

## The species of *Phora* (Diptera: Phoridae) of Costa Rica

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**Abstract:** The *Phora* of Costa Rica were reviewed and three species, all belonging to Schmitz's Group III, were recognized: *P. americana* Schmitz and Wirth, *P. truncata* new species and *P. paramericana* new species. Of the three species, *P. americana* is by far the most abundant, with the other two species being rarely collected. All specimens were collected in the central highlands of the country. The previous record of the Holarctic Region species *P. stictica* Meigen from Costa Rica was found to be based on a misidentification of *P. truncata*.

**Key words:** Taxonomy, Diptera, Phoridae, *Phora*.

The genus *Phora* is a large group of Phoridae that comprises 53 described species, almost all from the Holarctic Region. There are a few species known from tropical countries, mostly found in high elevation sites: for instance *P. congolensis* Beyer, 1965 from central Africa and *P. americana* Schmitz & Wirth, 1954 listed as occurring in Mexico, Colombia and Ecuador (Borgmeier 1968). The life history of *Phora* species is unknown, except for one Holarctic Region species found to be a predator of root aphids (Yarkulov 1972).

The *Phora* of Costa Rica have never been surveyed. The only record of the genus for the country was given by Borgmeier (1968) who listed the presence of *P. stictica* Meigen, 1830. This record is an error, however, and the fauna actually consists of the three species discussed below.

### MATERIAL

The material for this review consists of 136 male specimens. Females cannot be reliably identified to species at this time.

Terms and specimen treatment are the same as in my previous works (e.g. Brown 1997). Holotypes have catalog numbers from bar coded labels in square brackets.

Specimens are deposited in the following institutions, whose abbreviations are from Arnett *et al.* (1993):

- INBC Instituto Nacional de Biodiversidad, A.P. 22-3100, Santo Domingo, Heredia, Costa Rica (M.Zumbado).
- LACM Entomology Section, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, CA, 90007, U.S.A. (B.V.Brown).
- MUCR Museo de Insectos, Universidad de Costa Rica, San Pedro, San José, Costa Rica (P.S.Hanson).
- MZSP Museu de Zoologia, Universidade de São Paulo, Av. Nazaré 481, CP 7172, 01051 São Paulo, Brazil (F.C. do

Val).

USNM United States National Museum, Smithsonian Institution, Washington, DC, 20560, U.S.A. (on indefinite loan to B.V.Brown).

## SYSTEMATICS

### Genus *Phora*

*Phora* Latreille, 1796: 125. Type species: *Musca aterrima* Fabricius, 1794 [junior homonym, preoccupied by *M. aterrima* Villers, 1789, = *Trineura atra* Meigen, 1804] (subsequent monotypy, Latreille 1802).

*Trineura* Meigen, 1803: 276. Type species: *Musca aterrima* Fabricius, 1794. See note above for homonymy.

*Philodendria* Rondani, 1856: 137. Type species: *Nephritis aterrima* Fabricius = *Musca aterrima* Fabricius (see notes above).

Notes on classification. Brown (1992) placed *Phora* in a newly restricted subfamily Phorinae and later (Brown 1994) suggested that it was closely related to the Oriental Region genus *Postoptica* Disney.

There is no published information on relationships within *Phora*, but Schmitz (i.e. 1953, 1955) organized the genus into three groups of convenience: group I has the hind tibia with two-three anterobasal setae, group II has the hind tibia with one and the mid tibia with two anterobasal setae and group III with a single anterobasal seta on the mid and hind tibiae. All of the species treated herein would belong to Schmitz's group III, based on the presence of a single anterobasal seta on each of the mid and hind tibia.

The most recent keys for this genus are for the Palearctic Region (Schmitz 1953, 1955), Japan (Gotô 1986), North America (Borgmeier 1963) and England (Disney 1983). Since then, four further species have been described: *P. congolensis*, *P. greenwoodi* Disney, 1989, *P. michali* Disney, in Disney and Durska 1998, and *P. nartshukae* Zaitzev, 1977. All belong to

group III, except two species that cannot be ascribed to any of the groups: *P. congolensis* because the hind tibia was not properly described and *P. michali* Disney because the hind tibiae are missing from the only known specimen. All of these species differ from those treated herein by the structure of the male terminalia.

