; lower calypter whitish, usually with a dark brown median spot. Legs: coxae, trochanters and femora with silvery-grey microtomentum, tibiae somewhat paler brown; mid femur without a posteroventral ctenidium in its apical portion, with 3–4 anterior setae and a row of anteroventral setae; mid tibia with 1 anteroventral, 2 anterodorsal, 2 posterodorsal and 1 posterior setae; hind trochanter with a pad of short and stout setae; hind femur with anterior, anterodorsal, anteroventral and posteroventral rows of setae; hind tibia with 1 anteroventral, 2–5 anterodorsal (two larger) and 2 posterodorsal setae; mid and hind femur and tibia with long setulae; tarsi brown.



**FIGURES 1–9.** Male terminalia of *Austrophyto* spp. **1.** *Austrophyto noa* sp. nov. (paratype, MACN), SEM image of gonites, left lateral view. **2.** *Austrophyto noa* sp. nov. (paratype, MACN), SEM image of phallus in apico-dorsal view; arrow showing incomplete dorsal hinge between basi- and distiphallus. **3.** *Austrophyto noa* sp. nov. (paratype, MACN), SEM image of phallus in apical view; arrow showing partially broken left harpes. **4.** *Austrophyto cordobensis* Lopes (specimen from Córdoba, MACN), phallus in latero-ventral view. **5.** *Austrophyto mariluisi* sp. nov. (paratype, MACN), SEM image of phallus in latero-ventral view. **6.** *Austrophyto noa* sp. nov. (paratype, MACN), phallus in latero-ventral view. **7.** *Austrophyto cordobensis* (specimen from Córdoba, MACN), phallus in apical view. **8.** *Austrophyto mariluisi* sp. nov. (paratype, MACN), phallus in apical view. **9.** *Austrophyto noa* sp. nov. (paratype, MACN), phallus in apical view. Scale bars: 200 µm (Figs 1–4, 6–7, 9); 100 µm (Fig. 5, 8). Abbreviations: h, harpes; jl, juxtal lobe; ls, lateral stylus; mjs, medial juxtal sclerite; ms, median stylus; po, postgonite; pr, pregonite; v, vesica.





**FIGURES 10–13.** *Austrophyto cordobensis* Lopes (specimen from Córdoba, MACN). **10.** Terminalia, left lateral view (phallus dissected). **11.** Cerci and surstyli, dorsal view. **12.** Phallus, left lateral view; arrow showing swollen, desclerotized ventral area. **13.** Sternite 5, ventral view; arrows showing rounded basal lobes. Scale bars: 500  $\mu$ m (Figs 10–11, 13); 200  $\mu$ m (Fig. 12). Abbreviations: cer, cercus; ep, epandrium; pph, paraphallus, ST, sternite; stgst, sytergosternite; sur, surstylus; for other abbreviations, see Figs 1–9.

**Abdomen.** Dark brown or black; sternites exposed; sytergite 1+2 to T5 each with dorsal and lateral spots of silvery microtomentum; sytergite 1+2 and T3 each with 1 pair of lateral marginal setae; T3 with a pair of median marginal setae; T4 and T5 with a complete row of marginal setae; T5 with long setulosity on posteroventral margin; ST2–ST4 covered with short setulae.

**Terminalia.** ST5 V-shaped, reddish; arms of ST5 with conspicuous and well-projected, rounded, basal lobes covered with pale micro-pubescence (velvet-like) on their inner surface (Fig. 13); ventral surface of ST5 with setulae, with larger setae towards apex (Fig. 13); sytergosternite 7+8 reddish-orange with intense golden microtomentum, and with a row of weak marginal setae not differentiated from the few other setae present on its dorsal surface (Fig. 10); epandrium reddish-orange, with long hair-like setae; cercus elongated, with long hair-like setulosity covering cercal base (Figs 10–11); cercal base flattened in profile, 1.87x the length of cercal prong (Fig. 11); surstylus long, spatulate in posterior view (Fig. 11); pregonite curved (Fig. 10); postgonite curved distally, with two strong setae (Fig. 10); vesica (Figs 4, 7, 12) short and membranous, downward and laterally projected and with a microserrated surface; harpes (Fig. 7) heavily sclerotized, with a rough surface; juxta with apico-lateral

lobes somewhat sclerotized; medial juxtal sclerite elongated and deeply hidden between juxtal lobes (Figs 7, 12); lateral styli and median stylus tubular (Fig. 7).

*Female.* Unknown.

