Zootaxa 2182: 1–91 (2009)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

ZOOTAXA

2182

A revision of the *Anastrepha robusta* species group (Diptera: Tephritidae)

ALLEN L. NORRBOM[1] & CHESLAVO A. KORYTKOWSKI[2]

[1]*Systematic Entomology Lab., USDA, ARS, c/o Smithsonian Institution, P.O. Box 37012, MRC 168, Washington, DC 20013-7012, USA. E-mail: allen.norrbom@ars.usda.gov*

[2]*Programa de Maestría en Entomología, Vice-Rectoría de Investigación y Post-Grado, Universidad de Panamá, PANAMÁ. E-mail: cheslavok@cableonda.net*

Magnolia Press
Auckland, New Zealand

Accepted by D. Bickel: 2 Jun. 2009; published: 6 Aug. 2009

Allen L. Norrbom & Cheslavo A. Korytkowski
A revision of the Anastrepha robusta species group (Diptera: Tephritidae)
(*Zootaxa* 2182)

91 pp.; 30 cm.

6 Aug. 2009

ISBN 978-1-86977-397-7 (paperback)

ISBN 978-1-86977-398-4 (Online edition)

FIRST PUBLISHED IN 2009 BY

Magnolia Press

P.O. Box 41-383

Auckland 1346

New Zealand

e-mail: zootaxa@mapress.com

http://www.mapress.com/zootaxa/

ISSN 1175-5326 (Print edition)

ISSN 1175-5334 (Online edition)

A revision of the *Anastrepha robusta* species group (Diptera: Tephritidae)

Table of contents

Abstract

The *Anastrepha robusta* species group is revised to include the following 29 species: *A. amaryllis* Tigrero (Ecuador), *A. amazonensis*, **n. sp.** (Brazil: Amazonas), *A. bella*, **n. sp.** (Panamá), *A. binodosa* Stone (Brazil: Amazonas, Pará), *A. concava* Greene (Costa Rica to Ecuador and Brazil: Amazonia), *A. cordata* Aldrich (México to Venezuela), *A. cryptostrepha* Hendel (Peru, Surinam), *A. cryptostrephoides*, **n. sp.** (Perú), *A. disticrux*, **n. sp.** (Jamaica), *A. fenestrata* Lutz & Lima (Brazil: Amazonas, Pará), *A. fenestrella*, **n. sp.** (Costa Rica, Panamá), *A. furcata* Lima (Panamá, French Guiana, Brazil: Amazonas, Pará, Bahia, Espírito Santo), *A. fuscata*, **n. sp.** (Perú), *A. isolata*, **n. sp.** (Ecuador, Brazil: Amazonas), *A. jamaicensis*, **n. sp.** (Jamaica), *A. lambda* Hendel (Perú), *A. miza*, **n. sp.** (Venezuela), *A. nigra*, **n. sp.** (Panamá), *A. nigrifascia* Stone (Bahamas, USA: Florida), *A. nigrivittata*, **n. sp.** (Guyana), *A. partita*, **n. sp.** ("Amazon"), *A. phaeoptera* Lima (Brazil: Bahia, Rio Grande do Sul), *A. pittieri* Caraballo (Panamá, Venezuela), *A. pseudorobusta*, **n. sp.** (Perú, Trinidad, Venezuela), *A. rafaeli*, **n. sp.** (Brazil: Roraima, Venezuela), *A. robusta* Greene (México to Panamá), *A. rojasi*, **n. sp.** (Costa Rica, Panamá), *A. simulans* Zucchi (Brazil: Paraná, São Paulo, Rio de Janeiro), and *A. speciosa* Stone (Panamá). *Moutabea longifolia* is recorded as a host plant of *A. rojasi*, the first host record for *Anastrepha* species from the plant family Polygalaceae. The larvae feed on the seeds within the fruit. A key to the species and descriptions and illustrations for each species are provided, and their possible relationships are discussed.

Key words: *Anastrepha*, Tephritidae, fruit flies, taxonomy, Polygalaceae, *Moutabea*

Introduction

Anastrepha Schiner is the most diverse genus of fruit flies (Diptera: Tephritidae) in the American tropics and subtropics with more than 200 described species (Norrbom *et al*. 1999 a, b). It is also the most economically important fruit fly genus in this region, including a number of major fruit pests (Norrbom 2004). Despite its importance, many species remain undescribed and the native host plant relationships are poorly known. In this paper we revise the 29 species of the *robusta* group, including 13 species new to science, and report a host plant record for one of the new species, the first *Anastrepha* species discovered to feed in a member of the plant family Polygalaceae.

Materials and methods

We follow the morphological terminology of White *et al.* (1999). The names for the wing bands follow Stone (1942a) and are shown in Figure 21. Wing length was measured from the base of the costa to the wing apex in cell r_{4+5}; wing width at the broadest part, distal to the apex of vein R_1 to the margin of cell cu_1. The position of the apex of vein R_1 is the ratio of the distance from the base of the costa to the apex of vein R_1 divided by wing length. The width of cell r_{4+5} at the level of dm-cu was measured on a line directly anterior to the junction of vein M and dm-cu. Its apical width was measured on a line from the apex of vein R_{4+5} and the junction of vein M and the wing margin. The width of the distal part of the S-band was measured perpendicular to the band at the apex of vein R_{2+3}, and the width of cell r_{2+3} was measured along the same line. Oviscape length was measured medially on the ventral side from the concavity in the base to the apex, including the medial lobe. The length of the aculeus tip was measured ventrally from the inner margin of the sclerotized part to the extreme apex.

Label data for all examined specimens will be made available in the New World fruit fly specimen database on the Systematic Entomology Laboratory web site (www.sel.barc.usda.gov:591/diptera/Tephritidae/TephIntro.html). A USNM barcode label was added to most specimens that previously lacked a barcode label. These labels do not indicate ownership, they are unique specimen identifier numbers. In the Type data and Specimen examined sections the barcode number is listed following the depository acronym for each specimen or series.

Acronyms for institutions where specimens are deposited follow Thompson (1999): AMNH—American Museum of Natural History, New York; BMNH—Natural History Museum, London; CAS—California Academy of Sciences, San Francisco; CMP—Carnegie Museum of Natural History, Pittsburgh; CNC—Canadian National Collection, Ottawa; FSCA—Florida State Collection of Arthropods, Gainesville; HNHM—Hungarian Natural History Museum, Budapest; INBio—Instituto de Biodiversidad, Santo Domingo de Heredia, Costa Rica; INPA—Instituto Nacional de Pesquisas da Amazonia, Manaus; IOC—Instituto Oswaldo Cruz, Rio de Janeiro; IZAM—Universidad Central de Venezuela, Maracay; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge; MEUP—Museum de Entomología, Universidad de Panamá; MEUV—Museo de Entomología, Universidad del Valle, Cali; MZUSP—Museu de Zoologia, Universidade de São Paulo; NMW—Naturhistorisches Museum, Vienna; SENASA—Servicio Nacional de Sanidad Agraria, Lima; SMT—Staatliches Museum für Tierkunde, Dresden; UFPC—Universidade Federal de Paraná, Curitiba; UMSP—University of Minnesota, St. Paul; UNAM—Universidad Nacional Autónoma de México, México; USNM—National Museum of Natural History, Smithsonian Institution, Washington; and USU—Utah State University, Logan.

Methods used for analysis of phylogenetic relationships are discussed in that section. The data were analyzed using TNT (Goloboff *et al*. 2007). The cladogram figures were produced with WinClada (© K. C. Nixon 2002).