Two of the species treated herein, *P. americana* and *P. paramericana* new species, share the presence of a longitudinal, setose ridge on the lower lobe of the epandrium (Fig. 2). This character is also found in *P. lacunifera* Gotô, 1984, and is possibly a synapomorphy for this group of three species.

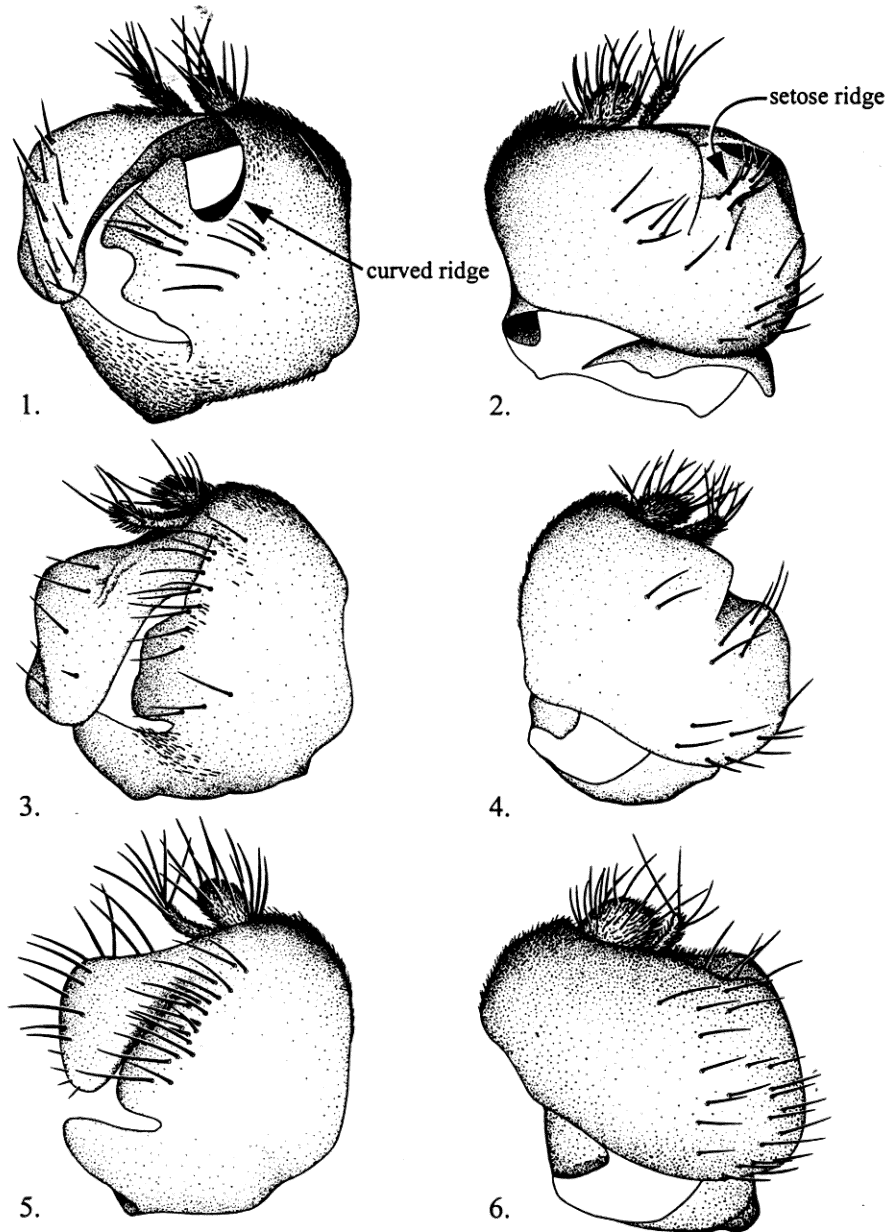
### *Phora americana* Schmitz & Wirth, 1954

(Figs. 1-2)

Holotype: ♂, MEXICO: Cuernavaca, H.Krauss (USNM) (examined).

Species recognition. Among species with a setose ridge on the left side of the epandrium (Fig. 2), this species can be recognized instantly by the distinctively curved, projecting ridge on the right side of the epandrium (Fig. 1). Additionally, in Costa Rica, the fore tarsomeres are dark brown, in contrast to those of the other two species. Unfortunately, this distinction does not hold for specimens of *P. americana* from other parts of its range.

