

Systematics, Morphology and Biogeography

## Redescription and first record in South America of *Neogriphoneura timida* Curran (Diptera, Lauxaniidae)



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### ABSTRACT

The genus *Neogriphoneura* Malloch, 1924 is currently composed of 11 species with New World distribution. *Neogriphoneura timida* Curran, 1942 is recorded for the first time in South America, with occurrences in Brazil, Colombia and Trinidad and Tobago; and new Central American records are presented: Belize, Honduras and Mexico. Here we redescribe the species and present, for the first time, illustrations of the male terminalia and female spermathecae, and discuss the main diagnostic characteristics of external morphology. A brief discussion about the postcopulatory sexual selection in this species is proposed based on morphology of the spermathecae.

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### Introduction

Lauxaniidae is a large family of Schizophora flies comprised of over 2000 species in about 200 genera worldwide. In the Neotropical Region is composed by nearly 400 species in about 70 genera (Gaimari and Silva, 2010).

The genus *Neogriphoneura* was erected by Malloch (in Malloch and McAtee, 1924) to include the species *Sapromyza sordida* Wiedemann, 1830, originally recorded from West Indies. The genus *Rhabdolauxania* was described by Hendel (1925) for his two new species *R. laevifrons* from Peru, and *R. schnusei* (the type species) from Bolivia and Peru. *Neogriphoneura striatifrons* was later described by Hendel (1932) based on material from Bolivia. In a subsequent publication, Hendel (1933) described *Rhabdolauxania immaculata* from Paraguay. *Neogriphoneura timida* was described by Curran (1942) based on four males and six females from Panama; in addition describing two other new species: *N. striga* and *N. tertia* both based on material from Panama and Brazil.

After 66 years without any additional species or taxonomic modification, Mello and Silva (2008a) presented a taxonomic review of *Neogriphoneura*. In this review, they described the species *N. bispoi* from Brazil, *N. corrugata* from the British Virgin Islands, and

*N. pacata* from Bolivia; the genus *Rhabdolauxania* was synonymized under *Neogriphoneura*, and its three species were combined into *Neogriphoneura*; lectotypes for *R. immaculata* and *R. laevifrons* were designated; an identification key to the species was presented; and new occurrence records were registered for the following species: *N. sordida*, *N. striatifrons*, *N. striga*, *N. tertia*, and *N. timida*. According with this information, *Neogriphoneura* is comprised of the following 11 species: *N. bispoi*, *N. corrugata*, *N. immaculata*, *N. laevifrons*, *N. pacata*, *N. schnusei*, *N. sordida*, *N. striatifrons*, *N. striga*, *N. tertia*, and *N. timida*.

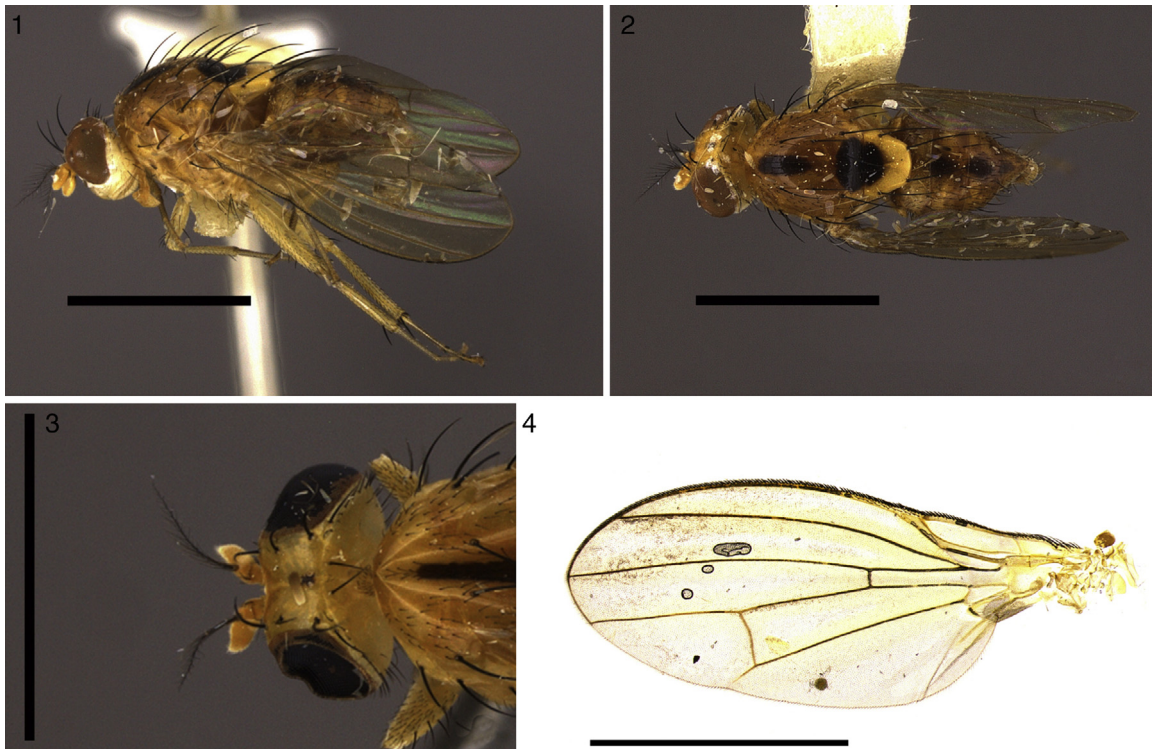
In this study, *N. timida* is redescribed, with photographs of external morphology, and illustrations of male terminalia, and female spermathecae; new records are added to its distribution, including the first record for the species in South America, in addition to new records within Central America and Mexico. The differentiated morphology of the spermathecae of this species, shared with two other congeners, *N. bispoi* and *N. corrugata*, is briefly discussed in the light of a possible correlated evolution with some male traits.

### Material and methods

The material analyzed in this study belongs to the following collections: American Museum of Natural History (AMNH), New York, USA; Coleção Zoológica da Universidade Federal de Mato Grosso do Sul (ZUFMS), Campo Grande, Brazil; Coleção Zoológica do Maranhão, Universidade Estadual do Maranhão (CZMA), Caxias,

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**Figs. 1–4.** *Neogriphoneura timida* Curran. (1) Habitus, lateral view (female); (2) habitus, dorsal view (female); (3) head, dorsal view (male); (4) wing (female). Scale: 2 mm.

Brazil; Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH), Bogotá, Colombia; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil; National Museum of Natural History (USNM), Washington, DC, USA; The Natural History Museum (BMNH), London, England.

The morphological terminology followed Cumming and Wood (2009). The dissection of the male terminalia follows the procedures presented in Mello and Silva (2008b).

### Taxonomy

*Neogriphoneura timida* Curran (Figs. 1–9)

*Neogriphoneura timida* Curran, 1942: 75. Type locality: Panama, Patilla Point. Holotype male, AMNH.

**Diagnosis:** This species can be separated from its congeners by the following combination of characters: frons unmarked; mesonotum with a central dark stripe anteriorly, and an oval spot on posterior margin extending onto scutellum; wing unspotted.

### Redescription

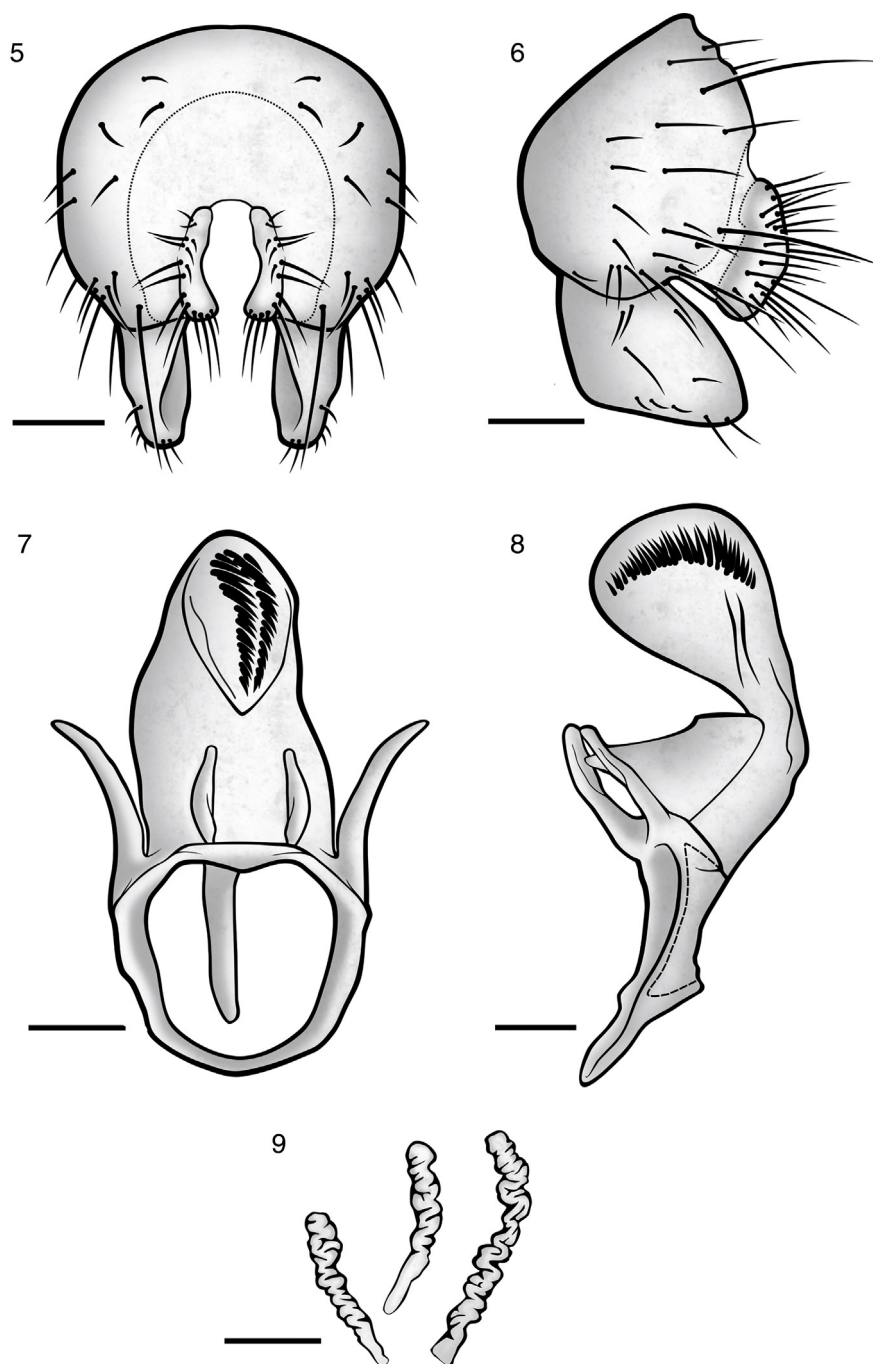
**Body** (Figs. 1 and 2): Yellow to yellowish brown or orange; length: 4–4.5 mm; wing: 3.2 mm.

**Head** (Figs. 1–3): Vertex rounded; ocellar tubercle brown, close to vertex, well developed; frons yellow, without dark markings, rectangular, wider than long, concave on middle part of anterior half; eye suboval, higher than long, posteroventral margin concave; face yellowish to light brown, unmarked, lower half slightly convex in profile; parafacial pale, whitish yellow; gena yellow; occiput and median occipital sclerite yellowish, unmarked; antenna yellow to yellowish brown, scape shorter than pedicel, first flagellomere two times longer than wide, arista about 2.5 times longer than the length of the antennal articles, black and plumose; palpus and labellum yellow to yellowish brown. Chaetotaxy: outer vertical

seta laterocline, 1/3 length of inner vertical seta; inner vertical seta reclinate, postocellar seta convergent; ocellar seta diminutive; anterior orbital seta inclinate, slightly longer than reclinate posterior seta.

**Thorax** (Fig. 2): Mesonotum yellowish brown to orange, with a black stripe anteromedially and a rounded spot on posterior part, extending onto scutellum; scutellum flat, otherwise yellow; pleura yellowish. Chaetotaxy: 1 postpronotal seta; 0 + 3 dorsocentral setae; 1 prescutellar acrostichal seta; 1 presutural supra-alar seta; 1 postsutural supra-alar seta; 2 notopleural setae; postalar seta absent; 1 intra-alar seta; 1 proepisternal seta; 1 anepisternal seta; 1 katepisternal seta; 2 scutellar setae divergent. Legs: whitish yellow, tarsi yellow. Chaetotaxy: fore coxa with a transversal row of anterodorsal setae; fore femur with a longitudinal row of posterodorsal setae, a longitudinal row of 3 apical setae on ventral surface, and 2 apical setae on posterior surface; fore tibia with 1 preapical dorsal seta; mid coxa with a transversal row of setae on dorsal surface; mid femur with a longitudinal row of anterodorsal setae and 1 apical seta on posterior surface; mid tibia with 1 preapical dorsal seta and 1 strong tibial spur; hind femur with 2 longitudinal setae on apical margin of dorsal surface; hind tibia with 1 apical seta on dorsal surface. Wing (Fig. 4): hyaline; veins yellow; costa sapromyziform; R bare; r-m slightly basal to mid-point of discal medial cell; crossvein dm-cu at the midpoint of cell  $r_{4+5}$ . Halter yellowish brown to orange.

**Abdomen** (Fig. 2): Yellowish brown, some specimens with one oval dark spot medially on each of tergites 3–5. Male terminalia: Epandrial complex (Figs. 5 and 6): epandrium saddle-shape in posterior view (Fig. 5), lower and upper margins oval and straight respectively, in lateral view (Fig. 6), covered by large and medial setae; surstylus articulated to epandrium, conical in posterior view (Fig. 5), trapezoidal on lateral view (Fig. 6), lower margin covered by thin hairs in lateral view. Phallic complex (Figs. 7 and 8): phallapodeme tubular, well developed (Fig. 7); phallus cylindrical, folded in the middle, with sclerotized spines internally on apical region (Figs. 7 and 8); hypandrial arms developed, almost three



**Figs. 5–9.** *Neogriphoneura timida* Curran. (5) Epandrial complex, posterior view; (6) epandrial complex, lateral view; (7) aedeagal complex, dorsal view; (8) aedeagal complex, lateral view; (9) spermathecae. Scale: 1 mm.

times the length of postgonite (Fig. 7); hypandrium forming a complete ring (Fig. 7); postgonite present (Fig. 7). Female terminalia: Spermathecae (Fig. 9): three (1 + 2), wrinkled and tubular.

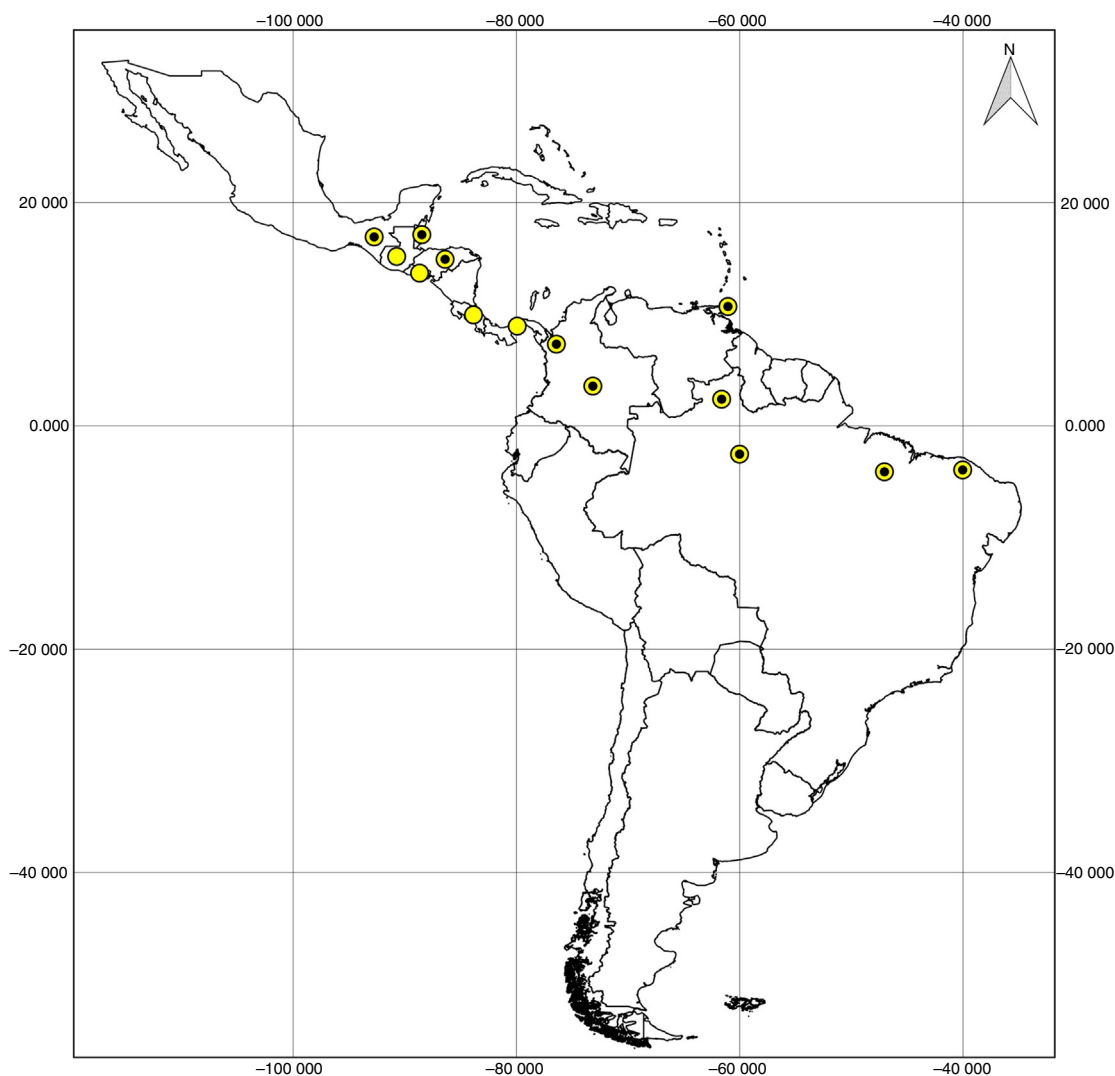
Distribution: Mexico, Guatemala, Belize, Honduras, El Salvador, Costa Rica, Panama, Trinidad and Tobago, Colombia, and Brazil (Fig. 10).

Type-material examined: Holotype male: PANAMA, Patilla Point, Canal Zone; 1/ii/1929; Coll. C. Curran (AMNH). Paratype female: idem (AMNH).

Additional material examined: MEXICO, Chiapas, Huixtla; 26/vii/1967; H. Sanches leg.; 1 male (USNM). GUATEMALA, Quirigua; 1926; M. Aldrich leg.; 1 male (USNM). BELIZE, Cayo District, Pook's Hill Lodge (17°09'15" N; 88° 51'08" W); 2008; Malaise

trap; leg. V. & R. Snaddon; 2 males and 1 female (BMNH); idem, 22.vi.2008; Malaise trap; leg. V. & R. Snaddon; 2 males and 1 female (BMNH). HONDURAS, La Ceiba, F. Deyer leg.; 1 female (USNM). Tegucigalpa; F. Deyer leg.; 1 male (USNM). PANAMA, Panama City, Canal Zone, Monsoon Forest; 15–30/vii/1979; E. Broadhead leg.; 1 male (USNM). TRINIDAD AND TOBAGO, Tobago Island, Saint John, Charlotteville; 14–21/iii/1979; D. Hardy & W. Rowe legs.; 1 female (USNM). COLOMBIA, Chocó, Riosucio, Parque Nacional Natural los Katíos, Centro Administrativo Sautatá, Afuera del Bosque (7°51'N; 77°8'W); 13–29/vi/2003; P. Lopes leg.; 2 males (IAvH). Meta, Parque Nacional Natural de La Macarena, Cabaña Cerrillo (3°21'N; 73°56'W); 21/xii/2002–04/i/2003; A. Herrera & W. Villalba leg.; 1 female (IAvH). BRAZIL, Roraima, Rio Uraricoera, Ilha de Maracá;





**Fig. 10.** Distributional map of *Neogriphoneura timida* Curran. Yellow circles correspond to previously known records; black circles with yellow rim correspond to the new records.

02–13/v/1987; J. Rafael, J. Brasil & L. Aquino leg.; 5 males and 12 females (INPA). Idem; 1 male and 1 female (ZUFMS). Amazonas, Manaus, INPA (3°5'45" S; 59°59'21" W); 21/viii/2014; T. Mahlmann leg.; 1 female (ZUFMS). Maranhão, Bom Jardim, REBIO [Reserva Biológica] do Gurupi (3°56'49.23" S; 46°49'23.02" W); Armadilha McPhail, 17–27/i/2010, F. Limeira-de-Oliveira, J. T. Câmara & M. B. Aguiar Neto, cols.; 2 males and 8 females (CZMA). Ceará, Ubajara, Parque Nacional de Ubajara, Cachoeira do Cafundó (3°50'13" S; 40°54'35" W); Armadilha Malaise; 18–30/xi/2012; F. Limeira-de-Oliveira, J. S. Pinto Junior cols.; 1 female (CZMA).

## Discussion

*Neogriphoneura timida* is similar to its congener *N. pacata* Mello and Silva, 2008a. *Neogriphoneura pacata* has the same pattern of marks on the mesonotum, but differs from *N. timida* by the presence of a large, longitudinal dark stripe through the frons. The three wrinkled and tubular spermathecae found in *N. timida* corresponds in number and shape with its congeners *N. bispoi* and *N. corrugata*. According to Mello and Silva (2008a) this character state is like a synapomorphy supporting a clade within the genus, as other *Neogriphoneura* species present differences in number and shape of spermathecae (Mello and Silva, unpublished data). The species

which spermathecae were not observed are: *N. immaculata*, *N. laevifrons*, *N. pacata*, *N. schnusei*, *N. sordida* and *N. striatifrons*.

The differences in the morphology of the spermathecae observed in *N. bispoi*, *N. corrugata* and *N. timida* seem to suggest a connection with a longer length of their sperm, indicating that sperm competition (spermatozoa of successive matings may compete for fertilization, according to Parker, 1970) or cryptic female choice (the sperm be differentially used by the female, according to Eberhard, 1996) occur at the spermathecae; in this case, as indicated by Pitnick et al. (2009), would be preferred to refer to a mechanism of postcopulatory sexual selection.

According with Wilkinson and Johns (2005), male and female Diptera reproductive traits should exhibit correlated patterns of evolution with great diversification among species of flies considering sperm size, sperm number, and female storage organs. Future studies involving detailed ultra-structural observations on these three species comparative to other lauxaniids could help to solve this question.

*Neogriphoneura* has a New World distribution (Stuckenberg, 1971; Mello and Silva, 2008a). The occurrence of *N. timida* was first recognized as being throughout continental Central America in Guatemala, El Salvador, Costa Rica and Panama (Mello and Silva, 2008a; Gaimari and Silva, 2010). Herein, the species is additionally recorded for Mexico (Chiapas, considered part of Central America

per Brown, 2009), Belize, and Honduras. This is the first record of the species for South America, occurring in Brazil, Colombia and Trinidad and Tobago, based on the exam of material; additionally, there is a photo of this species in a site (Cresswell, 2010–2014) from Colombia, Department of Magdalena. The new records of the species, in the Northwest of South America, form a continuous distributional pattern into the Central and South Americas.

### Conflicts of interest

The authors declare no conflicts of interest.

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