

Neodexiopsis Malloch (Diptera, Muscidae) from Ecuador: description of new species and a key to the species

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ABSTRACT

Neodexiopsis Malloch (Diptera, Muscidae) is a member of the subfamily Coenosiinae, with more than a hundred species recorded in the Neotropical region. In Ecuador, it is known by four species, which may be an underestimated number. We describe five new species based on recently collected material: *Neodexiopsis bicoloratta* **new species**, *N. longialata* **new species**, *N. nigrocalyptrata* **new species**, *N. plana* **new species**, and *N. secunda* **new species**. A key to segregating all the recorded species from Ecuador is presented. The male and female terminalia of the new species were dissected and illustrated. Images of the habitus of the adult from the new species are presented.

Introduction

Neodexiopsis Malloch (Diptera, Muscidae) is a Neotropical Coenosiinae genus, with more than a hundred species recorded in this region but with heterogeneous levels of knowledge among countries (de Carvalho et al., 2005). Half of the *Neodexiopsis* species are known from Brazil, while a few species have been recorded from Argentina, Bahamas, Bolivia, Caicos Island, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, Puerto Rico, Saint Vincent, Trinidad and Tobago, United States of America, Uruguay, and Venezuela (Löwenberg-Neto and de Carvalho, 2013). Recent publications have contributed to the knowledge of *Neodexiopsis* diversity, such as Costacurta et al. (2005) and Fogaça et al. (2020) from Brazil, and Couri (2011) from Bolivia.

However, in Ecuador, this genus is poorly understood. According to de Carvalho et al. (2005) and Löwenberg-Neto and de Carvalho (2013), only four species have been recorded: *N. devia* (Curran, 1934) in Galápagos islands, Trinidad Tobago, and the Nearctic region; *N. equator* Snyder, 1958 and *N. latifrons* (Thomson, 1869) endemic in Ecuador; and *N. rufitibia* (Stein, 1919) that also occurs in Panama,

Peru, Brazil, Paraguay, Argentina, Jamaica (a doubtful record) and in the Nearctic region.

The study of new material recently collected proved that the number of species in this country was underestimated. Herein, five new species are described and illustrated: *N. bicoloratta* **new species**, *N. longialata* **new species**, *N. nigrocalyptrata* **new species**, *N. plana* **new species**, *N. secunda* **new species**, and the last species belonging to the *ovata* group. A key to segregating all the species recorded from Ecuador is presented.

Material and methods

Specimens studied

The specimens studied herein are part of a short-term entomological project developed in the southern Ecuadorian Andes using Malaise and pan traps (de Carvalho et al., 2019). They were deposited at RBINS (Royal Belgium Institute of Natural Sciences, Brussels, Belgium), UTPL (Universidad Técnica Particular de Loja, San Cayetano Alto, Ecuador), MNRJ (Museu Nacional da Universidade do Rio de Janeiro, Brazil), and DZUP (Entomological Collection at the Universidade Federal do Paraná (Curitiba, Brazil).

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Dissections, terminology, images, and maps

Male and female terminalia were macerated in 10% potassium hydroxide, boiled in a water bath for ten minutes, and dissected using glycerol. The samples were analyzed using a stereomicroscope Carl Zeiss Standard 20 and drawn and inked with Inkscape 0.91 (<http://inkscape.org/en/>). The terminalia were stored in a microtube containing glycerol and attached to a pin bearing the specimen. The terminology of the descriptions follows Cumming and Wood (2017).

Images of the habitus of the adult from the new species were taken with Zeiss AxioCam ERc 5s using Discovery V20 stereomicroscope. The map was created using the free QGIS software (available at <http://www.qgis.org/en/site/>). The map coordinates follow Löwenberg-Neto and de Carvalho (2013). The specific localities of *N. equator* and *N. rufitibia* from Ecuador are unknown (Snyder, 1957, 1958) and we included the Quito coordinates for both species in the map.

Results and discussion

Taxonomy

The four *Neodexiopsis* species previously recorded from Ecuador are known only by a few specimens except *N. rufitibia*. Since their original descriptions, they have been treated mainly in catalogs. No material on these species was examined and all data about them were taken from literature, mainly from the original descriptions (Thomson, 1869; Stein, 1919; Curran, 1934; Snyder, 1958). *Neodexiopsis equator* and *N. latifrons* are endemic to Ecuador, the first of which belongs to the *ovata* group proposed by Snyder (1958). Species of this group can be easily distinguished from other *Neodexiopsis* species by modifications in the anal area of the wing. Males have a posterior lobe extension, while in females, it is more angular (see Snyder, 1958: 13 and 16).

A key to the *Neodexiopsis* species recorded from Ecuador

1. Males with the anal area of the wing with posterior lobe extension; same area more angular bend in female (Snyder, 1958, fig. 5); thorax with five brown vittae dorsally 2 (*ovata* group).
 - . Anal area of wing not modified in either sex; thorax without dorsal vittae or with only three inconspicuous brown vittae dorsally 3.
2. Apical scutellar setae long, as long as the basal scutellar setae; hind tibia with one anteroventral seta *Neodexiopsis equator* Snyder, 1958.
 - . Apical scutellar setae short, with a quarter of the basal scutellar setae length; hind tibia with two anteroventral setae *Neodexiopsis secunda* **new species**
3. Postpedicel four times longer than pedicel length; apical scutellar setae short, with a quarter of the basal scutellar setae length 4.
 - . Postpedicel three times longer than pedicel length; apical scutellar setae long, as long as the basal scutellar setae 5.
4. Antennae and palpus light brown; thorax without dorsal vittae; tibiae and femora yellow, with apical dark brown spots on the fore and mid femur (male tibiae yellow to light brown) *Neodexiopsis longialata* **new species**
 - . Antennae and palpus dark brown; thorax with three inconspicuous brown vittae dorsally; fore tibia yellow, mid and hind tibia light brown; fore femur dark brown; mid and hind femora basally yellow and apically dark brown ... *Neodexiopsis plana* **new species**
5. Antennae and palpus yellow; wing hyaline *Neodexiopsis latifrons* (Thomson, 1868).
 - . Antennae and palpus with other coloration; wing hyaline gray or light to dark brown 6.
6. Calyptera dark brown; hind tibia without anteroventral seta *Neodexiopsis nigrocalyptrata* **new species**

- . Calyptera white; hind tibia with 1–2 anteroventral setae 7.
- 7. Antennae blackish, basal half of pedicel reddish; palpus reddish yellow; wing hyaline grey *Neodexiopsis devia* (Curran, 1934).
 - . Antennae light brown; palpus light brown; wings light brown 8.
- 8. Thorax with three inconspicuous brown vittae dorsally; tibiae light brown; fore femur dark brown; mid and hind tibia yellow with apical light brown spot; hind tibia with one anteroventral seta *Neodexiopsis rufitibia* (Stein, 1919).
 - . Thorax without inconspicuous brown vittae dorsally; femora and tibiae yellow; hind tibia with two anteroventral setae *Neodexiopsis bicoloratta* **new species**

Neodexiopsis bicoloratta **new species**

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Diagnosis: This species has a thorax with lateral white pruinosity, whereas the dorsal region has light brown pruinosity. It also has two anteroventral apical setae on the hind tibia.