Costa Rican material examined. COSTA RICA: Cartago: La Cangreja, 9.8°N, 83.97°W, 2♂, vii.1991, 1♂, vi-vii.1992, P.Hanson, Malaise trap, 1950 m (LACM); Heredia: Vara Blanca, 10.15°N, 84.15°W, 2♂, i-ii.1990, P.Hanson, Malaise trap, 2100 m (LACM); Puntarenas: Las Alturas, 8.95°N, 82.83°W, 3♂, iii.1992, P.Hanson, Malaise trap, 1500 m (LACM); San José: 20 km S Empalme, 9.63°N, 83.85°W, 1♂, iii-vi.1990, P.Hanson, Malaise trap, 2800 m (LACM), Zurquí de Moravia, 10.05°N, 84.02°W, 1♂, i.1989, 3♂, vii.1990, 5♂, ix-x.1990, 8♂, x-xii.1990, 4♂, i.1991, 5♂, ii.1991, 19♂, iii.1991, 3♂, v.1991, 2♂, vi.1991, 5♂, vii.1991, 1♂, iii.1992, 2♂, vi.1992, 2♂, vii.1992, 2♂, iii-iv.1993, 5♂, iv-v.1993, 10♂, 1-15.vi.1993, 5♂, vi.1993, 8♂, ix-x.1993, 2♂, ii.1994, 4♂, iii.1994, 8♂,



Figs. 1-6. *Phora* species, male terminalia, right side, left side. 1-2. *P. americana*. 3-4. *P. paramericana*. 5-6. *P. truncata*.

v.1994, 3♂, v.1995, 3♂, vi.1995, 3♂, i.1996, P.Hanson, Malaise trap, 1600 m (INBC, LACM, MUCR), 1♂, 2-8.iii.1995, B.V.Brown, Malaise trap, 1600 m (LACM).

*Phora paramericana* **new species**

(Figs. 3-4)

Species recognition. This species is extremely similar to *P. americana*, but lacks the distinctive ridge on right side of epandrium; furthermore the terminalia are shorter in the new species and there are fewer setae in the setose ridge of the left side of the epandrium.

In the Palearctic key of Schmitz (1955), this species runs to couplet 4, but does not match either of the choices. In the North American key of Borgmeier (1963) it keys to *P. americana*. In the key to Japanese species (Gotô 1986), it keys to *P. lacunifera*, which it resembles closely. The major differences are that in *P. lacunifera* the epandrial setae are much longer and more numerous and that in *P. paramericana* the left process of the right hypandrial lobe is much more elongate and narrower apically. In the key to British species (Disney 1983) it keys to *P. bullata* Schmitz, 1927 if one considers the upper lobe of the left side of the epandrium as being as short, although it actually slightly exceeds the level of the hypoproct. However, *P. paramericana* has a distinctive, setose, longitudinal ridge across the lower lobe of the left side of the epandrium. The terminalia differ from those of all of the species described since these keys were published.

Description. Male. Body color dark brown to black. Legs dark brown, except fore tibia and tarsomeres, which are light brown.

Frons slightly convergent dorsally, frontal index (width of frons just below anterior ocellus/ width of head) 0.27-0.36. Frontal setae well-differentiated from sparse frontal setulae.

Mid tibia with one anterobasal seta; dorsally with 3-6 setae. Hind tibia with one anterobasal seta. Hind femur with ventrobasal expansion small, rounded. Mean costal length 0.53 wing length, range 0.51-0.55. Costal setae short.

Left side of epandrium (Fig. 4) divided

into small dorsal lobe and larger ventral lobe; ventral lobe with longitudinal, medial, ridge with few setae. Right side of epandrium (Fig. 3) with posteromedial process; right surstylus elongate, downturned, slightly bulging dorsally. Right hypandrial lobe with long, narrow left process and bilobed right process.

Derivation of specific name. The name is a combination of the Greek *para*, for near, and the specific name of the most similar species, *P. americana*.

Holotype. ♂, COSTA RICA: San José: Zurquí de Moravia, 10.05°N, 84.02°W, vi.1995, P.Hanson, Malaise trap, 1600 m [LACM ENT 081865] (LACM).