Status of the *robusta* group

Norrbom (1985) and Norrbom *et al*. (1999b) recognized the *robusta* species group to include 11 species. They suggested three characters as possible synapomorphies for the group, although none was unique and known to be present in all species. The presence of a brown band on the posterior margin of the scutum in most species, although variable in some, and the pattern of dorsobasal scales on the eversible membrane (only the distal rows long and hooklike, except in *A. speciosa*) were considered possible synapomorphies with some homoplasy. The presence of a long lobe on the egg, although known for only two species (*A. nigrifascia* Stone and *A. pittieri* Caraballo) was another possible synapomorphy. A unique apomorphic wing character, the presence of an extension from the middle of the S-band to the posterior margin in cell cu_1 in some species, including *A. speciosa*, also was proposed as support for inclusion of that species within the group.

Since that work additional new species and character data have been discovered that weaken the support for the monophyly of the *robusta* group. The eggs of *A. speciosa* and *A. bella*, **n. sp.**, were examined and found to lack lobes, thus this character is not a synapomorphy for the entire group. As noted by Norrbom *et al*. (1999b), a lobe on the egg also occurs, apparently by convergence, within the *spatulata* group of *Anastrepha* and in several other distantly related tephritid genera. Some of the new species variously share only some, presumably derived character states with different species previously included in the group, but different sets of species share different derived states. This mosaic distribution of character states suggests that many of these characters support conflicting hypotheses of relationship and that some are homoplastic. There are no unique derived character states shared by all species of the group, thus its monophyly is uncertain. We conducted a preliminary cladistic analysis in an attempt to resolve relationships among the included species, and some subgroups are strongly supported as monophyletic, but whether the entire group is natural remains unresolved (see Relationships section).

On a tentative basis we have more broadly redefined the *robusta* group to include species that possess any of these characters. As such it is taxonomically useful, although whether or not it is monophyletic remains uncertain. The group is defined here to include species with one or more of the following characters: scutum with dark band on posterior margin, sometimes also with dark brown vittae; base of S-band with posterior projection in cell cu_1, sometimes connected with proximal arm of V-band along posterior wing margin; aculeus dorsally curved; aculeus tip awl-shaped, as deep as wide (nearly circular in cross-section); and/or eversible membrane with gap in dorsobasal scales or with only distal rows long and hooklike. *Anastrepha cordata* Aldrich and *A. cryptostrepha* Hendel, which previously were included in the *cryptostrepha* group, and two new species that appear to be closely related to them, are here included in the *robusta* group because they

possess some of the above character states. The status of other species previously included in the *cryptostrepha* group (Norrbom et al. 1999a, Hérnandez-Ortiz 2004) is unresolved (see Relationships section).

Host plants are known for only four species: *A. cordata* was reared from fruit of *Tabernaemontana alba* Mill. (Apocynaceae) (Hernández-Ortiz 1992); *A. nigrifascia* has been reared from two species of *Manilkara* (Sapotaceae), *M. jaimiqui* (C. Wright) Dubard ssp. *emarginata* (L.) Cronquist and *M. zapota* (L.) P. Royen; *A. phaeoptera* Lima was reared from *Helicostylis tomentosa* (Poepp. & Endl.) Rusby (Moraceae) (Lima 1937a, 1938); and *A. rojasi*, **n. sp.** was bred from larvae feeding on seeds within fruits of *Moutabea longifolia* Poepp. & Endl. (Polygalaceae).

The geographic range of the *robusta* group is widespread, including species from México to southern Brazil, with three species in the Antilles and Florida.

Key to the species of the *robusta* group

1. Base of S-band with posterior extension to or almost to wing margin in middle of cell cu_1, sometimes connected to proximal arm of V-band (Figs. 19, 33–35, 41, 43) 2
- Base of S-band without posterior extension in middle of cell cu_1 (Figs. 20–32, 36–40) 12
2. Extension of S-band in middle of cell cu_1 connected to proximal arm of V-band along posterior wing margin (Figs. 41, 43, 45–46, 50–51, 53) 3
- Extension of S-band in middle of cell cu_1 not connected to proximal arm of V-band along posterior wing margin (Figs. 19, 33–35, 55, 61–62) 8
3. Scutum with extensive dark brown markings, including pair of submedial vittae on anterior two-thirds and large U-shaped posterior mark (Fig. 15). Subscutellum and mediotergite dark brown except very narrowly medially. S-band interrupted in base of cell cu_1 (Figs. 43, 50). V-band not connected to S-band anteriorly 4
- Scutum without dark brown markings except sometimes on posterior margin (Fig. 14). Subscutellum and mediotergite entirely orange, or subscutellum at most with dorsolateral brown spot. Basal part of S-band uninterrupted (Figs. 41, 45–46, 51, 53). V-band connected to S-band in cell r_{2+3} 5
4. Oviscape 3.13 mm long, 0.78 times as long as mesonotum. Aculeus 2.3 mm long; tip 0.33 mm long, 2.06 times as long as wide, with minute serrations (Fig. 175). Peru ..... *lambda* Hendel
- Oviscape 2.01 mm long, 0.52 times as long as mesonotum. Aculeus 1.35 mm long; tip 0.15 mm long, 1.2 times as long as wide, with small serrations (Figs. 156, 178). Guyana ..... *nigrivittata*, **n. sp.**
5. Apex of vein M strongly curved, width of cell r_{4+5} at apex less than 0.80 its width at dm-cu (Figs. 41, 53). C-band with well defined, yellow or subhyaline area in cell r_1 posterior to basal third to half of pterostigma, extending width of cell r_1. Oviscape less than 2.5 mm long, less than 0.6 times as long as mesonotum (Fig. 8) 6
- Apex of vein M slightly curved, width of cell r_{4+5} at apex greater than at dm-cu (Figs. 45–46, 51). C-band with at most small yellow or subhyaline area in cell r_1 extending slightly into cell from small posterobasal area in pterostigma, not extending more than midway across r_1. Oviscape more than 3.0 mm long, more than 0.8 times as long as mesonotum (Fig. 10) 7
6. Scutellum with setulae on disc usually brown. Aculeus tip at most slightly broader than shaft of aculeus, 0.08–0.10 mm wide, 1.6–1.9 times as long as wide, with small serrations (Figs. 159, 179). Panamá, Venezuela ..... *pittieri* Caraballo
- Scutellum with setulae on disc yellow to orange. Aculeus tip distinctly broader than shaft of aculeus, 0.13 mm wide, 1.1 times as long as wide, with large serrations (Fig. 150). Ecuador, Brazil (Amazonas) ..... *isolata*, **n. sp.**
7. Proximal arm of V-band with slender orange area bordering crossvein dm-cu, not extending into cell r_{4+5}, or entirely brown (Figs. 45–46). C-band in cells r_1 and r_{2+3} posterior to pterostigma entirely brown. Aculeus tip strongly constricted, distal oval part demarcated by distinct ridges (Fig. 154). Panamá ..... *nigra*, **n. sp.**
- Proximal arm of V-band with broad medial orange area bordering crossvein dm-cu, extending beyond vein R_{4+5} (Fig. 51). C-band in cells r_1 and r_{2+3} posterior to pterostigma with orange subapical area. Aculeus tip slightly constricted but without ridges (Figs. 157–158). "Amazon" ..... *partita*, **n. sp.**
8. S-band with large orange medial area bordering r-m and extending into cell dm (Figs. 33–35). C-band with lobelike orange or subhyaline area extending from cell c into cell r_1 posterior to basal third to half of pterostigma. Apex of

vein M strongly curved, width of cell r_{4+5} at apex less than 0.80 its width at dm-cu. Scutum with posterior brown band (if present) not broader medially than laterally, at most just reaching acrostichal seta and not extending to intra-alar seta (Fig. 14). Frons without brown markings except ocellar tubercle 9

- S-band entirely brown bordering r-m and in cell dm (Figs. 19, 55, 61–62). C-band without orange or subhyaline area in cell r_1 posterior to base of pterostigma. Apex of vein M slightly curved, width of cell r_{4+5} at apex greater than at dm-cu. Scutum with posterior brown band broadest medially, including acrostichal seta and often extending to intra-alar seta (Figs. 11, 13, 17). Frons often with posterior U-shaped brown mark 10

9. Oviscape 2.49 mm long, 0.59 times as long as mesonotum. Aculeus 1.76 mm long; tip (Fig. 147) triangular, but its base not wider than shaft of aculeus, only slightly longer than wide (ratio 1.14), apical 0.85 serrate. Brazil (Amazonas, Pará) ..... *fenestrata* Lutz & Lima

- Oviscape 1.65–1.80 mm long, 0.37–0.42 times as long as mesonotum. Aculeus 0.84–0.92 mm long, tip (Figs. 148, 172) sagittate, its base distinctly wider than shaft of aculeus, more than 1.4 times as long as wide and serrate on at least apical 0.9. Costa Rica, Panamá ..... *fenestrella*, **n. sp.**

10. Cells br and dm without hyaline areas proximal to crossvein r-m (Fig. 19). Hyaline area in cell r_{4+5} between S-band and proximal arm of V-band as broad as basal dark area of cell (measured along vein M). Scutal brown posterior band not extended to intra-alar seta, intra-alar seta within sublateral white vitta. Oviscape 2.55 mm long, 0.94 times as long as mesonotum. Aculeus 2.24 mm long; tip 0.26 mm long, apical 0.44 serrate (Fig. 144). Brazil (Amazonas). ..... *amazonensis*, **n. sp.**

- Cell br with at least small hyaline area (Figs. 55, 61–62). Cell dm with hyaline area proximal to crossvein r-m except often in male of *A. speciosa*. Hyaline area in cell r_{4+5} between S-band and proximal arm of V-band at least 1.5 times as broad as basal dark area of cell (measured along vein M). Scutal brown posterior band (when present) with lateral extension that includes intra-alar seta (Figs. 11, 13, 17). Other characters variable 11

11. Hyaline basomarginal spot in cell r_1 with apex aligned with or slightly distal to crossvein r-m (Fig. 55). Male with basal hyaline spot in cell dm extending to vein Cu_1. Oviscape 2.00–2.17 mm long, 0.65–0.68 times as long as mesonotum. Aculeus 1.71–1.72 mm long, tip with apical 0.69–0.75 serrate (Fig. 161). Brazil (Roraima), Venezuela ..... *rafaeli*, **n. sp.**

- Hyaline basomarginal spot in cell r_1 with apex aligned proximal to crossvein r-m (Figs. 61–62). Male with basal hyaline spot in cell dm absent or extending less than half distance to vein Cu_1 (Fig. 61). Oviscape 3.62–4.65 mm long, 1.23–1.38 times as long as mesonotum. Aculeus 3.40–4.60 mm long, tip with apical 0.35–0.37 serrate (Figs. 163, 188). Panamá ..... *speciosa* Stone

12. Apex of vein M strongly curved, width of cell r_{4+5} at apex less than 0.95 times its width at dm-cu, often reaching apex of S-band (Figs. 18, 36–40, 42, 47–49, 54, 56–57, 59–60). Oviscape entirely orange, less than 3 mm long and less than 0.75 times mesonotum length, except in *A. amaryllis* (3.43 mm long) (Figs. 5, 6, 9, 12). Eversible membrane with dorsobasal denticles similarly sclerotized, relatively short and stout except 1–2 apical elongate rows (Figs. 73–75, 77, 82–83, 87–88, 91, 93, 102–103) 13

- Apex of vein M slightly curved, cell r_{4+5} at apex at least as wide as at dm-cu, well separated from apex of S-band (Figs. 7, 20–26, 44, 58). Oviscape with distal 0.40 or more brown (except in *A. binodosa* and *miza*), more than 4 mm long and longer than mesonotum, except in *A. rojasi* and *miza* (2.65–3.44 mm long, 0.73–0.86 times mesonotum length) (Figs. 1–4, 7). Eversible membrane with numerous long dorsobasal denticles in triangular or crown-shaped pattern (as broad as long) or with gap of weakly sclerotized or membranous denticles proximal to one to several rows of strong, hooklike denticles (Figs. 64–69, 85, 92, 101) 21

13. S-band entirely brown in cell dm (Fig. 52). C-band brown except for costal cells. Hyaline basomarginal spot in cell r_1 with apex aligned slightly distal to crossvein r-m. V-band with distal arm separated from proximal arm and from S-band. Brazil (Bahia, Rio Grande do Sul) ..... *phaeoptera* Lima

- S-band with medial orange area in cell dm (Figs. 18, 36–40, 42, 47–49, 54, 56–57, 59–60). C-band often with large orange area in cells r_1 and r_{2+3}. Hyaline basomarginal spot in cell r_1 with apex aligned proximal to crossvein r-m. V-band with distal arm usually connected to proximal arm or S-band, except in *A. jamaicensis* 14

14. Aculeus in lateral view distinctly dorsally curved (Figs. 117, 119, 139, 143, 165, 173, 181) 15

- Aculeus in lateral view straight or ventrally curved (Figs. 123, 129, 135, 152, 177) 18

15. Oviscape 3.43 mm long, 0.71 times mesonotum length. Aculeus 2.59 mm long, tip 0.47 mm long. Ecuador ..... *amaryllis* Tigrero

- Oviscape less than 3.0 mm long and less than 0.7 times mesonotum length (Figs. 5, 6, 12). Aculeus less than 2.4 mm long, tip less than 0.40 mm long 16