Description: Male. Length: body: 2.9–3.1 mm; wing: 3.0 mm.

Color: General color brown, post-pronotum yellowish. Face and parafacial velvety dark brown with coppery reflections under certain light conditions. Frons, fronto-orbital plate and gena gray pollinose. Antenna brown, the apex of the pedicellum lighter. Arista and palpus brown. Calypteres uniformly whitish. Halter yellow. Wing smoky. Mesonotum brown, all pleurae brown-gray pollinose. Legs yellow, except apices of mid- and hind femora, which are brown. Abdomen dark brown, a little shiny, without clouds; tergite 1 + 2 yellowish at base.

Head: Eyes bare; inner and outer vertical setae long. Frontal row with three pairs of long setae, upper one backward directed. Ocellar setae long, forward-directed, and divergent from one another. Postpedicel about 3.0 times the length of the pedicel. Arista very short pubescent.

Thorax: Acrostichal hairs very fine, pre-scutellar pair not developed. Presutural one; supra-alar one; post supra-alar one. Scutellum with a very long pair of basal setae and a very short and fine apical one. Anepisternum with ground cilia setulae and four long setae, inferior one longer. Fore femur with anterodorsal and anteroventral complete rows of setae. Fore tibia on the posterior surface with one long median seta; dorsal and ventral surfaces with apical setae. Mid femur with three anterior setae, each one inserted in each third of the femur; ventral surface with two fine setae on the basal third and one on the apical third; posterior surface with two preapical setae. Mid tibia with one median anterodorsal and one median posteroventral setae; one dorsal and one ventral preapical and one dorsal apical. Hind femur with about 5–6 anterodorsal spaced setae and two anteroventrals on apical third. Hind tibia with one median anterodorsal and one median posterodorsal setae, one dorsal preapical, one posterodorsal on the apical third, two fine ventrals on the apical third, and one ventral apical.

Abdomen: Tergite 3 with one pair of lateral setae; tergite 4 with two pairs of lateral setae; tergite 5 with a series of four setae on disc. Sternite 5 triangular with many apical setae (Fig. 1A). Sternite 7 and syntergosternite 7 + 8 as in Fig. 1D.

Terminalia: Cercus is longer than wide and shorter than the surstylus length (Fig. 1B). Surstylus is long and enlarged (Figs 1B, C). Hypandrium tubular and long; phallopodeme with the same diameter in all extensions (Fig. 1C). The pregonite and postgonite are similar in length (Fig. 1C).

Female: Similar to male, except for the absence of the median posterodorsal seta on the hind tibia. Only one anteroventral seta on the hind tibia. Ovipositor long; tergites and sternites narrow, sternites with setae at apex; epiproct shorter than hypoproct; cerci long, with long seta on external margins (Figs 1E, F). Two spermatheca rounded (Fig. 1E).

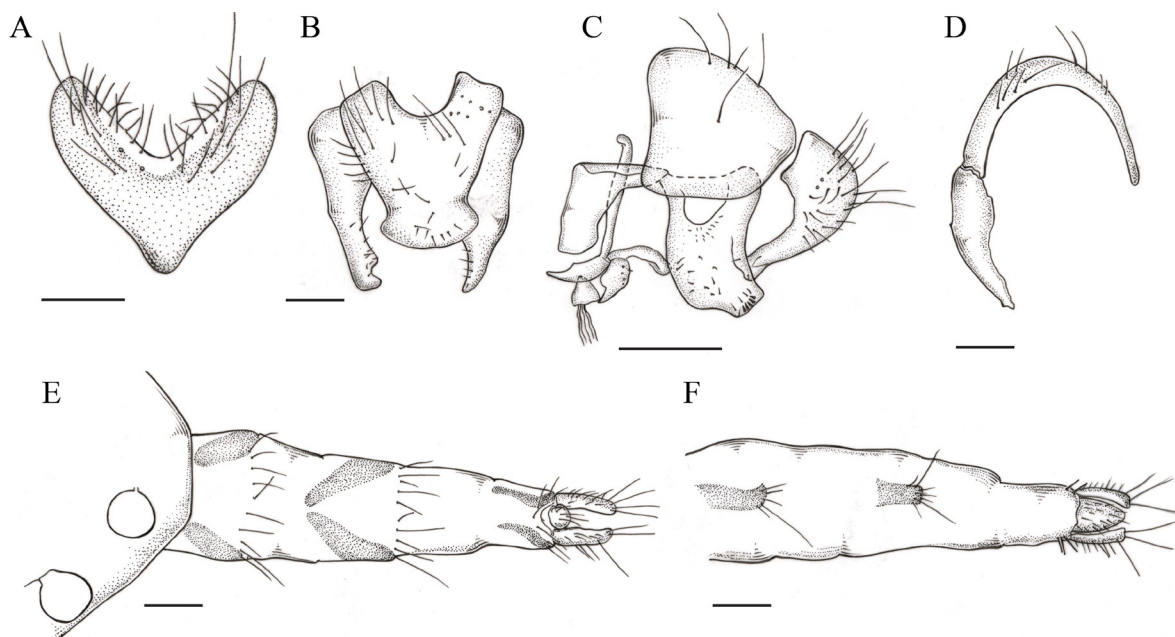


Figure 1 *Neodexiopsis bicoloratta* new species: A. Sternite 5, dorsal view; B. Cercal plate and surstylus, dorsal view; C. Cercal plate and surstylus and phallic complex, lateral view; D. Sternite 7 and sytergosternite 7 + 8, dorsal view; E. Ovipositor, dorsal view, and spermatheca; F. Ovipositor, ventral view. Scale: 0.1 mm.

Material examined: Holotype male: ECUADOR: 13171. (EC) Zamora Chinchipe: Bomboscaro, Podocarpus National Park, Trail Higuerones, 1000m, 15/02/2009-4/03/2009 (MT). Leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-38/MP&ADB-013 (UTPL).

Paratypes: Same label as holotype, including the number and sample code: 1♂2♀♀ (UTPL), 1♂ (RBINS), 3♂♂ (DZUP), 2♂♂ (MNRJ).

Etymology: The specific name refers to the contrasting colors of the upper and lateral sides of the scutum.

Neodexiopsis longialata new species

urn:lsid:zoobank.org:act:A3116D73-5693-4D45-BCB6-5AC8AC93139C (Figs 2A–G, 6B)

Diagnosis: The species is easily distinguished from the other *Neodexiopsis* recorded from Ecuador by the median large vittae on the male mesonotum and long and smoky wings.

Description: Male. Length: body: 5 mm; wing: 6.0–6.2 mm.