Paratypes. COSTA RICA: San José: Escazú, 9.9°N, 84.15°W, 2♂, iii.1989, W.Eberhard, Malaise trap, 1300 m (INBC, LACM), Zurquí de Moravia, 10.05°N, 84.02°W, 2♂, iii.1991, 1♂, vii.1991, 1♂, 1-15.vi.1993, 1♂, vi.1995, P.Hanson, Malaise trap, 1600 m (LACM, MUCR).

*Phora truncata* **new species**

(Figs. 5-6)

*Phora stictica*: Borgmeier, 1968: 45. Misidentification.

Species recognition. In Costa Rica, this species most closely resembles *P. paramericana* new species, but has the left side of the epandrium completely undivided.

In the Palearctic key of Schmitz (1955), this species runs to *P. bullata*, but differs from that species by having a completely undivided left side of the epandrium. In the North American key of Borgmeier (1963) it keys to couplet 13, but the terminalia differ from either choice. Similarly, this species keys to, but does not resemble, the Japanese species *P. lacunifera* (Gotô 1986). In the key to British species (Disney 1983) it keys to couplet 12, but does not match any of the choices in the following couplets. The terminalia differ from those of all of the species described since these keys were published.

I examined the specimen attributed to *P. stictica* by Borgmeier (1968) and found it to belong to this new species.

Description. Male. Body color dark brown

to black. Legs dark brown, except fore tibia and fore tarsomeres, which are light brown in color.

Frons parallel-sided, frontal index (width of frons just below anterior ocellus/ width of head) 0.29-0.31. Almost all frontal setae lost from specimens, but frontal setulae sparse, markedly shorter and smaller than those frontal setae remaining.

Foretarsomeres slightly flattened, expanded. Mid tibia with one anterobasal seta, except in holotype, which has an aberrant, extra seta on the left leg; 3-4 dorsal setae present. Hind tibia with one anterobasal seta. Hind femur lacking ventrobasal expansion. Mean costal length 0.49 wing length, range 0.48-0.50. Costal setae short.

Left side of epandrium (Fig. 6) undivided, posteriorly truncate, slightly concave at apex. Right side of epandrium (Fig. 5) rela-

tively unmodified; right surstylus apically directed ventrally, with small dorsal bulge. Right lobe of hypandrium with elongate, broad left process and short, bilobed right process.

Derivation of specific name. The name is from a Latin word, *truncus*, meaning cut off, referring to the truncate posterior margin of the left side of the epandrium.

Holotype. ♂, COSTA RICA: San José: Zurquí de Moravia, 10.05°N, 84.02°W, iii.1991, P.Hanson, Malaise trap, 1600 m [LACM ENT 063967] (LACM).

Paratypes. COSTA RICA: Cartago: La Suiza, 1 ♂, i.1924, P.Schild (MZSP) [identified by Borgmeier as *P. stictica*]; San José: Escazú, 9.9°N, 84.15°W, 1 ♂, i-ii.1989, 1 ♂, iii.1989 W.Eberhard, Malaise trap, 1300m (INBC, LACM), 26 km N San Isidro, 9.5°N,

#### KEY TO MALES OF COSTA RICAN *PHORA*

- |   |  |  |
|---|--|--|
| 1 | Right side of epandrium with prominent, curved ridge (Fig. 1); foretarsomeres dark brown (in Costa Rican specimens) .....                                  | <b><i>P. americana</i> Schmitz &amp; Wirth</b> |
| - | Epandrium without ridge; foretarsomeres yellowish-brown .....  | <b>2</b>                                       |
| 2 | Left side of epandrium divided into small dorsal and larger ventral lobes (Fig. 4); frons slightly narrowed posteriorly; foretarsomeres more slender ..... | <b><i>P. paramericana</i> new species</b>      |
| - | Left side of epandrium not divided (Fig. 6); frons parallel-sided; foretarsomeres expanded and flattened .....   | <b><i>P. truncata</i> new species</b>          |

83.72°W, 1 ♂, ix-x.1992, P.Hanson, Malaise trap, 2100 m (LACM).

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#### RESUMEN

Se reconoce tres especies de *Phora* costarricenses: *P. americana* Schmitz y Wirth, *P. truncata* sp. nov. y *P. paramericana* sp. nov. Las primeras dos son escasas y todas se recolectaron en las alturas centrales del país; *P. stictica*, una

especie holártica que supuestamente habitaba Costa Rica resultó ser una identificación incorrecta de *P. truncata*.