**Material examined.** 1 ♂, Argentina, Córdoba, Departamento Calamuchita, El Sauce, XII.1941, M. Vianna leg. (MACN); 1 ♂, Argentina, Jujuy, Departamento Ledesma, Sierra de Calilegua, without date or collector (INTA).

**Distribution.** Argentina (Córdoba, Jujuy) (Fig. 35).

**Remarks.** The holotype of *A. cordobensis* was not located in MNRJ and is probably lost or misplaced. The illustration of the phallus provided by Lopes (1989) is somewhat schematic but confirms the identification of the examined specimens.

### ***Austrophyto mariluisei* sp. nov.**

(Figs 5, 8, 14–18, 33–35)

**Diagnosis.** Parafacial and fronto-orbital plates with silvery microtomentum; genal dilation with silvery microtomentum; postgena with dark setae only; dorsocentrals 2–3 + 3; notopleuron with golden microtomentum; T5 with lateral spots of golden microtomentum; T3 without median marginal setae; ST2–ST4 with long setulosity; syntergosternite 7+8 shiny black or dark brown; cercal base flattened in profile; cercus with a pointed apex in dorsal view; vesica short and membranous, with two pointed lobes.

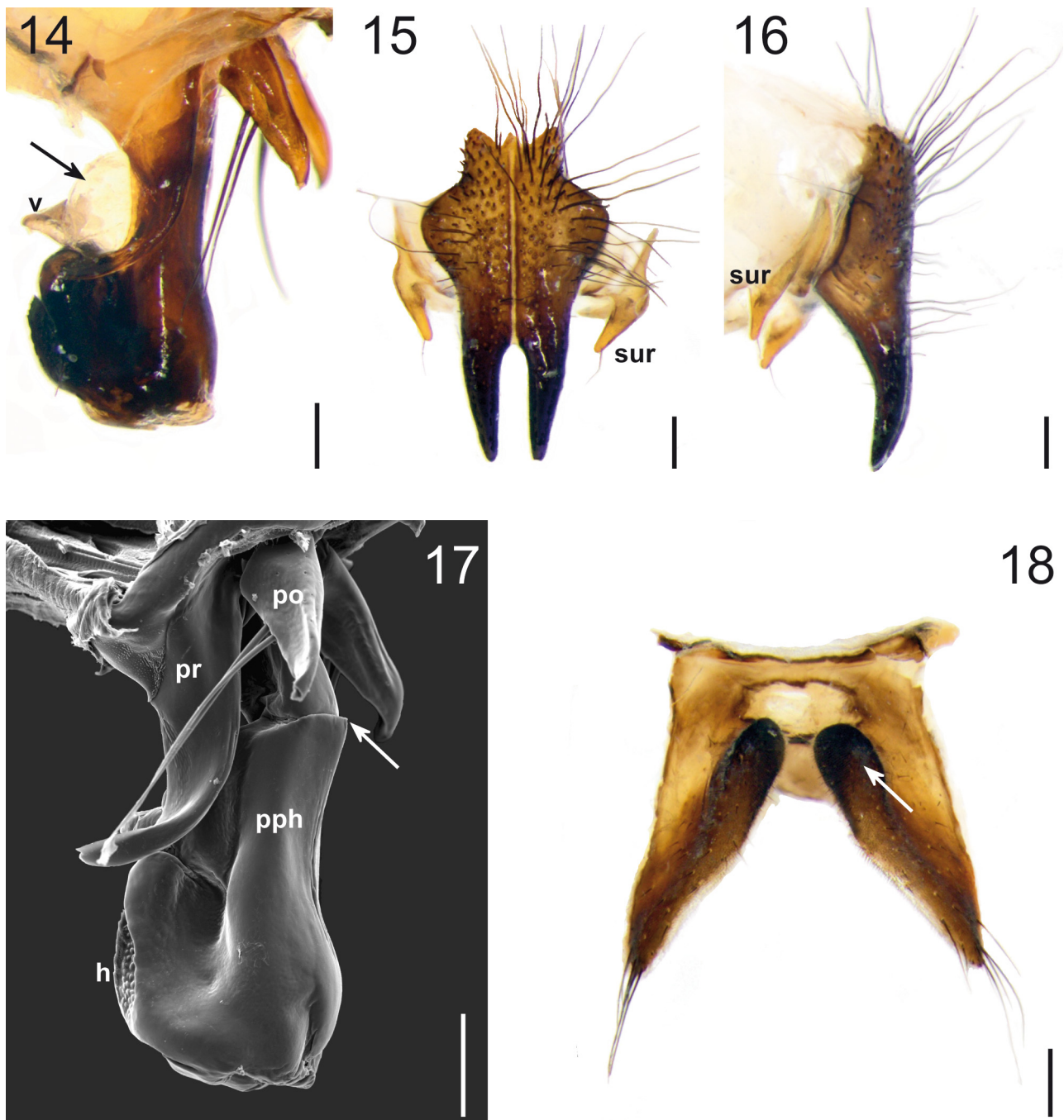
**Description.** *Male.* Body length 6.27–8.72 mm ( $n = 6$ ).

**Head.** Head length at antennal base 1.01–1.10x ( $n = 3$ ) head length at level of vibrissa; frons at its narrowest point 0.24–0.25x ( $n = 3$ ) head width. Parafacial and fronto-orbital plates with silvery microtomentum; frontal vitta blackish; postocular area with silvery microtomentum; postcranium with silvery-grey microtomentum; ocellar triangle black, with silvery microtomentum; genal groove, genal dilation, postgena, face and facial ridge with silvery microtomentum; antenna black; first flagellomere with brown microtomentum, 0.28–0.33x ( $n = 3$ ) head height; arista short plumose on basal 0.5, with longest rays longer (3.12–4.76x) than maximum width of arista; palpus blackish. Parafacial plate with a row of setulae close to eye, stronger in lower part; fronto-orbital plate with sparse setulae; postcranium with black setae on upper part and a few pale setae on lower part; eye bare; 7–10 frontal setae, the rows of frontal setae diverging strongly anteriorly at level of pedicel; 1 reclinate orbital seta; inner vertical seta strong and reclinate, outer vertical setae 0.5x the inner verticals and divergent; ocellar triangle with 1 pair of divergent and proclinate ocellar setae and supplementary setulae; postocellar and paraverticilar setae present; gena with black setae, postgena with dark setae; facial ridge with setae close to vibrissa and setulae reaching the lower half; 4–8 subvibrissal setae; palpus with black setae on apical half.

**Thorax.** Black, with silvery microtomentum; prescutum and scutum with dorsal and lateral stripes of silvery microtomentum and three black stripes; postpronotal lobe, katapisternum and anepimeron with spots of silvery microtomentum; notopleuron and anepisternum with spots of golden microtomentum; proepisternum silvery, bare. Chaetotaxy: 1 strong proepisternal seta plus one or two weaker and shorter supplementary setae; 1 proepimeral seta plus one or two weaker and shorter supplementary setae; katapisternals 3; postalar wall setulose; acrostichals 0 + 1 (prescutellar pair well developed), dorsocentrals 2–3 + 3, intra-alars 1 + 2, supra-alars 2 + 3 (the middle one stronger), anterior postpronotals 1, basal postpronotals 2, postalars 2, notopleurals 4 (two larger and two smaller). Scutellum with 2 pairs of lateral setae, 1 pair of crossed apical setae, and 1 pair of discal setae. Wing hyaline, tegula dark brown, basicosta whitish and veins pale brown; vein  $R_1$  bare; vein  $R_{4+5}$  setulose in proximal 0.4–0.5 of distance to crossvein R-M; costal spine not differentiated; third costal sector without ventral setae; cell  $r_{4+5}$  open; lower calypter whitish, with a central brown spot in some specimens. Legs: coxae, trochanters and femora with silvery-grey microtomentum; mid trochanter with a ventral pad of short and stout spines; mid femur without a posteroventral ctenidium in its apical portion, and with anterior and anteroventral rows of setae; mid tibia with 1 anteroventral, 2–3 anterodorsal, 3–4 posterodorsal and 1 posterior setae; hind trochanter with a ventral pad of short and stout spines; hind femur with anterior, anterodorsal and anteroventral rows of setae; hind tibia with 1 anteroventral, 2–3 anterodorsal and 2 posterodorsal setae; mid and hind femora and hind tibia with long setulae; tarsi blackish.

**Abdomen.** Black; sternites exposed; syntergite 1+2 to T4 each with dorsal and lateral spots of silvery

microtomentum; T5 with dorsal spots of silvery microtomentum and lateral spots of golden microtomentum; syntergite 1+2 and T3 each with a pair of lateral marginal setae; T3 without median marginal setae; T4 and T5 with a complete row of marginal setae; T5 with long setulosity on posteroventral margin; ST2–ST4 with long setulosity.



**FIGURES 14–18.** *Austrophyto mariluisi* **sp. nov.**, paratype (MACN). **14.** Phallus and gonites, left lateral view; arrow showing swollen, desclerotized ventral area. **15.** Cerci and surstyli, dorsal view. **16.** Cercus and surstyli, left lateral view. **17.** SEM image of phallus and gonites, left lateral view; arrow showing incomplete dorsal hinge between basi- and distiphallus. **18.** Sternite 5, ventral view; arrow showing rounded basal lobe. Scale bars: 200  $\mu$ m. For abbreviations, see Figs 1–9 and 10–13.

**Terminalia.** ST5 V-shaped, brown; arms of ST5 with rounded basal lobes, covered with velvet-like micro-pubescence on their inner surface (Fig. 18); ventral surface of ST5 with setulae, with larger setae towards apex (Fig. 18); syntergosternite 7+8 shiny black basally, dark brown on apical 1/3, with a median spot of golden microtomentum and a marginal row of weak setae almost not differentiated from the few other setae present on its dorsal surface (Fig. 33); epandrium reddish-orange, with hair-like setae; cercal prong about half as long as cercal base; cercal base with long setulosity (Fig. 15–16); cercus, in profile, slightly curved ventrally and with a pointed

apex (Fig. 16); surstylus narrow, with 1 apical hair-like seta (Figs 15–16); pregonite curved (Fig. 17); postgonite curved distally, with 2 strong setae (Fig. 17); vesica (Figs 5, 8, 14) membranous and short, with two pointed lobes; harpes (Figs 5, 8, 17) heavily sclerotized, with projections with a rough surface; juxta with small apico-lateral lobes with a microtrichose surface (Figs 5, 8); medial juxtal sclerite elongated and exposed between juxtal lobes (Figs 5, 8); lateral styli and median stylus tubular and ventrally curved (Fig. 8).

*Female.* Unknown.

**Type material.** Holotype ♂ (MACN): “Arg[entina], Salta, Alturas / de Amblayo 3600 m [m a.s.l.] / 12/[19]86 Mariluis col.” [white label, handwritten]; “Holotype [printed] ♂ / Austrophyto / mariluisi sp. nov. / Mulieri det. 2015” [red label, handwritten]. Holotype in good condition, with terminalia detached and glued to a piece of card pinned together with the rest of the specimen. Paratypes (MACN): 2 ♂♂, same data as holotype.

**Distribution.** Argentina (Salta) (Fig. 35).

**Etymology.** The specific epithet is given in recognition of the work of the Argentinean dipterist Juan Carlos Mariluis.

**Remarks.** This species is easily distinguished from its congeners by the black and dark brown syntergosternite 7+8.

### *Austrophyto noa* sp. nov.

(Figs 1–3, 6, 9, 19–26, 29–32, 35)

**Diagnosis.** Parafrons and lower half of fronto-orbital plate with golden microtomentum, upper half of fronto-orbital plate with silvery microtomentum; postgena with pale setae on posterior part; dorsocentrals 4 + 4 (the posteriormost two larger); notopleuron with silvery-grey microtomentum; T5 with lateral spots of silvery microtomentum; T3 with a pair of median marginal setae; ST2–ST4 with short setulosity; syntergosternite 7+8 reddish-orange; cercal base with a rounded protuberance; cercus with rounded apex in dorsal view; vesica folded upward, with a microsculptured surface.

**Description.** *Male.* Body length 9.33–10.30 mm ( $n = 6$ ).

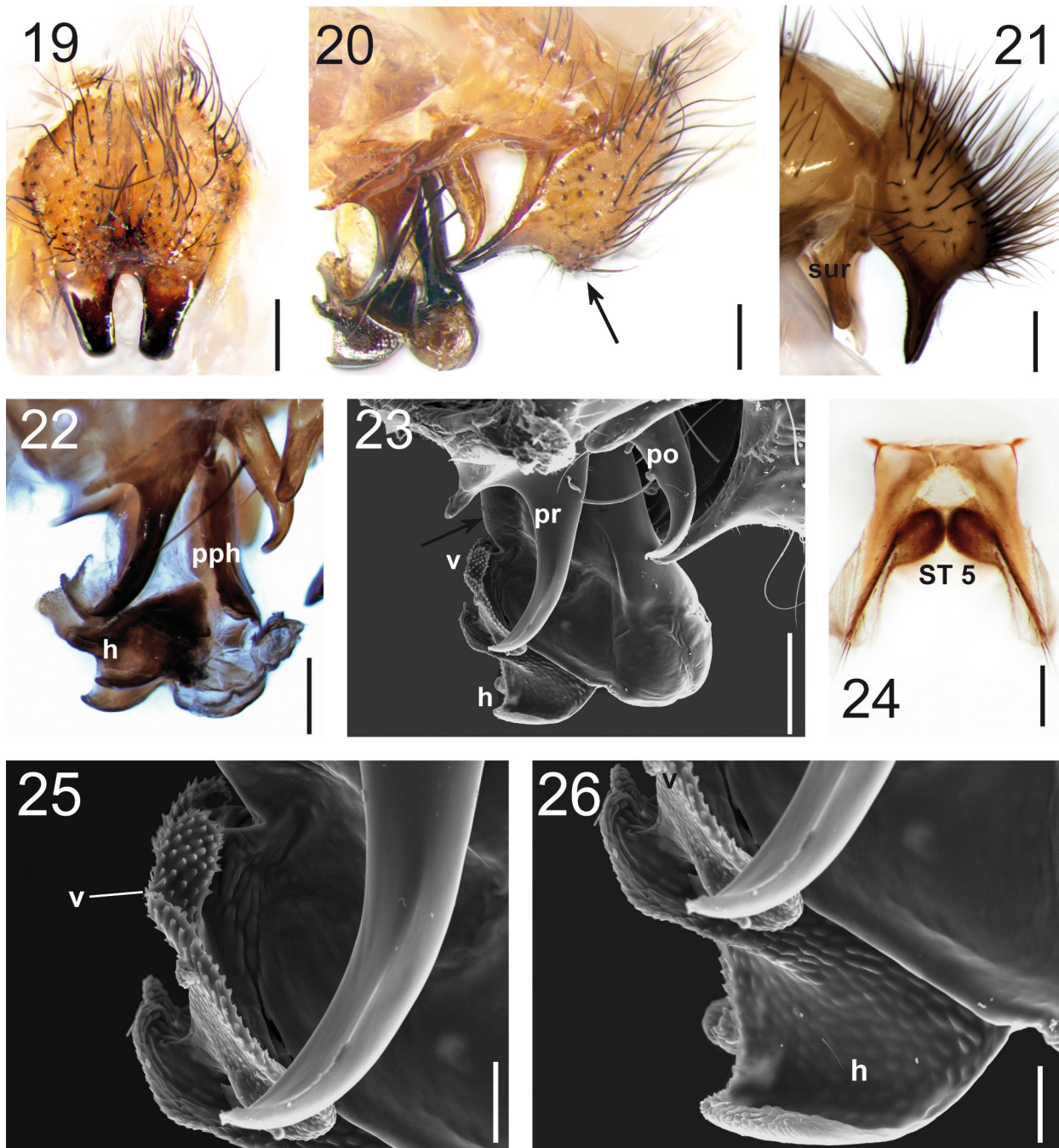
**Head.** Head length at antennal base 1.11–0.99x ( $n = 6$ ) head length at level of vibrissa; frons at its narrowest point 0.19–0.24x ( $n = 6$ ) head width. Parafrons and lower half of fronto-orbital plate with golden microtomentum, upper half of fronto-orbital plate with silvery microtomentum; postocular area with silvery microtomentum; postcranium with silvery-grey microtomentum; frontal vitta blackish; ocellar triangle black, with silvery microtomentum; genal groove and genal dilation with golden microtomentum; postgena face and facial ridge with silvery microtomentum; antenna brown, first flagellomere with grey microtomentum, 0.25–0.30x ( $n = 6$ ) head height; arista short plumose on basal 0.5, the longest rays longer (2.00–3.60x) than maximum width of arista; palpus brown. Parafrons plate with a row of setulae close to eye, stronger in lower part; fronto-orbital plate with sparse setulae; postcranium with black setae on upper part and a few pale setae on lower part; eyes bare; 9–11 frontal setae, the rows of frontal setae diverging strongly anteriorly at level of pedicel; 1 reclinate orbital seta; inner vertical seta strong and reclinate, outer vertical setae 0.30–0.25x ( $n = 6$ ) the inner verticals and divergent; ocellar triangle with 1 pair of divergent and proclinate ocellar setae and supplementary setulae; postocellar and paraverticilar setae present; gena with black setae, postgena with pale setae on posterior part; facial ridge with setae close to vibrissa and setulae on lower half; 10–12 subvibrissal setae; palpus with black setae on the apical 2/3.

**Thorax.** Black, with silvery-grey microtomentum; prescutum and scutum with dorsal and lateral stripes of silvery-grey microtomentum and three black stripes; postpronotal lobe, notopleuron, katepisternum and anepimeron with spots of silvery-grey microtomentum; anepisternum with dense golden microtomentum; proepisternum silvery, bare. Chaetotaxy: 1 strong proepisternal seta plus one weaker and shorter supplementary seta; 1 proepimeral seta plus one or two weaker and shorter supplementary setae; katepisternals 3; postalar wall setulose; acrostichals 0 + 1 (prescutellar pair well developed), dorsocentrals 4 + 4 (the posteriormost two larger), intra-alars 1–2 + 2, supra-alars 2 + 3 (the middle one stronger), anterior postpronotals 1, basal postpronotals 2, postalar setae 2, notopleurals 4 (two larger and two smaller). Scutellum with 2 pairs of lateral setae, 1 pair of crossed apical setae and 1 pair of weak discal setae. Wing hyaline, tegula pale brown, basicosta whitish and veins brown; vein  $R_1$  bare; vein  $R_{4+5}$  setulose in proximal 0.4–0.5 of distance to crossvein R-M; costal spine differentiated; third costal sector without ventral setae; cell  $r_{4+5}$  open; lower calypter whitish. Legs: coxae, trochanters and femora with silvery-grey microtomentum, tibiae somewhat reddish; mid femur without a posteroventral ctenidium in its apical

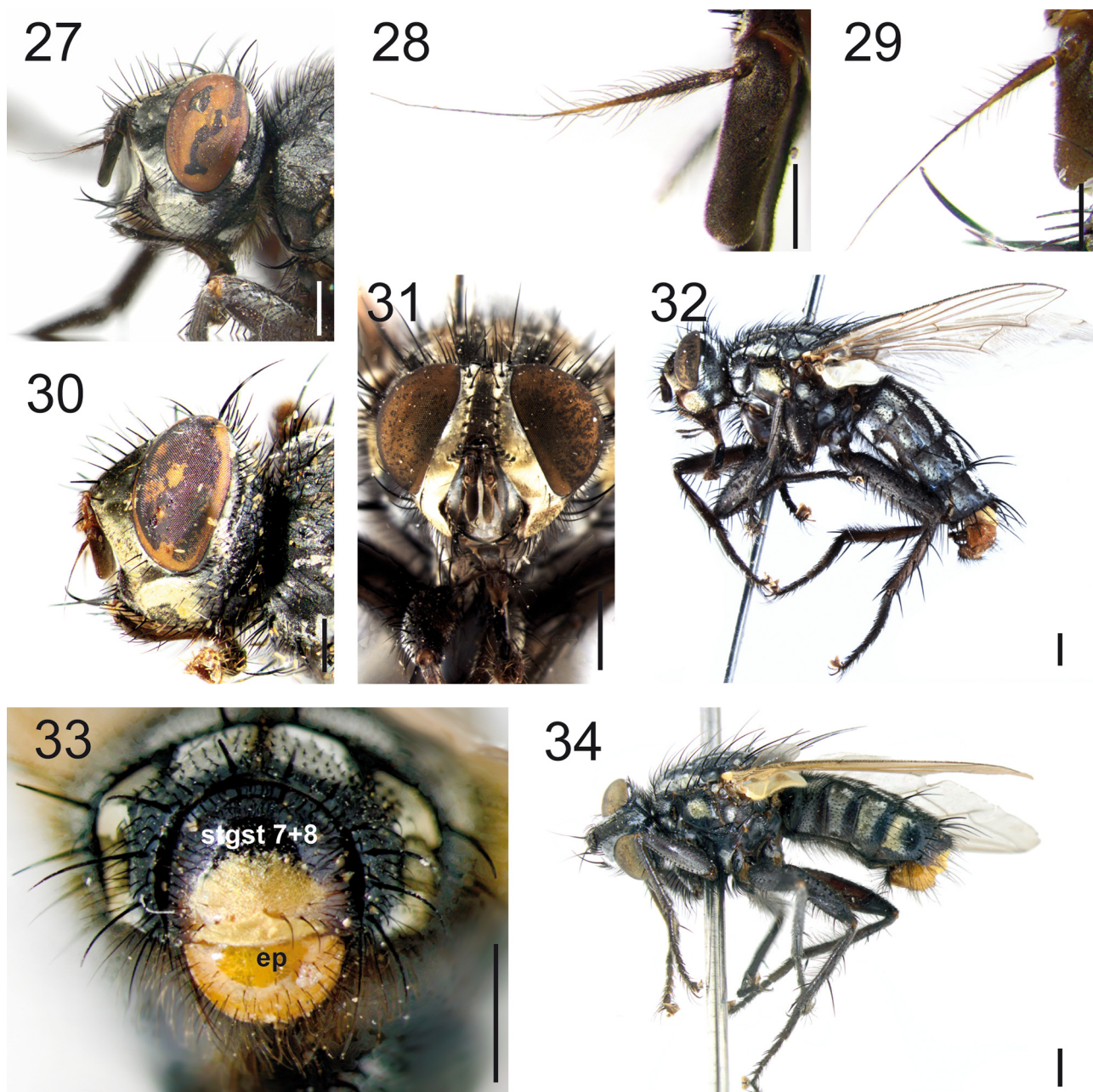


portion, with 4 anterior setae and 3–5 anteroventral setae; mid tibia with 1 anteroventral, 2 anterodorsal, 2 posterodorsal and 1 posterior setae; hind trochanter with a ventral pad of short and stout spines; hind femur with anterior, anterodorsal, anteroventral and posteroventral (in basal half) rows of setae; hind tibia with 1 anteroventral, 2–4 anterodorsal and 2 posterodorsal setae; mid and hind femora and hind tibia with long setulae; tarsi brown.

Abdomen. Dark brown; sternites exposed; syntergite 1+2 to T5 each with dorsal and lateral spots of silvery microtomentum; syntergite 1+2 and T3 each with a pair of lateral marginal setae; T3 with a pair of median marginal setae; T4 and T5 with a complete row of marginal setae; T5 with long setulosity on posteroventral margin; ST2–ST4 with short setulosity and marginal setae.



**FIGURES 19–26.** *Austrophyto noa* sp. nov. **19.** Cerci, dorsal view (paratype, MNRJ). **20.** Terminalia, lateral view (paratype, MACN); arrow showing rounded protuberance on cercal base. **21.** Cercus and surstylus, lateral view (paratype, MNRJ). **22.** Phallus and gonites, lateral view (paratype, MNRJ). **23.** SEM image of phallus and gonites, lateral view (paratype, MACN); arrow showing the swollen, desclerotized ventral area. **24.** Sternite 5, ventral view (paratype, MACN). **25.** SEM image showing detail of vesica, left lateral view (paratype, MACN). **26.** SEM image showing detail of harpes, left lateral view (paratype, MACN). Scale bars: 200  $\mu$ m (Figs 19–24); 50  $\mu$ m (Figs 25–26). For abbreviations, see Figs 1–9 and 10–13.



**FIGURES 27–34.** *Austrophyto* spp. **27–28.** *Austrophyto cordobensis* Lopes (specimen from Córdoba, MACN). **27.** Head in left lateral view. **28.** Detail of arista, lateral view. **29–30.** *Austrophyto noa* sp. nov. (paratype, MACN). **29.** Detail of arista, lateral view. **30.** Head in left lateral view. **31–32.** *Austrophyto noa* sp. nov. (paratype, MNRJ). **31.** Head in frontal view. **32.** Left lateral habitus. **33–34.** *Austrophyto mariluisei* sp. nov. (paratype, MACN). **33.** Tip of abdomen in posterior view. **34.** Left lateral habitus. Scale bars: 1 mm (Figs 27, 31–34); 200  $\mu$ m (Figs 28–29); 500  $\mu$ m (Fig. 30). For abbreviations, see Figs 10–13.

Terminalia. ST5 V-shaped, reddish (Fig. 24); arms of ST5 with rounded basal lobes, covered with pale micro-pubesence (velvet-like) on their inner surface; ventral surface of ST5 with setulae, with larger setae towards apex (Fig. 24); syntergosternite 7+8 reddish-orange, with intense golden microtomentum and with a marginal row of weak setae not differentiated from the few other setae present on its dorsal surface; epandrium reddish-orange, with long, hair-like setae; cercus short, with a long seta on cercal base; cercal base with a rounded protuberance in profile (Figs 20–21); cercal base 2.2–2.4x ( $n = 2$ ) as long as cercal prong (Fig. 19); surstylus elongated, with a rounded tip (Fig. 21); pregonite curved (Figs 1, 23); postgonite curved distally, with 2 strong setae (Fig. 1); vesica (Figs 6, 9, 23, 25) short and poorly sclerotized, folded upward and with a microserrated surface; harpes (Figs 3, 6, 22, 26) heavily sclerotized, with projections visible in lateral view; juxta with membranous apico-lateral lobes;



medial juxtal sclerite elongated and deeply hidden between juxtal lobes (Figs 3, 9); lateral styli and median stylus tubular and ventrally curved (Fig. 9).

*Female.* Unknown.

**Type material.** Holotype ♂ (IFML): “R. A. Catamarca / 6 km N. Belén / 1240 m [white label, printed]”; “Willink, Terán / Stange (Malaise) / 1-15.II.1969” [white label, printed]; “Entomofauna / Subandina” [blue label with black frame, printed] “Holotype [printed] ♂ / *Austrophyto noa* sp. nov. / Mulieri det. 2015” [red label, handwritten]. Holotype in good condition, with terminalia detached and glued to a piece of card pinned together with the rest of the specimen. Paratypes: 5 ♂♂, same data as holotype (1 in IFML, 4 in MACN); 1 ♂, Argentina, Tucumán, Burruyacú, La Mesada, 2.x.1947, Ares leg. (MACN); 2 ♂♂, Argentina, Salta, Departamento San Martín, 500–800 m, P. Wygodzinsky leg. (MNRJ).

**Distribution.** Argentina (Catamarca, Salta, Tucumán) (Fig. 35).

**Etymology.** The specific epithet is a noun in apposition and refers to the Spanish acronym used to designate the Argentinean region (“NOA = Noroeste argentino”) where the species was discovered.

**Remarks.** *Austrophyto noa* sp. nov. resembles *A. cordobensis* in some features of the terminalia, such as the shape of the cercal prong and vesica. However, these species can be easily separated by external characters given in the key.



**FIGURE 35.** Map showing the known distributions of *Austrophyto* species.

## Key to males of *Austrophyto*

1. Parafacial and lower half of fronto-orbital plate with golden microtomentum (Figs 30–31). Genal dilation with golden microtomentum (Figs 30–31). Cercal base with a rounded protuberance (lateral view) (Figs 20–21) ..... *A. noa* **sp. nov.**
- Parafacial and fronto-orbital plates with silvery microtomentum (Fig. 27). Genal dilation with silvery microtomentum (Fig. 27). Cercal base without a rounded protuberance (lateral view) (Figs 10, 16) ..... 2
2. T3 without median marginal setae. T5 with dorsal spots of silvery microtomentum and lateral spots of golden microtomentum (Figs 33–34). Syntergosternite 7+8 shiny black basally, dark brown on the apical 1/3 (Fig. 33). ST2–ST4 with long setulosity ..... *A. mariluisi* **sp. nov.**
- T3 with a pair of median marginal setae. T5 with dorsal and lateral spots of silvery microtomentum. Syntergosternite 7+8 reddish-orange. ST2–ST4 with short setulae ..... *A. cordobensis* Lopes

## Discussion

Relationships among *Austrophyto*, *Microcerella* and *Boettcheria* are not entirely clear. The following features are shared by all three genera: hind trochanter with a pad of short setae, presence of an incomplete dorsal hinge between basi- and distiphallus and acrophallus with three tube-shaped styli. However, *Austrophyto* and *Microcerella* do not possess a posteromedial row of spines on the hind trochanter, which is present in most species of *Boettcheria*. Additionally, the shape and configuration of the vesica separate males of *Austrophyto* and *Boettcheria*. The most conspicuous differences between *Austrophyto* and *Microcerella* are the length of the phallus (shortened in *Austrophyto* and more elongated in *Microcerella*) and the configuration of the juxta, which is much less developed in *Austrophyto*. Other characters are unique to *Austrophyto* and potentially represent autapomorphies supporting the monophyly of the genus: two long setae on the postgonite, a swollen and desclerotized area ventrally on the distiphallus, proximal to the vesica, and juxta scarcely developed and represented by apico-lateral membranous lobes with a medial sclerotization between them (the medial juxtal sclerite).

*Boettcheria* and *Microcerella* are more diverse genera in comparison to *Austrophyto*. *Boettcheria* comprises 26 species distributed throughout the New World, whereas *Microcerella* is one of the largest New World genera, with more than 70 described species (Pape 1996; Mulieri *et al.* 2015). A comprehensive phylogenetic analysis incorporating a significant number of *Austrophyto*, *Boettcheria* and *Microcerella* species would be required to more clearly define the limits of these related genera, and to determine whether the *Austrophyto* clade is embedded within *Boettcheria* or *Microcerella*.

*Austrophyto* appears to be exclusively distributed in tropical and subtropical Andean areas. Current records are restricted to the more humid, eastern Sub-Andean mountain ranges of north-western Argentina (Fig. 35). Some records from Argentina (see collecting localities for *A. noa* **sp. nov.**) are from tropical montane forest localities in the extreme south of the Yungas ecoregion, near Bolivia, and it is therefore likely that the genus also occurs in Bolivia as well as in other countries with similar habitats. The biology of all three species is unknown.

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