Color: General brown, with grey pollinosity. Parafacial, fronto-orbital plate, and gena with golden and silver reflections. Face and frons brown with gray pollinosity. Antenna and arista dark brown, pedicellum with apex yellow. Palpus brown. Calypteres uniformly whitish; halter yellow. Wing clear. Mesonotum brown with gray pollinosity; male with a large median brown vitta between the dorsocentral rows of setae, reaching apex of scutellum and two in intralar row, but less marked than the median one; females with mesonotum more uniformly brown. Pleurae brown, uniformly gray pollinose. Legs with coxae yellow with grey pollinosity; trochanter and femur yellow, except apices of the mid and hind femur, which are brown; tibia in male yellow on basal third and all yellow in female; tarsi brown in both sexes. Abdomen brown, a little shiny in males, and a faint brown longitudinal vitta in females.

Head: Eyes bare; inner and outer vertical setae long. Frontal row with five pairs of setae, only the fourth one long. Ocellar setae fine, long, forward-directed, and divergent from one another. Postpedicel about 3.0–3.2 times the length of the pedicel. Arista, very short pubescent.

Thorax: Acrostichal hairs very fine, pair pre-scutellar not developed. Presutural one; supra-alar one; post supra-alar one. Scutellum with a very long pair of basal setae and a very short and fine apical one. Anepisternum with ground setulae and four long setae, inferior one longer. Fore femur with anterodorsal and anteroventral complete rows of setae. Fore tibia on the posterior surface with a long median seta; dorsal and ventral surfaces with an apical seta. Mid femur with three anterior setae, each one inserted in each third; ventral surface with two fine setae on basal third and one on the apical third; posterior surface with two preapical setae. Mid tibia with one median anterodorsal and one submedian posteroventral setae; one dorsal pre-apical and one ventral and one dorsal apical. Hind femur with about 5–6 anterodorsal spaced setae and two anteroventrals on apical third. Hind tibia with anterodorsal and posterodorsal median seta, one ventral submedian, one long dorsal on the upper limit of the apical third, one dorsal preapical, and one strong ventral apical. Wing long.

Abdomen: Tergites 1 + 2 - 4 with one lateral pair of setae; tergite 5 with a series of setae on disc and apex. Sternite 5 (Fig. 2A) trapezoid with many apical setae. Sternite 7 and sytergosternite 7 + 8 as in Fig. 2D.

Terminalia: Cercus is longer than wide and not extending beyond the surstylus apex (Figs 2B, C). Surstylus is long (Fig. 2B, C). Hypandrium tubular and long; phallapodeme with the same diameter in all extensions (Fig. 2C). The length of the pregonite is shorter than that of the postgonite (Fig. 2C).

Female: Similar to male, except for long and fine preapical posteroventral seta absent on the fore tibia. Median anterodorsal seta absent on hind tibia. Ovipositor long; tergites and sternites narrow, sternites with setae at apex; epiproct as long as hypoproct; cerci long, with long seta on external margins (Figs 2E and F). Egg, as in Fig. 2G.

Material examined: Holotype male: ECUADOR: 13105. (EC) Loja: Cajanuma Podocarpus National Park, Trail Bosque Nublado, 3000m, 20/02/2009-27/02/2009 (YPT). Leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-34/MP&ADB-002 (UTPL).

Paratypes: Same label as holotype, 2♂♂, 1♀ (DZUP), 1♂, 1♀ (MNRJ); 13063, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-001,

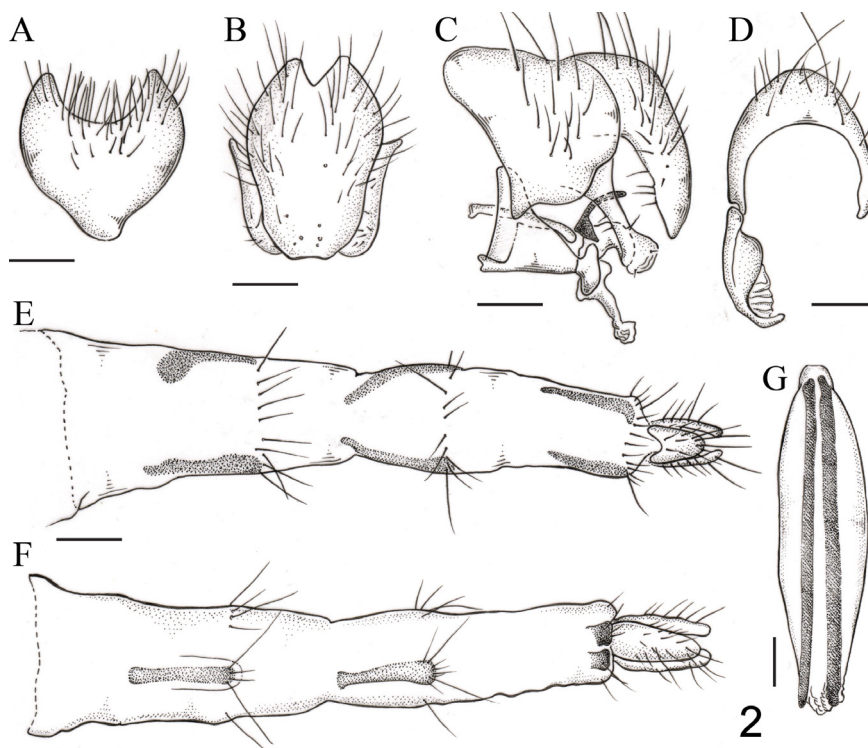


Figure 2 *Neodexiopsis longialata* new species: A. Sternite 5, dorsal view; B. Cercal plate and surstylus, dorsal view; C. Cercal plate and surstylus and phallic complex, lateral view; D. Sternite 7 and syntergosternite 7 + 8, dorsal view; E. Ovipositor, dorsal view; F. Ovipositor, ventral view; G. Egg. Scale: 0.1 mm.

3♀♀ (UTPL); 13064, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-002, 1♂, 2♀♀ (DZUP); 13108, trail Los Miradores, (WPT), sample code EC/2009-34/MP&ADB-005, 4♀♀ (DZUP); 13109, trail Los Miradores, (WPT), sample code EC/2009-34/MP&ADB-006, 1♀, 5♀♀ (DZUP); 13153, trail Los Miradores, 27/02/2009-05/03/2009 (BPT), sample code EC/2009-37/MP&ADB-009, 1♀ (UTPL); 13154, trail Los Miradores, 27/02/2009-05/03/2009 (BPT), sample code EC/2009-37/MP&ADB-010, 1♀ (UTPL); 13115, trail Oso de antejos, sample code EC/2009-34/MP&ADB-012, 3♀♀, 1♂ (DZUP); 13145, 27/02/2009-05/03/2009, sample code EC/2009-37/MP&ADB-001, 5♀♀ (DZUP); 13068, trail Los Miradores, 16/02/2009-20/02/2009 (WPT), sample code EC/2009-31/MP&ADB-006, 6♀♀ (MNRJ); 13105, Trail Bosque Nublado, 3000m, 20/02/2009-27/02/2009 (YPT). Leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-34/MP&ADB-002, 1♂1♀ (MNRJ); 13105, trail Los Miradores, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-004, 3♂♂, 6♀♀ (MNRJ); 13107, trail Los Miradores, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-004, 1♂, 11♀♀ (MNRJ); 13112, trail Los Miradores, 3000m, 27/02/2009-05/03/2009 (BPT), 1♀ (MNRJ); 13155, trail Oso de antejos, sample code EC/2009-37/MP&ADB-011, 3♂♂1♀ (UTPL), 2♂♂1♀ (RBINS/); 13170, trail Bosque Nublado, 3000m, 16/02/2009-05/03/2009 (MT), sample code EC/2009-37/MP&ADB-013, 1♂ (UTPL); 13066, trail Los Miradores, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-004, 1♂ 2♀♀ (UTPL), 2♀♀ (RBINS), 1♂, 3♀♀ (DZUP); 13074, trail Oso de Anteojos, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-012, 3♂♂2♀♀ (DZUP), 2♀♀ (RBINS); 13106, trail Los Miradores, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-012, 5♀♀ (UTPL), 1♂, 4♀♀ (RBINS/); 13106, trail Los Miradores, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-003, 3♂♂7♀♀ (UTPL), 1♂7♀♀ (RBINS); 13065, trail Los Miradores, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-003, 2♂, 7♀♀ (DZUP);

13114, trail Oso de Anteojos, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-011, 2♂♂5♀♀ (UTPL), 1♂2♀♀ (RBINS/); 13146, 27/02/2009-05/03/2009, Bosque Nublado, 3000m, sample code EC/2009-37/MP&ADB-002, 3♂♂, 7♀♀ (DZUP); 13147, 27/02/2009-05/03/2009, sample code EC/2009-37/MP&ADB-003, 2♀♀ (UTPL), 2♀♀ (RBINS); 13104, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-001, 4♀♀ (MNRJ); 13149, 27/02/2009-05/03/2009 (WPT), sample code EC/2009-37/MP&ADB-005, 2♂♂ (MNRJ); 13156, 27/02/2009-05/03/2009, sample code EC/2009-37/MP&ADB-012, 3♂♂ (MNRJ), 1♀ (RBINS); 13064, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-002, 4♂♂, 8♀♀ (MNRJ). Zamora Chinchipe: 13050, San Francisco, Reserva Biológica San Francisco, trail Rio San Francisco, 2000m, 03°58'30"S 79°04'25"W, 13-18/02/2009 (YPT). leg. M. Pollet & A. De Braekeleer, sorted by Marc Pollet – sample code EC/2009-30/MP&AD, 1♀ (RBINS); same label, except: 13102, trail Canal, 17-25/02/2009, EC/2009-33/MP&ADB-015, 1♂ (RBINS); 13098, trail Canal, 18-25/02/2009 (BPT), EC/2009-33/MP&ADB-011, 3♀♀ (MNRJ); 13055, trail Canal, 2000m, 13/02/2009-18/02/2009 (WPT), EC/2009-30/MP&ADB-07, 1♀ (UTPL); 13062, trail Atajo, 14/02/2009-18/02/2009 (YPT), EC/2009-30/MP&ADB-014, 1♀ (DZUP); 13132, trail Canal, 25/02/2009-03/03/2009 (YPT), EC/2009, 1♂ (DZUP).

Etymology: The specific name is derived from the Latin words *longi*, meaning long, and *ala*, meaning wing, and refers to the long length of the wing.

Neodexiopsis nigrocalyptrata new species

urn:lsid:zoobank.org:act:73DDC2D4-9DED-4B41-8779-89E29508C1C2 (Figs 3A–F, 6C)

Diagnosis: The species is morphologically close to *N. nigerrima* (Malloch, 1934), which occurs in Chile and Argentina but lacks the anteroventral seta on the hind tibia, and the calypteres in females are

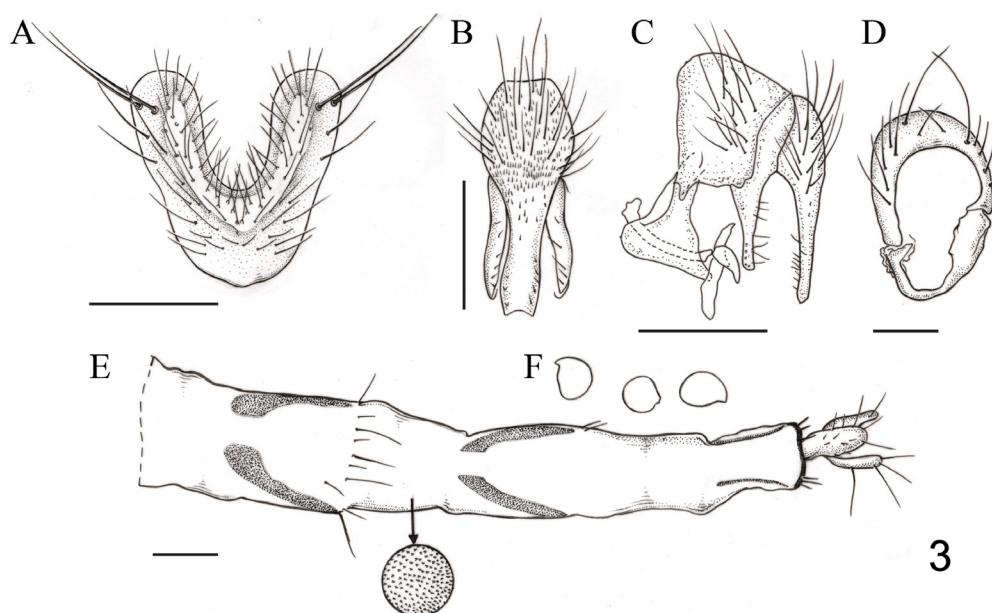


Figure 3 *Neodexiopsis nigrocalyptata* new species: A. Sternite 5, dorsal view; B. Cercal plate and surstylus, dorsal view; C. Cercal plate and surstylus and phallic complex, lateral view; D. Sternite 7 and syntergosternite 7 + 8, dorsal view; E. Ovipositor, dorsal view; F. Spermatheca. Scale: 0.1 mm.

dark brown. Both characters easily distinguished this species from other *Neodexiopsis* species recorded in Ecuador.

Description: Male. Length: body: 3.8 mm; wing: 4.2 mm.

Color: General color black, sometimes shining under certain lights. Parafacial, fronto-orbital plate, gena, face, and frons black. Antenna, arista, and palpus dark brown. Calypteres dark brown with darker margins; halter black. Wing smoky and darker on the longitudinal upper third. Mesonotum, pleurae, and legs are dark brown. Abdomen dark brown without clouds.

Head: Eyes bare; inner and outer vertical setae long. Frontal row with four pairs of long setae, second shorter, upper backward directed. Ocellar setae long, forward-directed, and divergent from one another. Postpedicel about 2.5–2.8 times the length of the pedicel. Arista larger on the basal fourth and very short pubescent stage.

Thorax: Acrostichal hairs distinct, more or less in two rows, pair pre-scutellar developed. Presuturals one; supra-alar one; post supra-alar one. Scutellum with two long pairs of setae, the apical one slightly longer than the basal one. Anepisternum with ground setulae and five long setae, inferior one longer. Katepisternum with three short discal cilia and three usual setae of 1 + 1 + 1. Fore femur with an anterodorsal and anteroventral complete row of setae; posterior surface with few setae. Fore tibia on the posterior surface with one long median seta; dorsal and ventral surfaces with long seta on the apical third; posterior surface with one preapical seta, ventral surface with one apical seta. Mid femur with one anterior supramedian seta; posterior surface with two preapical setae. Mid tibia with one median anterodorsal and one posteroventral setae, one dorsal preapical and one ventral and one dorsal apical. Hind femur with anterodorsal and anteroventral complete rows of spaced setae. Hind tibia with one anterodorsal supramedian seta, one dorsal preapical, one ventral and one dorsal apical.

Abdomen: Tergites 1 + 2 – 4 with two lateral pairs of setae; tergite 5 with a series of setae on disc and apex. Sternite 5 (Fig. 3A) trapezoid with many setae on all surfaces. Sternite 7 and syntergosternite 7 + 8 as in Fig. 3D.

Terminalia: Cercus is longer than wide, longer than surstylus (Fig. 3C–D). Surstylus long (Fig. 3C–D). Hypandrium tubular and long;

phallapodeme with the same diameter in all extensions (Fig. 3C). Pregonites are longer than postgonites (Fig. 3C).

Female: Similar to male, except head with a frontal row with six pairs of setae, the first and the fifth as long as ocellar seta, remaining shorter than half-length of the long ones. Ovipositor long; tergites narrow, epiproct and cerci long, with long seta on external margins; three spermathecae rounded (Figs 3E–F).

Material examined: Holotype male: ECUADOR: 13107. (EC) Loja: Cajanuma Podocarpus National Park, trail Bosque Nublado, 3000m, 16/02/2009–20/02/2009 (YPT). Leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-31/MP&ADB-002 (UTPL).

Paratypes: Same label as holotype: 13107, Trail Los Miradores, 3000m, 20/02/2009–27/02/2009 (YPT). sample code EC/2009-34/MP&ADB-004, 5♀♀ (MNRJ); 13105, trail Bosque Nublado, sample code EC/2009-34/MP&ADB-002, 13♀♀ (UTPL), 12♀♀ (RBINS), 7♀♀ (DZUP); 13063, trail Bosque Nublado, sample code EC/2009-31/MP&ADB-001, 3♀♀ (UTPL); 13113, sample code EC/2009-34/MP&AD5-010, 2♀ (RBINS); 13115, trail Oso de anteojos, sample code EC/2009-34/MP&ADB-012, 7♀♀ (RBINS); 13154, sample code EC/2009-37/MP&ADB-010, 6♀♀ (UTPL); 13155, trail Oso de anteojos, sample code EC/2009-37/MP&ADB-011, 4♀ (UTPL); 13109, sample code EC/2009-34/MP&ADB-006, 3♀♀ (UTPL), 4♀♀ (RBINS); 13064, 16/02/2009–20/02/2009, sample code EC/2009-31/MP&ADB-002, 24♀♀ (MNRJ); 13145, trail Bosque Nublado, sample code EC/2009-37/MP&ADB-001, 8♀♀ (DZUP); 13153, sample code EC/2009-37/MP&ADB-009, 2♀♀ (DZUP); 13170, trail Bosque Nublado, sample code EC/2009-37/MP&ADB-013, 1♀ (UTPL), 2♀♀ (RBINS); 13155, trail Oso de anteojos, sample code EC/2009-37/MP&ADB-011, 3♀♀ (RBINS); 13074, trail Oso de anteojos, 16/02/2009–20/02/2009, sample code EC/2009-31/MP&ADB-012, 2♀♀ (DZUP); 13106, trail Los Miradores, 20/02/2009–27/02/2009, sample code EC/2009-34/MP&ADB-003, 4♀♀ (UTPL), 3♀♀ (RBINS); 13146, trail Bosque Nublado, 27/02/2009–05/03/2009, sample code EC/2009-37/MP&ADB-002, 7♀♀ (UTL), 4♀♀ (RBINS); 13104, trail Bosque Nublado, 20/02/2009–27/02/2009, sample code EC/2009-34/MP&ADB-001, 6♀♀ (UTPL), 5♀♀ (RBINS); 13065, trail Los Miradores, 16/02/2009–20/02/2009, sample code EC/2009-31/MP&ADB-003, 3♀♀ (MNRJ); 13066, trail

Los Miradores, 16/02/2009-20/02/2009, sample code EC/2009-31/MP&ADB-004, 1♀♀ (RBINS), 9♀♀ (MNRJ); 13106, trail Los Miradores, 20/02/2009-27/02/2009, sample code EC/2009-34/MP&ADB-003, 4♀♀ (RBINS); 13108, trail Los Miradores, (WPT), sample code EC/2009-34/MP&ADB-005, 8♀♀ (DZUP); 13147, trail Los Miradores, 27/02/2009-05/03/2009, sample code EC/2009-37/MP&ADB-003, 2♀♀ (UTPL), 2♀♀ (RBINS). Zamora Chinchipe: 13102, San Francisco, Reserva Biológica San Francisco, trail Canal, 2000m, 03°58'30"S 79°04'25"W, 17-25/02/2009 (YPT), leg. M. Pollet & A. De Braekeleer, sorted by M. Pollet, sample code EC/2009-33/MP&ADB-015, 1♀ (UTPL); same label as holotype, except 13144, sample code EC/2009-36/MP&ADB-016, 1♀ (DZUP); 13068, trail Los Miradores, 16/02/2009-20/02/2009 (WPT), sample code EC/2009-31/MP&ADB-006, 6♀♀ (DZUP); 13051, sample code EC/2009-30/MP&ADB-003, 1♀ (DZUP); 13050, trail Rio San Francisco, sample code EC/2009-30/MP&ADB, 1♀ (UTPL); 13156, 27/02/2009-05/03/2009, sample code EC/2009-37/MP&ADB-012, 6♀♀ (DZUP).

Etymology: The specific name is derived from the Latin word *nigreos*, meaning black, and refers to the dark color of the lower calypter.

Neodexiopsis plana new species

urn:lsid:zoobank.org:act:903A99A3-F4FC-48C1-926C-F9ADDE3460EC (Figs 4A–G, 6D)

Diagnosis: The female abdomen of *Neodexiopsis plana* new species is dorsoventrally flattened, an unusual characteristic in other species of the genus.

Description: Male. Length: body: 3.5 mm; wing: 3.7 mm.

Color: General brown, with grey pollinosity. Frons brown with gray pollinosity around the ocellar triangle and along the middle line of the eyes. Face, parafacial, fronto-orbital plate, and gena gray pollinose. Antennae and arista dark brown. Palpus brown. Calypters uniformly whitish; halter yellow. Wing smoky. Mesonotum brown, postpronotum, and pleurae gray pollinose. Coxae grey pollinose; trochanter yellow; fore femur brown with extreme apex yellow, mid and hind femora with basal half or third yellow; tibiae yellowish brown and tarsi brown. Abdomen brown, a little shiny in males, and with grey pollinosity laterally in females.

Head: Eyes bare; inner and outer vertical setae long. Frontal row with four pairs of setae, third row long, upper backward directed. Ocellar setae fine, long, forward-directed, and divergent from one another. Lunule slightly projected in males. Antennae inserted slightly above mid-level eyes. Postpedicel approximately 3.8 times the length of the pedicel in males. Arista, very short pubescent. Vibrissa long.

Thorax: Acrostichal hairs very fine, pair pre-scutellar not developed. Presuturals one; supra-alar one; post supra-alar one. Scutellum with a very long pair of basal setae and a very short and fine apical one. Anepisternum with ground setulae and four long setae, inferior one longer. Fore femur with anterodorsal and anteroventral complete rows of setae. Fore tibia on posterior surface with a long median seta; dorsal and ventral surfaces with an apical seta. Mid femur with 1–2 anterior setae; ventral surface with about six fine-spaced setae; posterior surface with two preapical setae. Mid tibia with one median anterodorsal and one median posterodorsal setae; one dorsal preapical, one ventral and

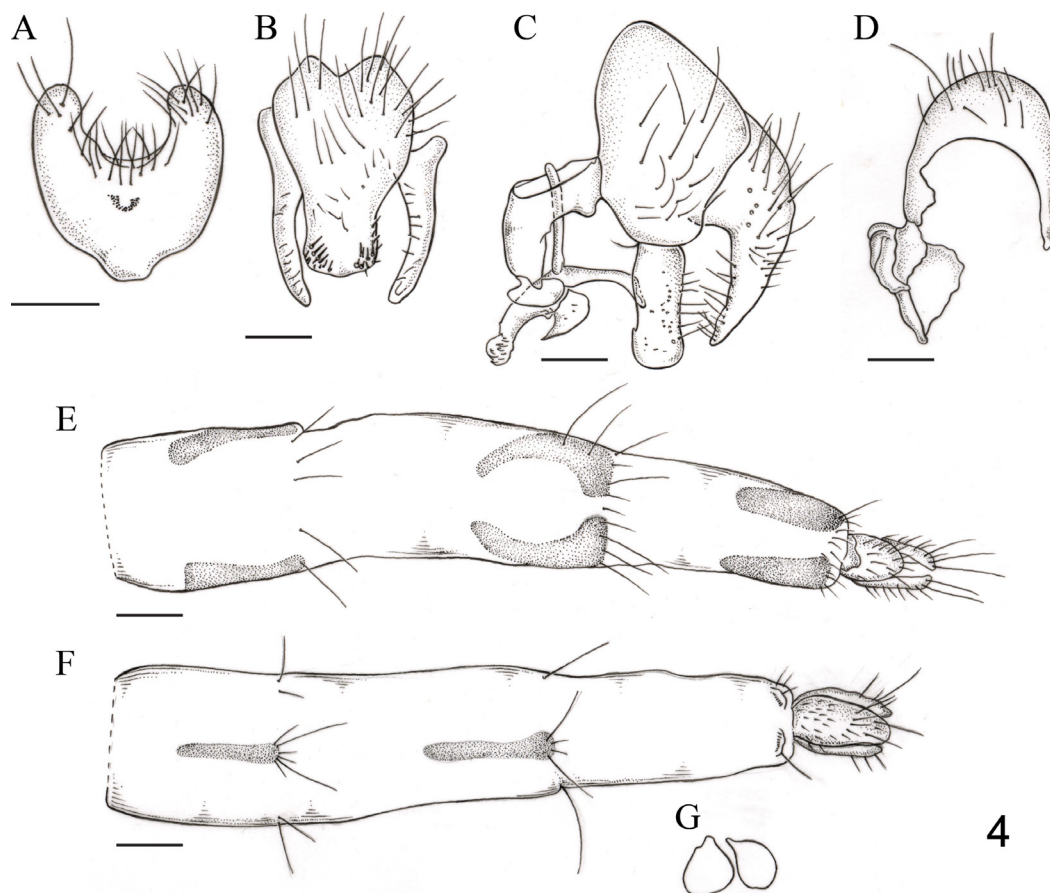


Figure 4 *Neodexiopsis plana* new species: A. Sternite 5, dorsal view; B. Cercal plate and surstylus, dorsal view; C. Cercal plate and surstylus and phallic complex, lateral view; D. Sternite 7 and syntergosternite 7 + 8, dorsal view; E. Ovipositor, dorsal view; F. Ovipositor, ventral view; G. Spermathecae. Scale: 0.1 mm.

one dorsal apical. Hind femur with about 5–6 anterodorsal spaced setae and two anteroventrals on apical third. Hind tibia with one anterodorsal and one posterodorsal median seta, long dorsal on apical third, one dorsal preapical and one ventral apical. Wing long.

Abdomen: Tergites 1 + 2 – 4 with one lateral pair of setae; tergite 5 with a series of setae on disc and apex. Sternite 5 (Fig. 4A) trapezoid with many apical setae. Sternite 7 and syntergosternite 7 + 8, as in Fig. 4D.

Terminalia: Cercus is longer than wide and not extending beyond the surstylus apex (Figs 4B–C). Surstylus long and enlarged (Figs 4B–C). Hypandrium tubular and long; phallopodeme with the same diameter in all extensions (Fig. 4C). Pregonite and postgonite of similar length (Fig. 4C).

Female: Similar to male, except for the postpedicel shorter, approximately 3.0 times the length of the pedicel, median posterodorsal seta absent on hind tibia. Ovipositor long with tergites narrow, epiproct and cerci long, with long seta on external margins (Fig. 4E); sternites narrow and two spermathecae rounded (Figs 4F–G).

Material examined: Holotype male: ECUADOR: 13074. (EC) Loja: Cajanuma, Podocarpus National Park, trail Oso de anteojos, 3000m, 16/02/2009–20/02/2009 (YPT), leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-31/MP&ADB-012 (UTPL).

Paratypes: Same label as holotype, sample code EC/2009-34/MP&ADB-012, 2♀ (UTPL), 2♂♂ (MNRJ), 2♀ (DZUP); 13106, Trail Los Miradores, EC/2009-34/MP&ADB-003, 1♀ (UTPL), 1♀ (RBINS), 1♀ (DZUP); 13065, Trail Los Miradores, 16/02/2009–20/02/2009, EC/2009-31/MP&ADB-00, 1♀ (UTPL); 13147, Trail Los Miradores, 27/02/2009–05/03/2009, EC/2009-37/MP&ADB-003, 2♀ (DZUP); 13170, Trail Bosque Nublado, 16/02/2009–05/03/2009, EC/2009-37/MP&ADB-013, 1♀ (RBINS), 2♀ (MNRJ).

Etymology: The specific name is derived from the Latin word *plana* and refers to the flat dorsal aspect of the abdomen.

Neodexiopsis secunda new species

urn:lsid:zoobank.org:act:31C145EC-3A8B-4874-A82C-3467AF54DBA5 (Figs 5A–E, 6E)

Diagnosis: The new species belongs to the *ovata* group. In Snyder's (1958) key to this group, this species approaches *N. willistoni* because of the length of the apical scutellar setae but differs in many other characters. The species is easily distinguished from the other *Neodexiopsis* recorded in Ecuador by a long median seta on the posterior surface of the hind tibia. This species is known only by its holotype.

Description: Male. Length: body: 3.2 mm; wing: 3.4 mm.

Color: General brown, with grey pollinosity. Frons brown and light brown along the midline. Face, parafacial, fronto-orbital plate, and gena gray pollinose. Antenna and arista dark brown, the apex of the pedicel lighter with gray pollinosity. Palpus yellowish on basal two-thirds and brown on apical third. Calypteres uniformly whitish; halter yellow. Wing clear. Mesonotum brown-grey pollinose with five faint stripes. Legs yellow, the apex of femora brown on dorsal surface; tarsi brown. Abdomen brown, lateral areas of tergites 1 + 2 and 3 yellow; terminalia yellow.

Head: Eyes bare; inner vertical setae longer than outer setae. Frontal row with four pairs of setae, third row long, upper backward directed. Ocellar setae fine. Antennae inserted slightly above mid-level eyes. Postpedicel about 2.8 times the length of the pedicel. Arista, very short pubescent.

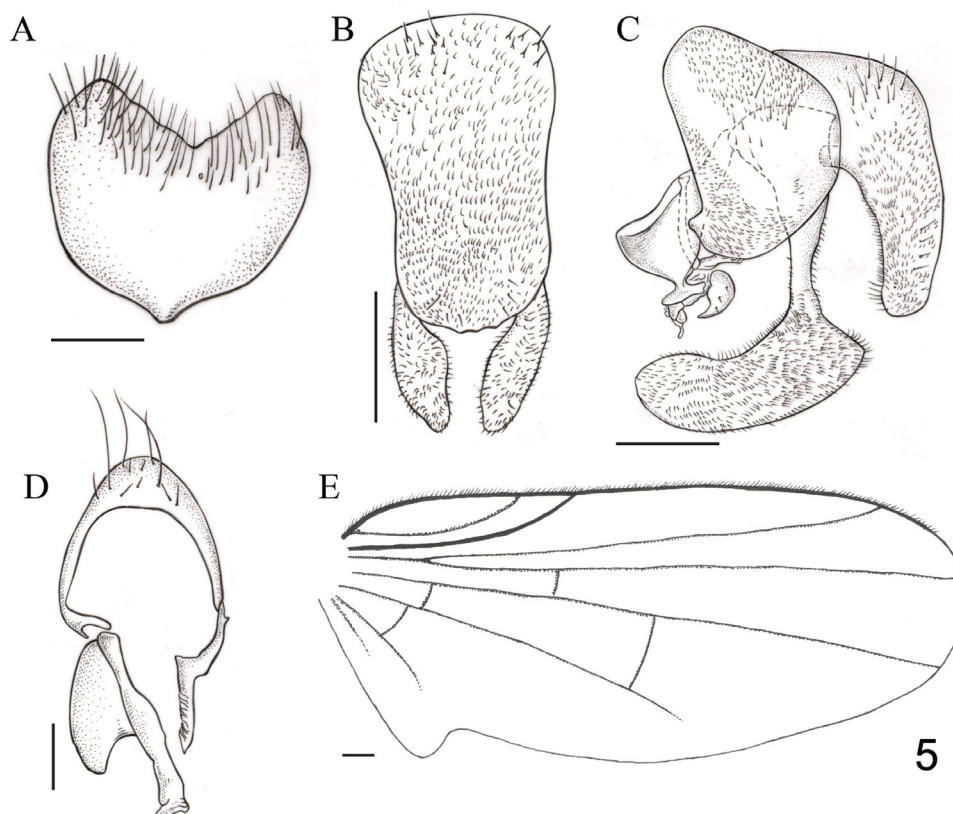


Figure 5 *Neodexiopsis secunda* new species: A. Sternite 5, dorsal view; B. Cercal plate and surstylus, dorsal view; C. Cercal plate and surstylus and phallic complex, lateral view; D. Sternite 7 and syntergosternite 7 + 8, dorsal view; E. Wing. Scale: 0.1 mm.

Thorax: Acrostichals very fine. Presutural one; supra-alar one; post supra-alar one. Scutellum with a very long pair of basal setae and a very short and fine apical one. Anepisternum with ground setulae and four long setae, inferior one longer. The two posterior katepisternals very long. Lower calypter long, about 2.8 times the length of the superior and broad. Fore femur with anterodorsal and anteroventral complete rows of spaced setae. Fore tibia on the posterior surface with a long median seta; one short preapical dorsal and posterodorsal; ventral surface with an apical seta. Mid femur with one fine anterior setae on apical fourth; ventral surface with three fine-spaced setae; posterior surface with two preapical setae. Mid tibia with one median anterodorsal submedian and one median posterodorsal setae, one anterior and one ventral apical setae, the last one very strong. Hind femur with about five anterodorsal spaced setae and two anteroventral on apical third. Hind tibia with one anterodorsal and one posterodorsal median seta, long dorsal on apical third, dorsal preapical, and ventral apical. Wing with the basal lobe (Fig. 5E).

Abdomen: Tergites 1 + 2 – 4 with one lateral pair of setae; tergite 5 with a series of setae on disc and apex. Sternite 5 (Fig. 5A) rounded with many apical setae. Sternite 7 and syntergosternite 7 + 8, as in Fig. 5D.

Terminalia: Cercus is longer than wide, shorter than the length of the surstylus (Figs 5B–C). Surstylus long and very enlarged apically (Figs 5B–C). Hypandrium tubular and long; phallapodeme with the

same diameter in all extensions (Fig. 5C). Pregonite and postgonite of similar lengths (Fig. 5C).

Female: unknown.

Material examined: Holotype male: ECUADOR: 13147. (EC) Loja: Cajanuma Podocarpus National Park, Trail Los Miradores, 3000m, 20/02/2009–05/03/2009 (YPT). Leg. Marc Pollet & Anja De Braekeleer, sorted by Marc Pollet – sample code EC/2009-34/MP&ADB-003 (UTPL).

Etymology: The name refers to the second species of the *ovata* group recorded in Ecuador.

Geographical distribution

Neodexiopsis species occurring in the Ecuadorian highland sites are mostly endemic, as only *N. latifrons* and *N. equator* occur in other regions (Fig. 7). In the same sites as the new species described here, many other endemic Muscidae species are present, some of them occurring also up to 3000 meters (Fogaça and de Carvalho, 2015; de Carvalho et al., 2019). We updated the distribution of *N. devia*, the records from Trinidad and Tobago and the United States of America presented by Löwenberg-Neto & de Carvalho (2013) are mistaken. Based on this, we updated the distribution of *N. devia* as being endemic to Isla de San Cristóbal and Isla Santiago (Galapagos Islands), as previously presented by Curran (1934).

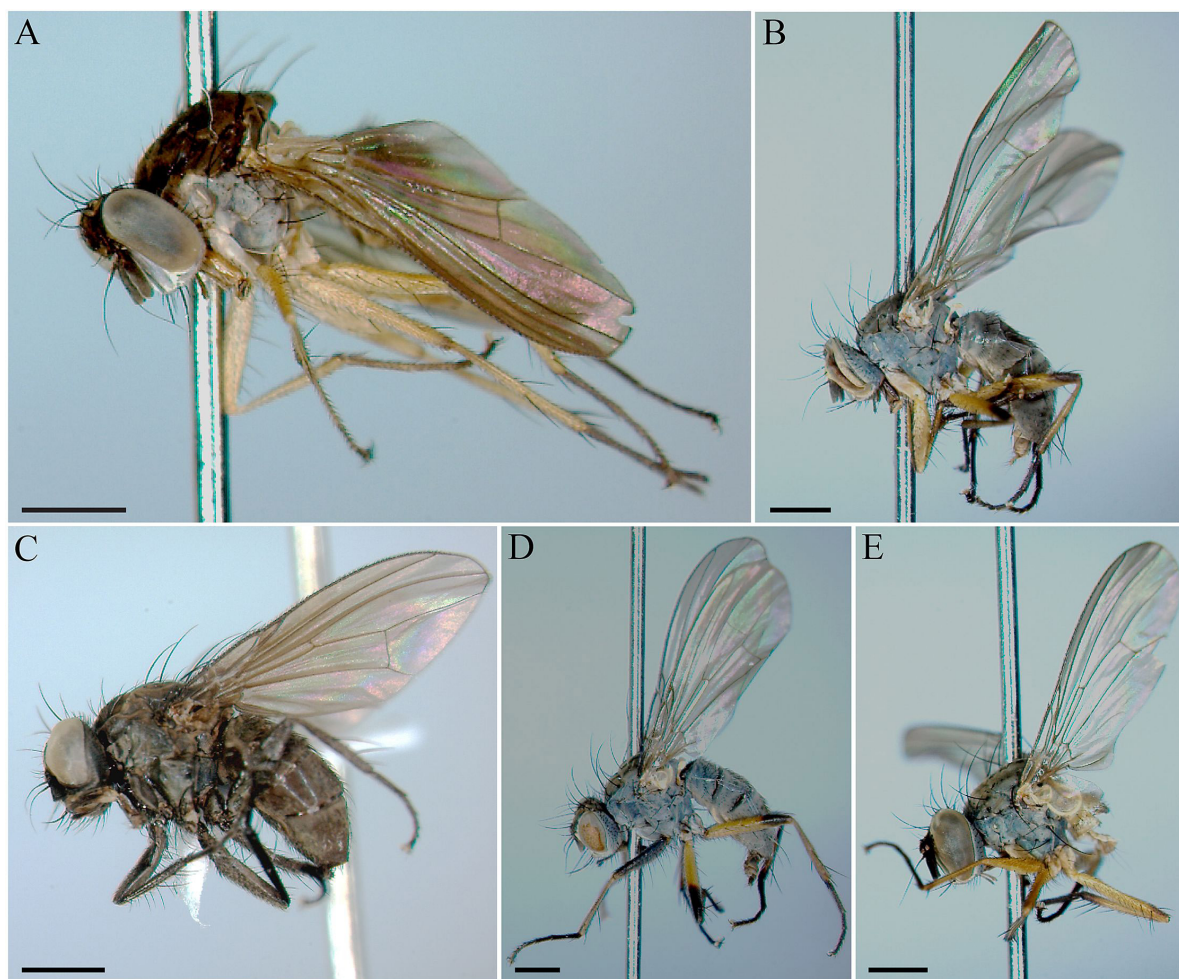


Figure 6 *Neodexiopsis*, habitus lateral view: A. *N. bicoloratta* new species, male paratype; B. *N. longialata* new species, female paratype; C. *N. nigrocalyptrata* new species, female paratype; D. *N. plana* new species, female paratype; E. *N. secunda* new species, male holotype. Scale: 1.0 mm.

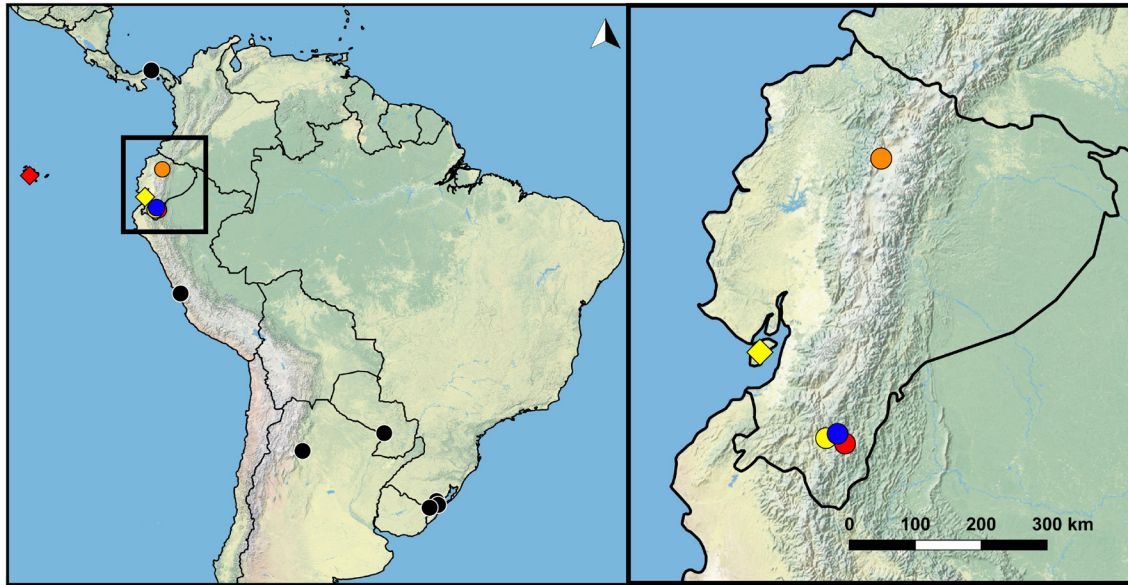


Figure 7 Geographical distribution of *Neodexiopsis* species in Ecuador. *N. bicoloratta* new species (red circle); *N. devia* (red diamond); *N. latifrons* (yellow diamond); *N. rufitibia* (black circle). Orange circle= *N. equator* and *N. rufitibia*. Blue circle= *N. longialata* new species and *N. nigrocalyprata* new species. Yellow circle= *N. longialata* new species, *N. nigrocalyprata* new species, *N. plana* new species, *N. secunda* new species.

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Conflicts of interest

The authors declare no conflicts of interest.

Author contribution statement

MSC and CJBdeC designed the study. MSC described the new species. LRP and CJBdeC revised the descriptions of the new species. LRP made the map. All authors contributed equally to the revision of the manuscript and approved the final version.

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