#### REFERENCES

- Arnett, R. H., G. A. Samuelson & G. M. Nishida. 1993. The insect and spider collections of the world. Sandhill Crane, Gainesville, Florida. vi + 310 p.
- Beyer, E. M. 1965. Phoridae. Explor. Parc Nat. Albert Miss. de Witte 1933-1935. 99: 1-211.
- Borgmeier, T. 1963. Revision of the North American phorid flies. Part I. The Phorinae, Aenigmatiinae and Metopininae, except *Megaselia* (Diptera, Phoridae). *Studia Ent.* 6: 1-256.
- Borgmeier, T. 1968. A catalogue of the Phoridae of the World (Diptera, Phoridae). *Studia Ent.* 11: 1-367.
- Brown, B. V. 1992. Generic revision of Phoridae of the Nearctic Region and phylogenetic classification of Phoridae, Sciadoceridae and Ironomyiidae (Diptera:

- Phoridae). Mem. Ent. Soc. Can. 164: 1-144.
- Brown, B. V. 1994. Descriptions and subfamily classification of some unusual Phoridae (Diptera). Can. Ent. 126: 703-707.
- Brown, B. V. 1997. Revision of the *Apocephalus atrophilus*-group of ant-decapitating flies (Diptera: Phoridae). Contrib. Sci. 468: 1-60.
- Disney, R. H. L. 1983. Scuttle flies-Diptera, Phoridae (except *Megaselia*). Handbk Ident.Br.Insects. 10: 1-81.
- Disney, R. H. L. 1989. A new species of *Phora* (Dipt., Phoridae) from France. Ent. Mon. Mag. 125: 81-82.
- Disney, R. H. L. & E. Durska. 1998. A new genus and new species of Phoridae (Diptera) from Poland. Eur. J. Ent. 95: 437-453.
- Fabricius, J. C. 1794. Entomologia systematica emendata et aucta., Hafniae (=Copenhagen). 472 p.
- Gotô, T. 1984. Systematic study of the genus *Phora* Latreille from Japan (Diptera, Phoridae) I. Description of a new species, with discussion on the terminology of the male genitalia. Kontyû 52: 159-171.
- Gotô, T. 1986. Systematic study of the genus *Phora* Latreille from Japan (Diptera, Phoridae) V. Kontyû 54: 128-142.
- Latreille, P. A. 1796. Précis des caractères génériques des Insectes, disposés dans un ordre naturel. Paris. xiii + 179 p.
- Latreille, P. A. 1802. Histoire naturelle, générale et particulière, des Crustacés et des Insectes, p. 468. In C. S. Sonnini (ed.). Histoire naturelle par Buffon. Paris.
- Meigen, J. W. 1803. Versuch einer neuen Gattungseintheilung der europäischen zweiflügeligen Insekten. Mag. f. Insektenkunde. 2: 259-281.
- Meigen, J. W. 1804. Beschreibung der europäischen zweiflügeligen Insekten (Diptera Linn.). Braunschweig (=Brunswick). xxviii + 314 p.
- Meigen, J. W. 1830. Systematische Beschreibung der bekannten europaeischen zweiflügeligen Insekten. Hamm. iv + 401 p.
- Rondani, C. 1856. Dipterologiae Italicae prodromus. Parmae. 228 p.
- Schmitz, H. 1927. Die palaearktischen Arten der Gattung *Phora* Latr. Bestimmungsschlüssel und neue Arten. Konowia 6: 144-160.
- Schmitz, H. 1953. Phoridae, p. 273-320. In Lindner, E. (ed.). Die Fliegen der palaearktischen Region. E. Schweiz., Stuttgart.
- Schmitz, H. 1955. Phoridae, p. 321-386. In Lindner, E. (ed.). Die Fliegen der palaearktischen Region. E. Schweiz., Stuttgart.
- Schmitz, H. & W. W. Wirth. 1954. A review of the North American species of the genus *Phora* Latreille. Wasmann J. Biol. 12: 113-127.
- Villers, C. J. de. 1789. Caroli Linnaei entomologia, faunae suecicae descriptionibus aucta. Lugduni (=Lyon). 472 p.
- Yarkulov, F. 1972. *Phora holosericea* (Diptera, Phoridae), a predator of root aphids. Zool. Zh. 51: 1415-1418.
- Zaitzev, V. F. 1977. Some phorid flies (Diptera, Phoridae) from Mongolia. Insects Mongolia 5: