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Taxonomic revision of the Neotropical Lauxaniidae genus *Neopachycerina* Malloch, 1933 (Diptera: Schizophora), with description of a new species

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Abstract. A systematic review of the Neotropical Lauxaniidae genus *Neopachycerina* Malloch, 1933 is presented. The genus is characterized mainly based on some features of the head, like the anterior pair of fronto-orbital setae conspicuously shorter than posterior one and rather close to them; face with a distinct elevation between antennal bases; antenna slightly elongate, first flagellomere tapered to tip and about three times as long as its basal width, arista thickened by dense black short hairs both above and below, with some longer outstanding hairs on upper side basally. Although some authors have grouped it with some other genera based on chaetotaxy of the head, it was considered closer to *Parapachycerina* Stuckenberg. Other authors, on the other hand, noted very important differences in the male terminalia, shape of the syntergosternite 7+8 and phallic complex, stressing a view that there are many convergent similarities in unrelated Old and New World lauxaniid genera. This shows that there is some conflicting evidence about the position of *Neopachycerina* within the Lauxaniidae, but a precise affiliation of *Neopachycerina* to any genus or group of genera still depends on a global cladistic analysis of the Lauxaniidae genera. In the present paper, *Neopachycerina nigra* sp. nov., from Argentina, is described and *N. aristata* Malloch, 1933 is redescribed, with illustrations of both species.

Key-Words. Lauxaniinae; New species; Neotropical Region; Key; Taxonomy.

INTRODUCTION

Lauxaniidae is one of the largest Diptera Schizophora families, very common in tropical areas. The family comprises about 2000 valid species in 158 genera (Shewell, 1965, 1977; Miller, 1980; Papp, 1984; Shatalkin, 2000; Papp, 2007; Gaimari & Silva, 2010a, 2010b; Evenhuis, 2012), with nearly 400 described species in 53 genera in the Neotropics (Gaimari & Silva, 2010b). The family is classified into three subfamilies: Homoneurinae, Lauxaniinae and Eurychoromyiinae (Stuckenberg, 1971; Shewell, 1977; Gaimari & Silva, 2010a). Lauxaniinae is based on the extension of the black costal setulae to a point at or near the apex of R_{2+3} in the wing, absence of a ctenidium and presence of a single tibial spur (Shewell, 1977). The conditions found in Lauxaniinae are clearly plesiomorphic and are likely part of the groundplan for the Muscomorpha (McAlpine, 1989). Stuckenberg (1971) and Shewell (1977) agree with the possibility of paraphyly to the group. Lauxaniinae presents a worldwide distribution, comprises 119 genera, of which *Neopachycerina* Malloch, 1933 (plus 39 other genera) are restricted to the Neotropical area.

Malloch (1933) described the Neotropical genus *Neopachycerina* to his new species *N. aristata,* which was described from a male specimen from Uruguay. The genus was considered by Malloch (1933: 357) similar to *Pachycerina* Macquart, but with some relevant differences such as the: "anterior pair of fronto-orbital bristles reclinate, very much shorter than posterior pair and rather close to them; face with a rather distinct elevation between antennal bases; antennae slightly elongate, basal segment shorter than second and bare below, third tapered to tip and about three times as long as its basal width, arista thickened by dense black short hairs both above and below, with some longer outstanding hairs on upper side basally".

In his monograph of the Old World Lauxaniidae, Stuckenberg (1971: 538) in the key to genera, grouped *Parapachycerina* Stuckenberg, *Micropachycerina* Stuckenberg, *Neopachycerina* and *Katalauxania* Hendel, because they share the posterior fronto-orbital seta situated far from

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anterior margin of the frons, near apex of the orbital plate, the anterior fronto-orbital seta reduced, inserted immediately in front of the posterior fronto-orbital seta (which is strong and reclinate), and by the arista plumose and thickly haired, except in *Katalauxania*. According to Stuckenberg (1971: 519), *Parapachycerina* and *Micropachycerina* seemed to be part of a larger cluster of 14 related genera, most sharing a bare, glossy integument, bulbous face, very elongate antennae and sparse mesonotal setulae. Stuckenberg (1971: 513) also considered the resemblance of some Neotropical genera to ones occurring in the Old World as result of convergence and presented them as counterpart, but not as related taxa, as occurs between *Neopachycerina* and *Parapachycerina*.

In Stuckenberg's key to genera (1971: 539), *Neopachycerina* differs from *Parapachycerina* by relatively trivial, although numerous characters, as A_1 diverging from the wing margin (running close but subparallel to wing margin in *Parapachycerina*), R_1 clearly distant from Sc over the entire wing length, costal cell about 3.3 times the length of the subcostal cell (R_1 ending relatively close to Sc, length of subcostal cell only about one-fifth the length of costal cell in *Parapachycerina*), arista thickly feathered and with dorsal series of long hairs relatively shorter (arista loosely feathered and dorsal hairs relatively much longer in *Parapachycerina*), scape with at least six setulae on the upper anterior edge (*Parapachycerina* with usually not more than 2-3 setulae above), and ocellar setae strong, much longer than the postocellar setae (ocellar setae relatively smaller and weaker, about equal to postocellar setae or smaller in *Parapachycerina*). For Stuckenberg (1971), these features are relatively constant in all *Parapachycerina* species. Also, the geographic distribution of these genera is different, *Neopachycerina* exclusive from southern South America, and *Parapachycerina* distributed through the Old World tropics, suggesting, according to Stuckenberg (1971), a convergent evolution.

Davies & Miller (2008) reviewed the Afrotropical species of *Parapachycerina* and presented more differences between the two genera: *Neopachycerina* has a more protuberant ocellar tubercle; dense ocellar setulae (lacking in *Parapachycerina*); tiny setulae on the anterolateral portions of the face (absent in *Parapachycerina*); a conspicuous lunule; a very weak anterior katepisternal seta; stout, costal spinules terminating well short of R_{4+5} (approximately half way); and densely plumose arista (loosely plumose arista in *Parapachycerina*). They also noted very important differences in the male terminalia, in the shape of the syntergosternite 7+8 and phallic complexes. These differences, for Davies & Miller (2008), stress the view pointed out by Shewell (1986) that there are many convergent similarities in unrelated Old and New World lauxaniid genera.

The information above shows that there is some conflicting evidence about the position of *Neopachycerina* within the Lauxaniinae, but a precise affiliation of *Neopachycerina* to any genus or group of genera certainly still depends on a more inclusive analysis of the Lauxaniidae.

Until now, the genus is only known from Southern South America, from Argentina and Uruguay.

In the present paper, we revise the genus *Neopachycerina,* including the description of a new species, *N. nigra* sp. nov. and redescription of *N. aristata* Malloch.

MATERIALS AND METHODS

The material studied is housed in the collections (with their respective acronyms, and curators) of the "Fundación Miguel Lillo", San Miguel de Tucumán, Argentina (FML, G. Claps); "Museu de Zoologia da Universidade de São Paulo", São Paulo, Brazil (MZUSP, C.J.E. Lamas), and The Natural History Museum, London, England (BMNH, B. Pitkin and J. Chainey).

For the study of the morphology of the terminalia, the post-abdomen was removed from dry specimens, placed in a warm 10% KOH solution for 10-15 minutes to soften the tissues, then rinsed in distilled water, transferred to glacial acetic acid, and dehydrated in an increasing ethanol series (30%, 50%, 70% and 95%). The post-abdomen was then bleached with lactophenol and stored in a vial with glycerin fixed to the insect pin. Illustrations were made using a Leica DM 2500 microscope and Leica S8APO stereomicroscope, both equipped with a Leica DC 500 camera. Stacking of the photos was performed by the Helicon Focus 6.0 software, later edited with Photoshop CC 2018.

The general morphological terminology follows Cumming & Wood (2009) and Gaimari & Silva (2010b), while we use the homology in Cumming & Wood (2017) for wing venation.

RESULTS AND DISCUSSION

Neopachycerina Malloch, 1933

Neopachycerina Malloch, 1933: 357. Type species, *N. aristata* Malloch (orig. des.).

Diagnosis: Ocellar tubercle well developed and humped; ocellar seta longer, at least at the same level of anterior margin of the frons; anterior fronto-orbital seta reclinate and reduced, shorter than posterior pair and rather close to them; antenna slightly elongate, scape shorter than pedicel and bare proximally, first flagellomere tapered to tip and about three times as long as its basal width, arista thickened by dense black short setulae both dorsally and ventrally, with some longer outstanding hairs on upper side basally. It can be distinguished from an undescribed Neotropical genus that shares a thickened arista, with short, dense hairs (undescribed genus J, Gaimari & Silva, 2010b: 990 [in couplet 84 of the key]) by the small eye, first flagellomere slender and tapering apically, and frons without a velvet black spot on central anterior margin.

Neopachycerina aristata Malloch, 1933 (Figs. 1, 3E, 3F)

Neopachycerina aristata Malloch, 1933: 358, fig. 67c (head). Type locality: Uruguay, Montevideo. Refs.: Davies & Miller (2008: 151; fig. 31, male terminalia), Silva (2014, new record from Argentina).

Diagnosis: Brownish yellow body; arista black, thickened by dense black short setulae both above and below, with some longer, outstanding hairs on upper side basally; wing yellowish.

Redescription: Male and female. Length: body 3.8 mm; wing 3.5 mm.

Head (Figs. 1A, B, C): vertex rounded; ocellar triangle close to vertex, ocellar tubercle well developed, velvet black, contrasting with the pale ocelli. Frons rectangular, wider than long; in profile slightly convex, in profile; slightly concave anteriorly, in dorsal view. Face almost straight, but outstanding medially, in profile; lunule exposed; lower facial margin short. Eye small, rounded oval, posteroventral outline concave, lower half strongly narrowed. Parafacial and gena wide, whitish pruinose. Mouthparts yellow; palpus brown with paler base. Antenna: scape shorter than pedicel; first flagellomere long, oval, tapering toward apex; arista black, thickened by dense black short setulae both above and below, with some longer outstanding hairs on upper side basally. Chaetotaxy: outer vertical seta long, ½ length of inner vertical seta; ocellar setae very long, strong, diverging; postocellar setae short, cruciate; fronto-orbital setae reclinate, anterior seta ⅓ length of posterior one; 2 genal setae; supravibrissal setae short.

Thorax (Fig. 1A): Yellowish brown; scutum slightly arched, small dark stripe from katepisternum to wing base; scutellum triangular with rounded apex, flat. Chaetotaxy: 0+3 dorsocentral setae, anterior seta smaller and close to suture; 1 postpronotal seta; 2 notopleural setae; 1 small prescutellar acrostichal seta; 6 rows of acrostichal setulae; intra-alar seta absent; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae; 1 proepisternal seta; 1 katepisternal seta; 1 anepisternal seta; anepimeron bare; 2 scutellar setae, apical pair parallel. **Legs:** yellow, tarsi darker; fore tibia thick and laterally compressed. Chaetotaxy: fore coxa with 1 preapical dorsal seta, 3 apical dorsal setae; fore femur with posterodorsal, posterior and posteroventral rows of setae; fore tibia with 1 short preapical dorsal seta; mid coxa with apical row of setae; mid femur with anterodorsal row of setae and 1 short apical posteroventral seta; mid tibia with 1 preapical anterodorsal seta, 1 strong apical ventral seta and many apical strong setulae; hind coxa with 1 posterior seta and 1 apical dorsal seta; hind femur with 1 subapical anterodorsal seta, and 2 small anteroventral subapical setae; hind tibia with 1 short preapical seta. **Wing (Figs. 1A, D):** yellowish hyaline, brownish veins; costa sapromyziform (costal spinules not reaching apex of vein R_{4+5}); Radial veins bare; crossvein *r-m* before middle of discal cell; crossvein *dm-m* before middle of r_{4+5}; longitudinal veins almost parallel; anal vein shorter than length cell *cua*. Halter yellow.

Abdomen (Fig. 1A): Yellowish brown.

Male teminalia (from Davies & Miller, 2008: 154, fig. 31): Syntergosternite 7+8 bonnet-like, lengthened longitudinally and shortened laterally, incomplete ventrally; epandrium broader laterally than dorsally; surstylus as a broadly rounded process, not articulated or fused to the inner surface of epandrium, but meeting below the circus. Phallus navicular (boat-shaped), sclerite with spines (teeth) posteriorly on the inner subapical surface; phallapodeme very short (< 0.5X length of phallus), with anterior disc and posterior stem, tapering strongly posteriorly to short posterior arms. Hypandrium as a transverse band broad with a small "apron" projecting downwards at an oblique angle; lateral hypandrial arms long, curve upwards and inwards forming an irregularly shaped convolution bearing a tiny lappet that has 2 or 3 setulae; the inner edge of this convolution fuses with the base of the gonopods. Gonopods long, slender, curved apically.

Female: As male, except for abdominal apical segments, telescopic; sternite 8 narrow. **Terminalia:** Hypoproct and epiproct well developed. Cercus long, papillated. Spermathecae oblong, with configuration 1+2; pair of spermathecae united with a very short duct; duct of solitary spermatheca very long, longer than the one connecting the paired spermathecae to the genital chamber (Figs. 3E, F).

Material examined: Holotype male: URUGUAY, Montevideo, 17.x.1926, F. & M. Edwards, B.M. 1927-63 (BMNH). Additional specimens. Argentina, Catamarca, Sta Maria (E. Rios), 19.i.1968, Golbach, Terán & Willink col. 1 f# (FML); Catamarca, Andalhuallas (2.000 m), 19.i.1968, Golbach, Terán & Willink col. 1 f# (FML); Tucumán, Laguna del Quilmes, 20.i.1968, Golbach, Terán & Willink col. 1 f# (FML); 1 f# (FML) without locality label, from Argentina (possibly from Tucumán, Hun-Hun or Salta).

Comments: The male terminalia was not figured here because Davies & Miller (2008) presented an adequate one.

Neopachycerina nigra Silva & Frare, sp. nov. (Figs. 2, 3A-D)

Diagnosis: Brownish black body, with anterior margin of frons and face yellow; arista black, thickened by dense black short setulae both above and below, with some slightly longer, outstanding hairs on upper side basally; wing membrane yellowish hyaline, with blackish base.

Description: Male and female. Body length, 2.5 mm; wing length, 2.8 mm.

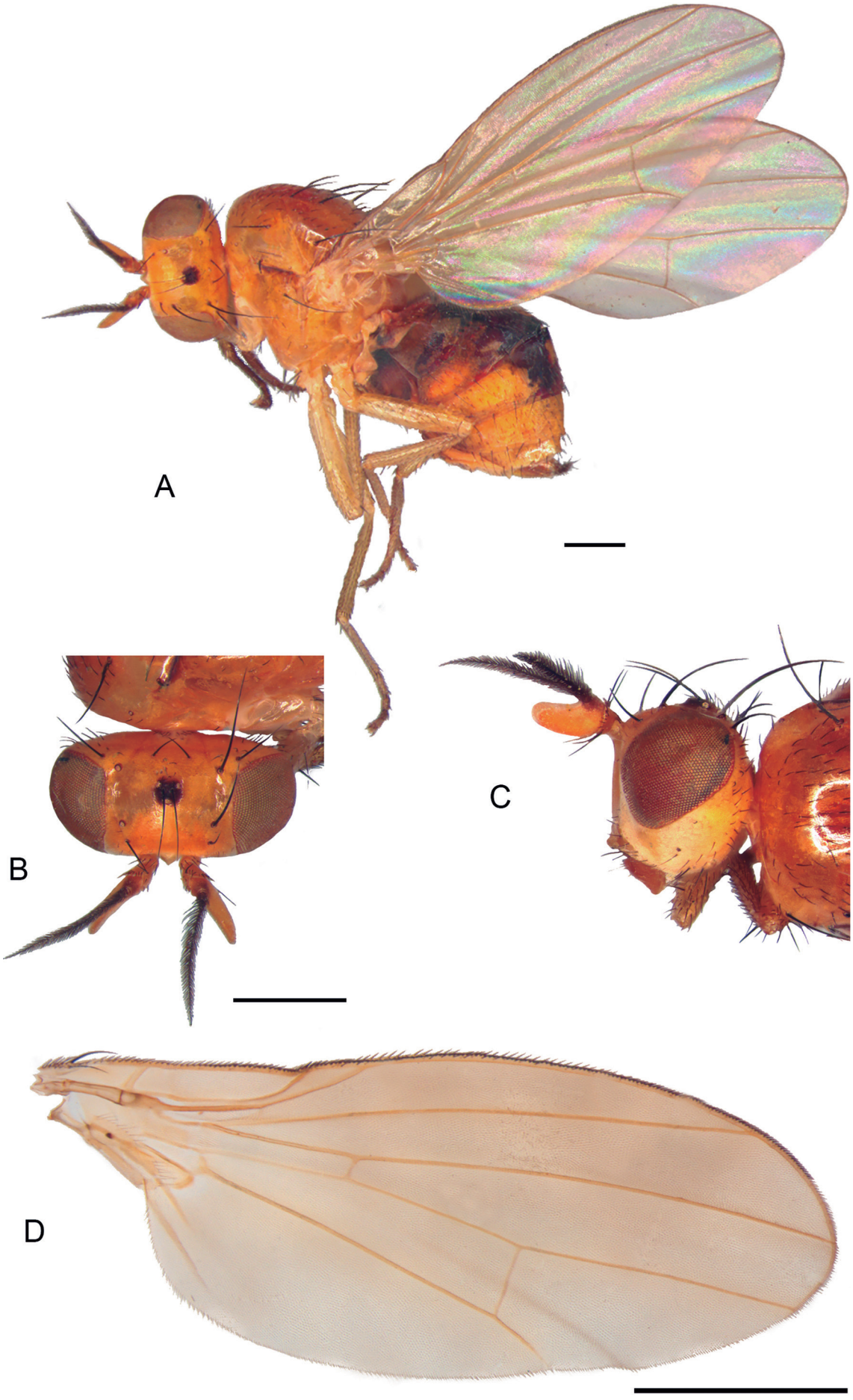

Figure 1. *Neopachycerina aristata* Malloch. (A) Habitus, lateral view; (B) Head, dorsal view; (C) Head, lateral view; (D) Wing. Scales 0.5 mm.

Head (Figs. 2A, B, C): Vertex rounded; ocellar triangle close to vertex, ocellar tubercle well developed, ocelli whitish yellow. Frons rectangular, wider than long; in profile, almost flat; anterior part concave in dorsal view; brownish black, anterior margin shining yellow, fronto-orbital plate shining, other parts dull. Fronto-facial angle slightly less than 90°. Face concave in profile, with a deep median transversal groove; shining brownish yel-

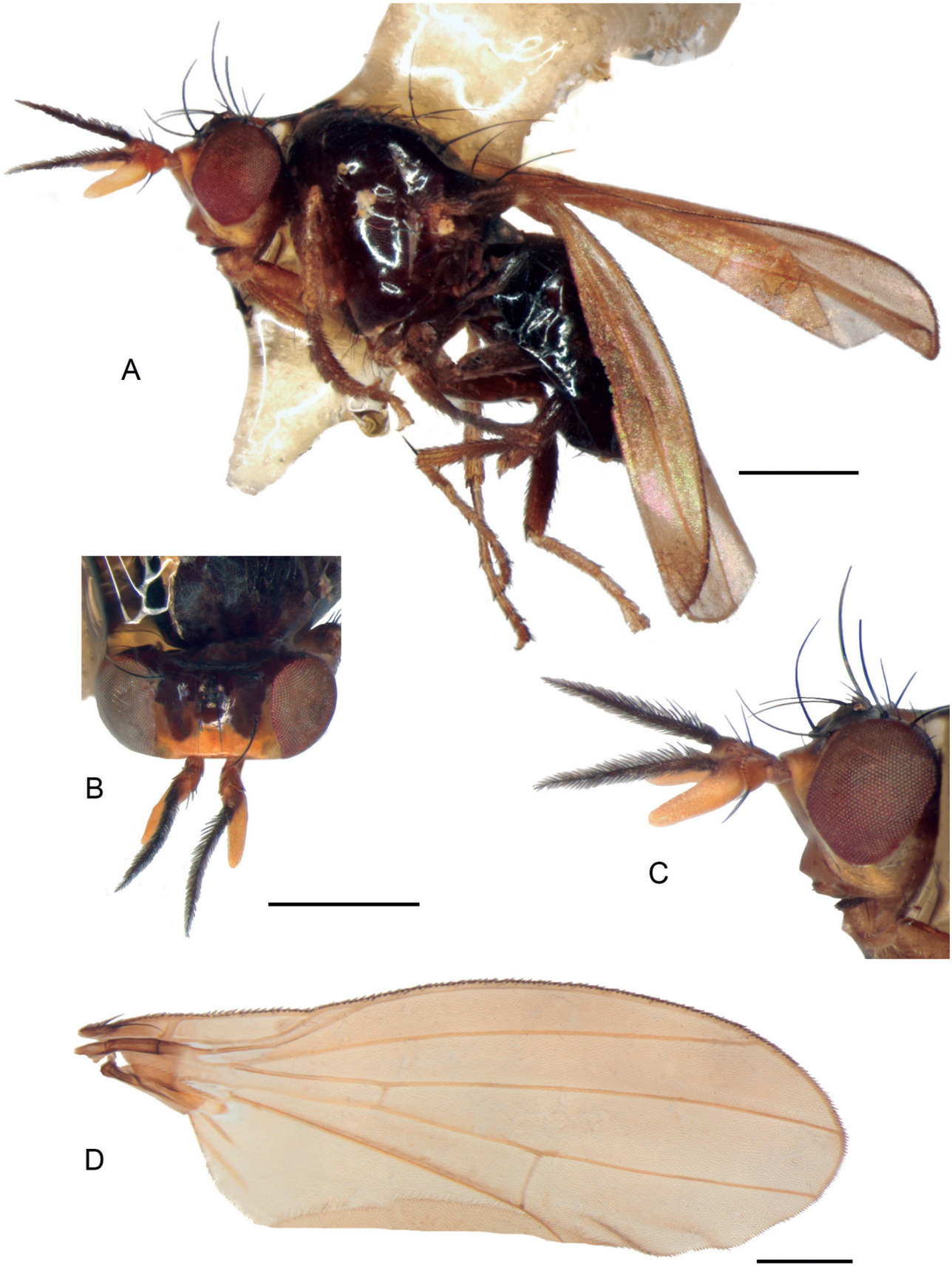

Figure 2. Neopachycerina nigra Silva & Frare, sp. nov. (A) Habitus, lateral view; (B) Head, dorsal view; (C) Head, lateral view; (D) Wing. Scales 0.5 mm.

low; lunule exposed. Eye small, oval, posteroventral outline rounded, lower half narrowed. Parafacial and gena wide, brownish yellow, with whitish pruinosity; postgena yellow. Mouthparts brownish yellow; clypeus slender, brownish; palpus slender, brown with paler base. Antenna: yellow; scape shorter than pedicel; pedicel with 1 dorsal and 2 ventral apical setae; first flagellomere long, oval, tapering toward apex; arista black, thickened

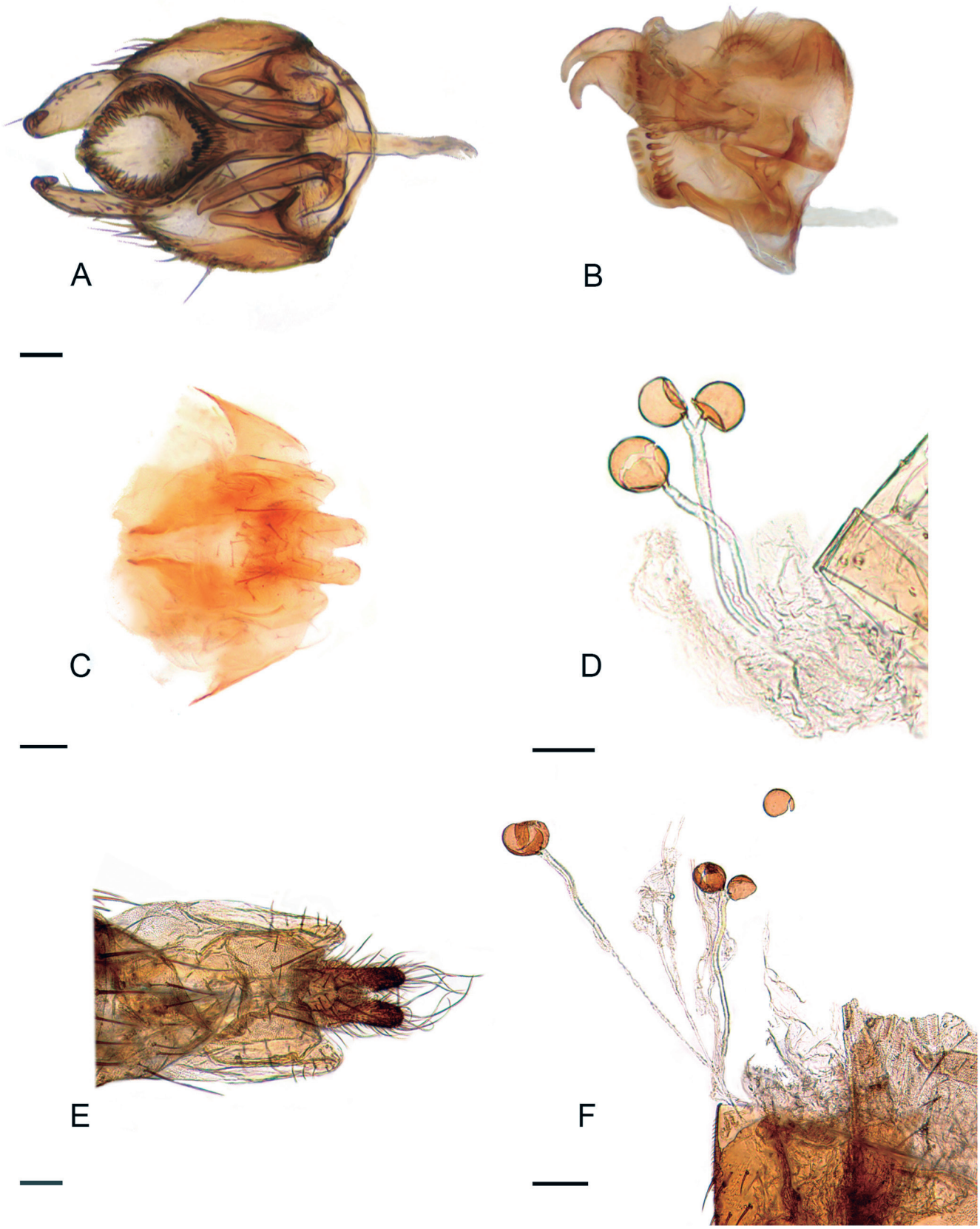

Figure 3. Neopachycerina nigra Silva & Frare, sp. nov., figs. A-D: (A) Male terminalia, ventral view; (B) Male terminalia, lateral view; (C) Female terminalia, ventral view; (D) Spermathecae. *Neopachycerina aristata* Malloch, figs. E-F: (E) End of female abdomen, ventral view; (F) Spermathecae. Scales 0.1 mm.

by dense black short setulae both above and below, with some slightly longer outstanding hairs on upper side basally. Chaetotaxy: outer vertical seta half the length of the inner vertical seta, short; ocellar setae longer, at least at the same level of anterior margin of the frons, in dorsal view, diverging; postocellar setae short, cruciate (partially broken in the holotype); anterior orbital seta minute; posterior orbital seta long, reclinate; 2 genal setae; supravibrissal setae few and sparse, quite long.

Thorax (Fig. 2A): Brown, with yellow pruinosity; scutum arched; scutellum triangular, short, convex. Chaetotaxy: 0+3 dorsocentral setae, anterior seta very small and close to suture; 1 postpronotal seta; 2 notopleural setae; prescutellar acrostichal seta absent; 4 rows of acrostichal setulae; intra-alar seta absent; 1 presutural and 1 postsutural supra-alar setae; 2 postalar setae; 1 short proepisternal seta; 1 katepisternal seta; anepisternal seta absent; anepimeron bare; 2 long scutellar setae, apical pair parallel. **Legs:** Mostly brown, fore legs brownish yellow, fore coxa darker at base, mid and hind tibiae brown with yellowish apical third. Fore coxa with 1 preapical dorsal seta, 1 subbasal dorsal seta; fore femur with 1 subbasal posteroventral seta and posterior and posteroventral rows of setae; fore tibia with 1 preapical dorsal seta, 1 short apical ventral seta; mid coxa with apical row of setae; mid femur with anterodorsal row of setae and 1 short apical posteroventral seta; mid tibia with 1 strong apical ventral seta; hind coxa with 1 apical dorsal seta; hind femur with 1 preapical anterodorsal seta; hind tibia with 1 short preapical seta. **Wing (Figs. 2A, D):** yellowish hyaline, with blackish base, veins yellow; costa sapromyziform (costal spinules not reaching apex of vein R_{4+5}); Radial veins bare; crossvein *r-m* before middle of discal cell; crossvein *dm-m* before middle of r_{4+5}; longitudinal veins almost parallel; anal vein shorter than length cell *cua*. Halter blackish brown.

Abdomen (Fig. 2A): Brownish black, shining.

Male terminalia (Figs. 3A, B): Epandrium wider laterally than dorsally. Surstylus longer than wide, hook-like apex, not rounded, articulated with epandrium. Phallus as navicular sclerite, with spines posteriorly on the inner subapical surface. Phallapodeme long and tapered (> 0.5X phallus length). Hypandrium narrow, ribbon-shaped, lateral hypadrial arms long, curved, forming a "lappet" with setulae, fusing its edge with the base of the gonopods. Gonopods long, slender, curved apically.

Female terminalia: Hpoproct and epiproct well developed. Cercus long, papillated. Spermathecae almost rounded, with configuration 1+2; pair of spermathecae united by a very short duct; duct of solitary spermatheca as long as the one connecting the paired spermathecae to the genital chamber (Figs. 3C, D).

Etymology: from the Latin *nigra,* meaning black, to denote the general body color. To be treated as a noun in apposition.

Type material: *Holotype* male, Argentina, La Rioja, Miranda, i.1970, L.E. Peña col. (MZUSP). Paratypes: idem holotype, but 2f# (MZUSP); ARGENTINA, Capitilias, Catamarca, 3000 m, ii.1970, L.E. Peña col. 1#f (MZUSP); Salta, Cafayate, 20.i.1968, Golbach, Terán & Willink col. 1#f (FML).

Comments: All tarsi are broken in the holotype. This species can be easily distinguished from *N. aristata* by the key presented below.

Key to species of *Neopachycerina*

1. Body fulvous yellow (Fig. 1A); wing veins brownish; halter yellow... .....*N. aristata* Malloch
— Body brownish black (Fig. 2A); wing veins yellow; halter blackish brown..... *N. nigra,* sp. nov.

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