16. C-band mostly to entirely brown in cells r_1 and r_{2+3} (Figs. 36–40). Aculeus tip evenly tapered to slightly acute apex, lateral margins convex or straight (Figs. 75, 149, 174) 17
- C-band in cells r_1 and r_{2+3} more than half orange (Figs. 56–57). Aculeus tip more tapered subbasally, lateral margins distinctly concave, apex blunt (Fig. 187). México to Panamá ..... *robusta* Greene
17. Oviscape 0.47 times as long as mesonotum. Aculeus tip 0.38 mm long. Subscutellum with dark brown dorsolateral mark. Perú ..... *fuscata*, **n. sp.**
- Oviscape 0.50–0.65 times as long as mesonotum. Aculeus tip 0.22–0.28 mm long (Figs. 149, 174). Subscutellum entirely orange or with brown dorsolateral mark. Panamá, French Guiana, Brazil (Amazonas, Pará, Bahia, Espírito Santo) ..... *furcata* Lima
18. Aculeus tip 0.33–0.39 mm long (Fig. 180). Oviscape 2.45–2.91 mm long, 0.59–0.71 times as long as mesonotum. Perú, Trinidad, Venezuela ..... *pseudorobusta*, **n. sp.**
- Aculeus tip 0.22–0.28 mm long. Oviscape 1.68–2.42 mm long, 0.40–0.72 times as long as mesonotum (perhaps sometimes slightly longer in *A. jamaicensis*) 19
19. Scutum largely nonmicrotrichose, microtrichia present medially between acrostichal lines at and anterior to transverse suture, gradually broadening posteriorly to intra-alar seta and on and lateral to sublateral vitta. Proximal arm of V-band usually constricted or interrupted in cell r_{4+5} (Figs. 47–49). USA (Florida), Bahamas ..... *nigrifascia* Stone
- Scutum entirely microtrichose. Proximal arm of V-band not constricted or interrupted in cell r_{4+5} (Figs. 42, 59–60)... 20
20. Base of S-band in cell cu_1 with posterior margin more or less straight, without indentation (Fig. 42); pterostigma distinctly darker than brown portions of S-band and V-band; distal arm of V-band separated from proximal arm. Oviscape 0.72 times as long as mesonotum. Aculeus 1.92 mm long. Jamaica ..... *jamaicensis*, **n. sp.**
- Base of S-band in cell cu_1 with distinct indentation in posterior margin (Fig. 59–60); pterostigma similar in color to brown portions of S-band and V-band; distal arm of V-band usually connected to proximal arm. Oviscape 0.43–0.53 times as long as mesonotum. Aculeus 1.33–1.37 mm long. Brazil (Paraná, São Paulo, Rio de Janeiro)..... ..... *simulans* Zucchi
21. Proximal arm of V-band not exceptionally broad, broadening posteriorly, if brown rest of wing pattern extensively brown, including much of S-band (Figs. 20–26, 44, 58). Scutum at most with brown band on posterior margin. Subscutellum, mediotergite and abdomen without dark brown markings 22
- Proximal arm of V-band extremely broad, oval, and dark brown; rest of pattern yellow except distal arm of V-band sometimes medium to dark brown (Figs. 7, 27–28). Scutum with extensive dark brown markings, including pair of submedial vittae on anterior two-thirds, large oval presutural lateral mark, and large U-shaped posterior mark with extension to intra-alar seta (Fig. 7). Subscutellum and mediotergite extensively dark brown. Abdomen with dark brown bands. México to Venezuela ..... *cordata* Aldrich
22. Wing bands predominantly orange (Figs. 22–23, 44, 58). Aculeus tip with small protrusion on lateral margin near base and with subapical ridge also protruding at lateral margin (Figs. 145, 153, 162, 167). Proctiger sclerotization separate dorsally 23
- Wing bands with extensive dark brown areas (Figs. 20–21, 24–26), except in *A. cryptostrephoides*. Aculeus tip without such protrusion or ridge (Figs. 146, 166, 168, 171). Proctiger sclerotization often connected dorsally (Fig. 195) 25
23. Cell br with hyaline area small, much shorter than distal colored part of cell (Fig. 58). Thoracic setae dark brown to black. Oviscape 2.90–3.44 mm long, 0.72–0.85 times as long as mesonotum; aculeus 2.65–3.00 mm long. Costa Rica, Panamá ..... *rojasi*, **n. sp.**
- Cell br with hyaline area large, at least as long as distal colored part of cell (Fig. 22–23, 44). Thoracic setae orange to red brown 24
24. Oviscape 2.65–2.84 mm long, 0.73–0.75 times as long as mesonotum. Aculeus 2.01–2.17 mm long. Venezuela .... *miza*, **n. sp.**
- Oviscape 4.79–5.70 mm long, 1.09–1.36 times as long as mesonotum (Fig. 2). Aculeus 4.28–5.00 mm long. Brazil (Amazonas, Pará) ..... *binodosa* Stone
25. C-band mostly yellow, at most with narrow distal margin in cells r_1 and r_{2+3} and pterostigma brown, strongly contrasting with dark brown distal half of wing pattern (Figs. 20–21). Aculeus tip more than 0.12 mm wide, tapered on basal and distal thirds, with middle third parallel-sided (Figs. 65, 166). Panamá ..... *bella*, **n. sp.**
- C-band more extensively brown, at least in pterostigma (Figs. 24–26, 29–30, 32), if predominantly orange, much of

distal half of S-band and proximal arm of V-band also orange (Fig. 31). Aculeus tip less than 0.12 mm wide, gradually tapered (Figs. 146, 168, 171) 26

26. Scutum entirely microtrichose, without brown band on posterior margin. S-band entirely brown bordering r-m and in cell dm (Figs. 24–26). Basomarginal hyaline mark in cell r_1 with apex proximal to crossvein r-m. Oviscape more than 6 mm long (Fig. 4). Aculeus tip more than 0.50 mm long (Fig. 168). Eversible membrane with 2 irregular distal rows of long hooklike dorsobasal scales separated by membranous gap from short, stout basal denticles (Figs. 67, 101). Costa Rica to Ecuador and Brazil (Amazonia) ..... *concava* Greene
- Scutum nonmicrotrichose except narrowly laterally, often with brown band on posterior margin. S-band with large orange area bordering r-m and extending into cell dm (Figs. 29–32). Oviscape less than 5 mm long (although probably longer in *A. cryptostrephoides*). Aculeus tip less than 0.20 mm long (Fig. 146, 171). Eversible membrane with 3–4 irregular rows of hooklike dorsobasal scales in triangular pattern, without membranous gap (Fig. 69)..... 27

27. Basomarginal hyaline mark in cell r_1 not extending into cell r_{2+3} and with apex aligned with or distal to crossvein r-m (Figs. 29–30). Surinam, Perú ..... *cryptostrepha* Hendel
- Basomarginal hyaline mark in cell r_1 extending into cell r_{2+3} and with apex proximal to crossvein r-m (Figs. 31–32). 28

28. Crossvein r-m at 0.73 distance from crossvein bm-cu to crossvein dm-cu (Fig. 31). Jamaica..... *disticrux,* **n. sp.**
- Crossvein r-m at 0.68 distance from crossvein bm-cu to crossvein dm-cu (Fig. 32). Perú .....*cryptostrephoides,* **n. sp.**

***Anastrepha amaryllis* Tigrero**

Figs. 18, 143, 164–165

Anastrepha cryptostrepha: Molineros *et al*. 1992: 40 [misidentification, see Tigrero 1998: 48].

Anastrepha amaryllis Tigrero 1998: 38 [description, wing, aculeus tip, Ecuador]; Norrbom *et al*. 1999b: 333 [classification]; Korytkowski 2004: 61 [in key].

Diagnosis. *Anastrepha amaryllis* differs from other species of *Anastrepha* except *A. furcata, A. fuscata* and *A. robusta* in having the aculeus strongly dorsally curved. We have not examined this species, but it appears to differ from the latter three species in having longer terminalia (oviscape 3.43 mm long, 0.71 times mesonotum length vs. no more than 3.0 mm long, 0.65 times mesonotum length in the other species). It also has a longer aculeus tip (0.47 mm, vs. less than 0.40 mm in the other three species). In wing pattern it more resembles *A. robusta*, with less extensive dark brown areas than in the other two species.

Description. Setae dark.

Thorax: Mesonotum 4.81 mm long. Scutum with dark brown band on posterior margin. Scutal setulae yellowish. Katepisternal seta short and weak.

Wing (Fig. 18): Length 9.44 mm, 2.48 times as long as wide. Apex of vein R_1 at 0.55 wing length. Cell c 1.27 times as long as pterostigma; pterostigma 3.50 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65 distance from bm-cu to dm-cu on vein M. Vein M strongly curved apically; cell r_{4+5} 0.72 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.64 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band with cells bc and c mostly yellowish; pterostigma mostly brown; cells r_1, br, and r_{2+3} orange except posterior and distal margins partially narrowly brown. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br narrowly separated from vein R_{4+5}, ca. as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly orange with brown margins, in radial cells and distally in cell dm, proximal margin in cell dm orange; more than posterior half of part in cell cu_1 brown; posterior margin with distinct incision in cell cu_1; distal section of band orange with brown margins, broad, at apex of vein R_{2+3} 0.91 times width of cell r_{2+3}, distinctly broadening in cell r_{2+3}, narrowly separated from apex of vein M. Hyaline basomarginal spot in cell r_1 triangular, with blunt apex, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area from apex of band to anterior fourth of dm-cu; proximal arm slender anteriorly, slightly

broadening posteriorly, with short basal extension along wing margin, at level of vein M ca. 2 times as wide as distal arm and ca. as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Male terminalia: Unknown.

Female terminalia: Oviscape 3.43 mm long, 0.71 times as long as mesonotum. Eversible membrane with only distal row of 6 scales large and curved. Aculeus dorsally curved, 2.59 mm long; shaft 0.09 mm wide at midlength; tip (Figs. 143, 164–165) 0.47 mm long, 0.08 mm wide, 5.88 times as long as wide (based on measurements in description, ca. 4.0 times as long as wide in figure), slightly expanded subbasally, then gradually tapered, nonserrate.

Distribution. *Anastrepha amaryllis* is known only from Ecuador.

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type Data. Holotype female (Pontificia Universidad Católica, Quito), Ecuador: Napo: El Coca, Oct 1987, G. Onore and students, collected by net [not examined].

Comments. The description and measurements for this species, which we have not seen, are mostly taken from the original description and figures of Tigrero (1998) and additional measurements kindly provided by Ing. Tigrero. The measurments of the terminalia are those he provided in the description; the length/width ratio of the aculeus tip in Tigrero's fig. 82 is less than that based on the measurements.

***Anastrepha amazonensis*, new species**
Figs. 19, 63, 108, 144

Anastrepha amazonensis Norrbom & Korytkowski in Korytkowski 2004: 58 [*nomen nudum*; in key].

Diagnosis. *Anastrepha amazonensis* differs from most species of *Anastrepha* in having an extension from the basal part of the S-band to the posterior wing margin in the middle of cell cu_1 that is not connected to the posterior end of the proximal arm of the V-band. It differs from the other species having that wing character in lacking hyaline areas in cells br and dm proximal to crossvein r-m. It differs from the other species except *A. rafaeli* in having the basomarginal hyaline area in cell r_1 aligned slightly distal to crossvein r-m.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown.

Head: Yellow to orange except brown ocellar tubercle and U-shaped mark on posterior half of orbital plate and vertex, touching eye, connected only to posterior side of mark on ocellar tubercle. 3 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, 1.2 times as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.85 distance to ventral facial margin.

Thorax: Mostly yellow to orange with following areas white or pale yellow (color pattern not well differentiated in holotype): postpronotal lobe; possibly an inverted T-shaped medial scutal vitta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad brown band, broadest medially, including acrostichal seta and extended almost to dorsocentral seta, laterally with short anterior extension along sublateral white vitta. Subscutellum and mediotergite entirely orange. Mesonotum 2.70 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta well developed, nearly as dark as and 0.67 times as large as anepimeral seta.

Wing (Fig. 19): Length 6.5 mm, width 2.7 mm, ratio 2.41. Apex of vein R_1 at 0.55 wing length. Cell c 1.19 times as long as pterostigma; pterostigma 3.15 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.33 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.63 times as long as anterior margin. Wing pattern mostly dark brown. C-band with cell bc

yellowish to subhyaline; cell c narrowly yellowish basally and narrowly brown distally and on distal half of anterior margin, posteriorly with elongate medial subhyaline area, not extended into pterostigma or cell r_1; remainder of C-band dark brown. Cell c posteromedial nonmicrotrichose area small, less than half width of cell. C-band and S-band broadly connected along vein R_{4+5} and basally, cell br and base of cell dm without hyaline areas. Basal half of S-band entirely brown, without orange area in cell dm or bordering crossvein r-m; with lobelike projection to posterior wing margin in middle of cell cu_1; distal section of band orange with brown margins, relatively broad, at apex of vein R_{2+3} 0.75 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 short triangular, extended slightly beyond vein R_{2+3}, its apex aligned slightly distal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area bordering anterior 0.40 of dm-cu extending anteriorly beyond vein R_{4+5}; proximal arm very broad, gradually broadening posteriorly, without basal extension along wing margin, at level of vein M ca. 3 times as wide as distal arm and hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender. Abdomen: Mostly orange, without brown markings.

Male terminalia: Unknown.

Female terminalia: Oviscape 2.55 mm long, 0.94 times as long as mesonotum; base orange, distal three fourths brown; spiracle at basal 0.34. Eversible membrane (Fig. 63) with 20–25 large, hooklike dorsobasal scales in triangular pattern, gradually shorter and stouter proximally. Aculeus straight in lateral view, 2.24 mm long; in ventral view (Fig. 108) base 0.22 mm wide; shaft 0.12 mm wide at midlength; tip (Fig. 144) 0.26 mm long, 0.11 mm wide, 2.39 times as long as wide, 0.06 mm wide in lateral view, 0.55 times ventral width, in ventral view basal part nearly parallel-sided with lateral margin very slightly concave, apical 0.44 elongate triangular, finely serrate, but basal serrations curving onto dorsal side (difficult to see in ventral view). Spermathecae spherical.

Distribution. *Anastrepha amazonensis* is known only from Brazil (Amazonas).

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type Data. Holotype female (INPA USNMENT00052107), BRAZIL: Amazonas: Manaus, 18 Oct 1985, B. Klein R-1301 R. e. s. 2. The holotype appears to have been preserved originally in alcohol and later pinned. Its eyes and scutum are slightly shriveled, making the color pattern of the latter difficult to observe.

Etymology. The name of this species is an adjective referring to the region where the holotype was collected.

***Anastrepha bella*, new species**

Figs. 1, 20–21, 64–65, 109, 166, 211–212

Anastrepha bella Norrbom & Korytkowski in Korytkowski 2004: 60 [*nomen nudum*; in key].

Diagnosis. *Anastrepha bella* differs from other species of *Anastrepha* by its distinctive wing pattern, which is entirely dark brown except for most of the C-band and a large medial area in the S-band in cells br and dm, which are yellow. It is unusual among predominantly brown-patterned species in that the distal part of the C-band, particularly the pterostigma, is much paler than the bands on the distal half of the wing. In the key of Steyskal (1977: 28), *A. bella* runs poorly to *A. bondari* Lima and *A. tumida* Stone which have predominantly orange wing patterns. It somewhat resembles *A. bondari* Lima, *A. buscki* Stone, and species of the *doryphoros* group in aculeus tip shape, but this similarity is probably superficial. Other useful diagnostic characters include: vein M weakly curved apically; mesonotum and abdomen without brown markings; and C-band and S-band, and S-band and V-band broadly connected.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae red brown to dark red brown.

Head: Yellow to orange except brown ocellar tubercle. 3–6 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.75–0.90 distance to ventral facial margin.

Thorax (Fig. 1): Without brown markings. Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; medial scutal vitta, sometimes indistinct or absent, very slender, posteriorly not extended laterally beyond acrostichal seta; paired sublateral scutal vitta from transverse suture to posterior margin, including base of intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum without darker band. Subscutellum and mediotergite entirely orange. Mesonotum 3.1–3.5 mm long. Scutum entirely microtrichose; setulae yellow to orange medially, brownish laterally. Katepisternal seta undifferentiated or small, weak, and yellowish.

Wing (Figs. 20–21): Length 6.8–8.4 mm, width 2.9–3.4 mm, ratio 2.33–2.55. Apex of vein R_1 at 0.51–0.55 wing length. Cell c 1.21–1.36 times as long as pterostigma; pterostigma 2.75–4.07 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.62–0.65 distance from bm-cu to dm-cu on vein M. Vein M slightly curved apically; cell r_{4+5} 1.03–1.28 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.53–1.73 times as long as anterior margin. Wing pattern mostly dark brown, yellow anterobasally. C-band entirely yellow except pterostigma sometimes orange to moderate brown, and distal margin in cells r_1 and r_{2+3} and narrow streak in base of cell br dark brown; cell bc yellowish; cell c entirely yellow and entirely microtrichose. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, reaching vein R_{4+5}, but 0.57–1.10 times as long as distal colored area of cell; cell dm with basal hyaline area small to moderately large. Basal half of S-band dark brown except for large medial yellow area in cells br and dm from anterior end of r-m to or almost to vein Cu_1, proximally in cell dm without brown margin; with distinct incision in posterior margin in cell cu_1; remainder of S-band dark brown, including area near connection with V-band; distal section medium width to moderately broad, at apex of vein R_{2+3} 0.56–0.79 times width of cell r_{2+3}, even in width, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3} in females, but usually not reaching it in males. Hyaline basomarginal spot in cell r_1 subtriangular with very blunt apex, broadly extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, entirely dark brown, very broadly connected to S-band in cell r_{2+3}; proximal arm slender anteriorly, broad posteriorly and with broad basal extension along wing margin, at level of vein M 1.50–1.67 times as wide as distal arm, 0.55–0.75 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 211–212): Lateral surstylus relatively long, extended beyond prensisetae by ca. 3.5 times length of prensiseta; in lateral view strongly posteriorly curved; in posterior view broad on basal half, rapidly tapered then nearly parallel-sided on short blunt apical lobe, lateral margin convex then concave, medial margin convex then straight to slightly concave. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 5.89–6.55 mm long, 1.9 times as long as mesonotum; glans 0.57–0.58 mm long.

Female terminalia: Oviscape (Fig. 1) 5.45–6.40 mm long, 1.73–2.02 times as long as mesonotum; brown except basal fifth ventrally and extreme base dorsally; spiracle at basal 0.20–0.28. Eversible membrane (Figs. 64–65) with ca. 60 hooklike dorsobasal scales in broad semicircular pattern. Aculeus (Fig. 109) straight or ventrally curved in lateral view, 4.76–5.85 mm long; in ventral view base only slightly expanded, 0.20–0.23 mm wide; shaft 0.16–0.17 mm wide at midlength; tip (Fig. 166) 0.22–0.24 mm long, 0.13–0.14 mm wide, 1.63–1.77 times as long as wide, 0.07–0.08 mm wide in lateral view, 0.53–0.59 times ventral width, in ventral view slightly broadened at base, rapidly tapering on basal third, then parallel-sided, and tapering on apical third, nonserrate. Spermathecae spherical.

Egg (25 dissected from abdomen of holotype): Slender, 2.15–2.25 mm long, 0.21–0.23 mm wide at broadest point, slightly curved. Posterior end strongly tapered. Anterior end without lobe distal to micropyle, micropyle nipple-shaped.

Distribution. *Anastrepha bella* is known only from Panamá.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT00216156), PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora, Chayotera, McPhail trap 548, 20 Jul 1997, C. A. Korytkowski. Paratypes: PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora, Chayotera, McPhail trap 547, 1 Aug 1997, C. A. Korytkowski, 1♂ (MEUP); Altos de Pacora, Lote H4, McPhail trap 570, 22 Jul 1997, 1♀ (MEUP USNMENT00214905); Altos de Pacora, Lote H4, McPhail trap 567, 14 Jul 2000, 1♀ (MEUP); Altos de Pacora, Desvio, McPhail trap 554, 9 Aug 1996, C. Campo, 1♀ (MEUP); Altos de Pacora, Desvio, McPhail trap, 24 Oct 1997, C. A. Korytkowski, 1♂ (MEUP USNMENT00214906); Parque Nacional Chagres, Migdalia Fuentes, McPhail trap 534, 5 Sep 1997, C. A. Korytkowski, 2♂ (USNM USNMENT00215485-86); Migdalia Fuentes, McPhail trap 535A, 16 Apr 2004, C. A. Korytkowski, 2♂ 1♀ (USNM USNMENT00761175-77).

Etymology. The name of this species is a Latin adjective meaning beautiful.

***Anastrepha binodosa* Stone**
Figs. 2, 22–23, 66, 110, 145, 167

Anastrepha binodosa Stone 1942a: 57 [description, wing, aculeus tip, Brazil: Pará]; Foote 1967: 8 [in catalog]; Steyskal 1977: 6 [in key]; Zucchi 1978: 34; Norrbom 1985: 161 [wing, aculeus tip]; Zucchi *et al*. 1996: 260 [Brazil]; Korytkowski 1997: 63 [in key]; Norrbom *et al*. 1999a: 77 [in catalog]; Norrbom *et al*. 1999b: 333 [classification]; Zucchi 2000a: 22 [in key]; Zucchi 2000b: 43 [in list]; Silva & Ronchi-Teles 2000: 203 [Brazil: Amazonia]; Korytkowski 2004: 64 [in key].
[not] *Anastrepha binodosa*: Carrejo & González 1994: 87 [misidentification].

Diagnosis. This species is very similar to *A. rojasi* and especially *A. miza*, which have very similar aculeus tips with two pairs of ridges that project in ventral view as small lateral protuberances. It differs from *A. rojasi* in having orange to orange brown setae (dark red brown to black in *rojasi*) and the hyaline area in cell br large, 1.0–1.5 times as long as the distal colored area of the cell (0.33–0.64 times as long in *rojasi*), and from both species in having longer terminalia.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae orange to orange brown.

Head: Yellow to orange except brown ocellar tubercle. 3–5 (usually 4) frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, about as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.67–0.75 distance to ventral facial margin.

Thorax (Fig. 2): Mostly orange with following areas white or pale yellow (usually poorly differentiated in the dried specimens examined): postpronotal lobe; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Scutum orange medially, without pale vitta; posterior margin sometimes with broad dark orange band, with straight anterior margin, not extended beyond acrostichal seta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.80–4.37 mm long. Scutum entirely microtrichose; setulae yellow to orange. Katepisternal seta undifferentiated or small, weak, and yellowish.

Wing (Figs. 22–23): Length 9.20–10.50 mm, width 3.90–4.55 mm, ratio 2.29–2.39. Apex of vein R_1 at 0.58–0.63 wing length. Cell c 0.99–1.10 times as long as pterostigma; pterostigma 4.20–6.03 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.68–0.71 distance from bm-cu to dm-cu

on vein M. Vein M slightly curved apically; cell r_{4+5} 1.03–1.22 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.49–1.54 times as long as anterior margin. Wing pattern mostly orange. C-band with cells bc and c mostly yellowish; pterostigma and distal and posterior margins narrowly pale brown. C-band and S-band narrowly to broadly connected along vein R_{4+5}; hyaline area in cell br large, reaching vein R_{4+5}, more elongate anteriorly, 1.0–1.5 times as long as distal colored area of cell; cell dm with basal hyaline area moderate sized. S-band with margins narrowly pale brown, except proximal margin in cell dm orange, posterior margin of basal part broadly pale brown in cells dm and especially cu_1 and with distinct incision in cell cu_1; distal section relatively broad, at apex of vein R_{2+3} 0.66–0.85 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 subtriangular, sometimes with blunt apex, extended to vein R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly pale brown, proximal arm with broad medial orange area from connection with S-band to entire length of dm-cu; broadly connected to S-band in cell r_{2+3}; proximal arm moderately broad, gradually and slightly broadening posteriorly to vein Cu_1, and with broad basal extension along wing margin, at level of vein M 1.20–1.45 times as wide as distal arm, 0.67–0.87 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Similar to *A. rojasi* (Figs. 209–210). Lateral surstylus very short, extended beyond prensisetae by 0.5 times length of prensiseta; in lateral view tapered to slightly acute apex; in posterior view gradually tapered to blunt apex, ventrolateral margin less produced than in *A. rojasi*. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 6.83 mm long, 1.80 times as long as mesonotum; glans 0.51 mm long.

Female terminalia: Oviscape (Fig. 2) 4.79–5.70 mm long, 1.10–1.36 times as long as mesonotum; entirely orange; spiracle at basal 0.29–0.32. Eversible membrane (Fig. 66) with 60–70 long slender hooklike dorsobasal scales in 3–4 irregular transverse rows separated from minute basal denticles by several rows of weakly sclerotized to membranous smaller thin more widely spaced scales. Aculeus (Fig. 110) straight to slightly ventrally curved in lateral view, 4.28–5.00 mm long; in ventral view base expanded, ca. 0.28 mm wide; shaft ca. 0.09 mm wide at midlength; tip (Figs. 145, 167) 0.46–0.49 mm long, 0.10 mm wide, 4.64–4.90 times as long as wide, 0.06 mm wide in lateral view, 0.6 times ventral width, in ventral view with 2 pairs of small lateral protuberances, 1 subbasal, the other near distal third, both continuing on dorsal side as weak ridges; parallel-sided until distal protuberances then slightly expanded and gradually tapered to blunt apex, distal 0.24–0.25 very finely serrate, sides of serrate part slightly convex. Spermathecae spherical.

Distribution. *Anastrepha binodosa* is known only from northern Brazil (Amazonas, Pará). The records from Colombia were based on misidentification.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (BMNH), Brazil: Pará [not examined].

Other specimens examined. BRAZIL: Pará: Belém [as Para], 1931, G. Moinar, 1♂ (HNHM USNMENT00214871); Rio Tapajós, [1852, H. W. Bates], 1♀ paratype (USNM USNMENT00216098); Santarém, Sep, S. W. Williston Collection, 1♀ paratype (AMNH USNMENT00104291); Santarém, Acc. No. 2966, 2♀ (CMP USNMENT00104292-93) 1♀ (USNM USNMENT00216097); Santarém, May 1919, S. M. Klages, Acc. No. 6324, 1♀ (CMP USNMENT00671150).

Comments. This species was well described by Stone (1942a) and its identity is not in question. We have examined paratypes. The specimens from Colombia that were reported by Carrejo & González (1994) as *A. binodosa* are an undetermined species of the *dentata* group. The aculeus is missing from the female, but its eversible membrane has only minute dorsobasal denticles. The terminalia of the males is typical of the *dentata* group, with extremely short surstyli and a very short phallus without a glans. Vein M is also more strongly curved distally than in *A. binodosa*; in the female cell r_{4+5} is 0.78 times as wide at the apex as at the level of dm-cu. The data for these specimens are: Colombia: Valle del Cauca: Municipio Buenaventura, Vereda Bajo

Anchicayá, 4–6 Oct 1996, 1♂ (MEUV MUSENUV100496); Municipio Buenaventura, Corregimiento Cisneros, Vereda Sombrerillo, 6–13 Mar 1994, 1♂1♀ (MEUV MUSENUV100494).

***Anastrepha concava* Greene**
Figs. 4, 24–26, 67, 101, 168, 192–193, 213–214

Anastrepha concava Greene 1934: 169 [description, wing, Panamá]; Stone 1942a: 93 [aculeus tip, Brazil: Pará]; Foote 1967: 8 [in catalog]; Steyskal 1977: 27 [in key]; Zucchi 1978: 38; Norrbom 1985: 173 [wing, eversible membrane, aculeus tip, male terminalia]; Zucchi *et al*. 1996: 261 [in list]; Korytkowski 1997: 62 [in key]; Norrbom *et al*. 1999a: 77 [in catalog; Costa Rica, Ecuador]; Norrbom *et al*. 1999b: 338 [classification]; Zucchi 2000a: 23 [in key]; Zucchi 2000b: 43 [in list]; Silva & Ronchi-Teles 2000: 208 [Brazil: Amazonia]; Korytkowski 2004: 64 [in key].

Diagnosis. *Anastrepha concava* differs from other species of *Anastrepha* by the following combination of characters: C-band and S-band broadly connected; wing pattern mostly dark brown, C-band in cells r_1 and r_{2+3} and S-band in cells br and dm without orange areas; vein M only slightly curved apically, cell r_{4+5} 1.03–1.19 times as wide at apex as at level of dm-cu; oviscape 6.66–9.00 mm long, 1.62–2.07 times as long as mesonotum; and aculeus tip 0.60–0.75 mm long, nonserrate.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, straight or slightly convex dorsally and medially. Antenna extended 0.70–0.85 distance to ventral facial margin.

Thorax (Fig. 4): Without brown markings. Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; paired sublateral scutal vitta from transverse suture to posterior margin, including base of intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Scutum orange medially, without pale vitta; posterior margin without darker band. Subscutellum and mediotergite entirely orange. Mesonotum 4.0–4.6 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta 0.40–0.75 as large as anepimeral seta, orange to red brown.

Wing (Figs. 24–26): Length 8.7–10.9 mm, width 3.5–4.3 mm, ratio 2.37–2.73. Apex of vein R_1 at 0.52–0.58 wing length. Cell c 1.15–1.50 times as long as pterostigma; pterostigma 3.10–4.44 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.66–0.69 distance from bm–cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.03–1.19 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.47–1.57 times as long as anterior margin. Wing pattern mostly dark brown. C-band with cell bc yellowish; cell c yellowish basally and distally, anterior margin yellowish to subhyaline, sometimes narrowly brown distally, posteriory with elongate medial hyaline to subhyaline nonmicrotrichose area; yellow area usually extended into posterobasal corner of pterostigma but not into cell r_1; remainder of C-band dark brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br absent in male, small to moderate sized in female, sometimes not reaching vein R_{4+5} and at most 1.4 times as long as distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band entirely dark brown, without orange area in cell dm or bordering crossvein r-m, posterior margin with distinct incision in cell cu_1; distal section of band paler brown, relatively broad, at apex of vein R_{2+3} 0.69–0.80 times width of cell r_{2+3}, even in width or usually slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3} or rarely (1 Panamanian male) almost reaching it or often extending slightly into cell r_1. Hyaline basomarginal spot in cell r_1 triangular, extended to or almost to vein R_{4+5}, its apex aligned slightly proximal to crossvein r-m. V-band complete, entirely brown although mostly slightly paler than base of S-band, broadly to very broadly connected to S-band in cell r_{2+3}; proximal arm narrow to moderately broad anteriorly, gradually broadening posteriorly, with long basal extension along wing margin, at level of vein M 1.2–2.0 times as wide as distal arm and 1.0–4.0 times as wide

as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, connected to proximal arm, but sometimes constricted on vein R_{4+5}.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 192–193, 213–214): Lateral surstylus moderately long, extended beyond prensisetae by 2.0–2.5 times length of prensiseta; in lateral view gradually tapered to slightly acute apex; in posterior view broad, slightly tapered to blunt, subtruncate apex, slightly longer medially than laterally; medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 10.6–12.7 mm long, 2.59–2.94 times as long as mesonotum; glans 0.55–0.62 mm long.

Female terminalia: Oviscape (Fig. 4) 6.66–9.00 mm long, 1.62–2.07 times as long as mesonotum; mostly moderate to dark brown, base orange to yellow ventrally, at most extended to level of spiracle; spiracle at basal 0.20–0.23. Eversible membrane (Figs. 67, 101) with 15–25 long moderately stout hooklike dorsobasal scales in 2 irregular rows and 1 row of short stout scales separated by membranous gap from short, stout basal denticles in triangular pattern. Aculeus straight or ventrally curved in lateral view, 6.40–9.20 mm long; in ventral view base moderately expanded, 0.20–0.22 mm wide; shaft 0.09–0.13 mm wide at midlength; tip (Fig. 168) 0.60–0.75 mm long, 0.09–0.12 mm wide, 6.25–6.86 times as long as wide, 0.065–0.09 mm wide in lateral view, 0.62–0.75 times ventral width, in ventral view gradually tapered or with basal third or less nearly parallel-sided, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha concava* is known from Costa Rica, Panamá, Ecuador, Bolivia, and Brazil (Amazonas, Pará).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype adult of unknown sex (USMN USNMENT00104302), PANAMÁ: Canal Zone, Cano Saddle, Close's, Sep 1923, M. F. Close [examined]. The abdomen of this specimen was lost prior to its description.

Other specimens examined. BOLIVIA: Cochabamba: Chapare, Agrigento A, trampa McPhail R3-3, 17 Jun 2005, E. Quisberth, 1♀ (USNM USNMENT00212059); Chapare, Dorado, trampa McPhail R3-1, 17 Jun 2005, E. Quisberth *et al*., 1♀ (USNM USNMENT00212061). BRAZIL: Pará: Santarém, S. W. Williston Collection, 1♀ (AMNH USNMENT00671170); Santarém, Acc. No. 2966, 1♀ (CMP USNMENT00671104). COSTA RICA: Puntarenas: Osa Peninsula, Rincon, 3–10 mi. S, 7–20 Feb 1967, H. R. & E. H. Roberts, M.S. Harrison, W. W. Moss, D. A. Nickle, 1♀ (ANSP USNMENT00671167). ECUADOR: Río Palenque, 0°35'S 70°22'W, 150 m, 22–26 Feb 1976, G.E. Shewell, 1♀ (CNC USNMENT00671171). Napo: Reserva Etnica Waorani, Onkone Gare Camp, 1 km S, Transect Ent., 0°39'10"S 76°26'W, 10 x-trans, 42 m mark, 220 m, insecticidal fogging, terra firme forest, 29 Jun 1994, T. L. Erwin *et al*. Project MAXUS Lot 744, 1♂ (USNM USNMENT00053494). PANAMÁ: Panamá: Arraijan, 26 Dec 1947, J. Zetek 5320, 1♂ (USNM USNMENT00671156); Arraijan, 13 May 1948, J. Zetek 5342, 1♂ (USNM USNMENT00214860); Arraijan, 24 Jun 1948, J. Zetek 5348, 1♀ (USNM USNMENT00214911); Arraijan, 16 Sep 1948, J. Zetek 5360, 1♂ (USNM USNMENT00671172); Arraijan, 11 Nov 1948, J. Zetek 5371, 1♀ (USNM USNMENT00671173); Arraijan, 23 Nov 1950, J. Zetek 5487, 1♂ (USNM USNMENT00104277); El Cermeño, 23 Jul 1940, J. Zetek 4670, 1♀ (USNM USNMENT00104251).

Anastrepha cordata Aldrich

Figs. 7, 27–28, 68, 97, 111, 169–170

Anastrepha cordata Aldrich 1925: 4 [description, Belize]; Greene 1934: 144 [wing]; Lima 1934: 502; Stone 1942a: 35 [wing, aculeus tip, Panamá]; Stone 1942b: 304 [Venezuela]; Fernández Yépez 1953: 23; Foote 1967: 9 [in catalog]; Steyskal 1977: 5 [in key]; Caraballo 1981: 77 [wing, aculeus tip, Venezuela]; Norrbom 1985: 99 [mesonotum, eversible membrane, aculeus tip, egg]; Norrbom & Foote 1989: 21 [egg]; Hernández-Ortiz 1992: 49, 137 [host, México: Veracruz]; Hernández-Ortiz & Pérez-Alonso 1993: 453 [host]; Korytkowski 1997: 50 [in key]; Norrbom *et al*.

1999a: 78 [in catalog; Guatemala]; Norrbom *et al*. 1999b: 333 [aculeus tip, classification]; Aluja *et al*. 2000: 808 [host]; Aluja *et al*. 2003: 1381 [host, parasitoid wasps, México: Chiapas]; Korytkowski 2004: 54 [in key]; Hernández-Ortiz 2007: 59 [México: Oaxaca].

Diagnosis. *Anastrepha cordata* differs from all other species of *Anastrepha* by its wing pattern in which the proximal arm of the V-band is dark brown, extremely broad, and ovoid, strongly contrasting with the C-band and S-band which are yellow to orange. It also differs from all other species except *A. lambda* and *A. nigrivittata* by its scutal color pattern, which includes 3 pairs of dark brown vittae (Fig. 7), of which the postsutural sublateral pair is fused to a dark band on the posterior margin to form a U-shaped mark. In *A. cordata* the posterior band has a lateral extension that includes the intra-alar seta whereas in the other two species its margin approaches but does not include the intra-alar. *A. cordata* further differs from those two species in having the scutum mostly nonmicrotrichose and in the shape of the aculeus tip.

Description. Mostly yellow to orange, with dark brown markings. Setae dark red brown to black.

Head: Mostly yellow to orange, ocellar tubercle and large V-shaped mark on orbital plate, vertex and occiput brown, mark extended to or almost to eye margin laterally, occasionally including bases of orbital setae and/or connected to ocellar tubercle, posteriorly extending to acute apex ca. 0.6 of distance from vertex to ventral margin of occiput. 3–4 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, 1.0–1.5 times as long as ocellar tubercle. Postocellar seta occasionally weak or absent. Facial carina, in profile, straight to very slightly convex dorsally and medially. Antenna extended 0.78–0.90 distance to ventral facial margin.

Thorax (Fig. 7): Mostly yellow to orange with dark brown markings. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture towards intra-alar seta; medial scutal vitta; most of scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) not differentiated in dried specimens examined, possibly present in live or fluid preserved material. Scutum with 3 paired dark brown vittae; submedial vitta between acrostichal and dorsocentral lines, extended from anterior margin to ca. half distance from transverse suture to posterior margin, isolated or occasionally diffusely connected to sublateral vitta posteriorly, anteriorly broader than space between vittae, narrowest at transverse suture; broad, subtriangular, presutural sublateral mark from slightly posterior to level of postpronotal seta to ca. level of presutural supra-alar seta, extending laterally almost to latter seta; narrower postsutural sublateral vitta between dorsocentral and intra-alar lines, extended anteriorly almost to transverse suture, posteriorly connected to band on posterior scutal margin to form U-shaped mark; posterior band broadest medially, extending beyond acrostichal seta anteriorly (when latter present) and onto basal 0.25 or less of disk of scutellum medially, laterally with extension including intra-alar seta and often postalar seta. Subscutellum and mediotergite dark brown except often narrowly medially. Anatergite and katatergite often with small pale to moderate brown posteroventral spot. Meron usually with crescent shaped pale to moderate brown posteroventral spot. Mesonotum 2.26–3.21 mm long. Scutum microtrichose only lateral to intra-alar line posterior to transverse suture; scutellum entirely microtrichose; setulae mostly orange to brown. Acrostichal seta usually absent (present on 2 Panamanian males). Katepisternal seta undifferentiated or weak and much shorter than anepisternal seta.

Wing (Figs. 27–28): Length 6.57–9.04 mm, width 2.84–3.25 mm, ratio 2.44–2.59. Apex of vein R_1 at 0.54–0.57 wing length. Cell c 0.98–1.14 times as long as pterostigma; pterostigma 3.91–4.97 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.53–0.64 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.09–1.27 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe relatively short, length of bcu 1.38–1.46 times as long as anterior margin. Wing pattern mostly yellow to orange and dark brown. C-band entirely yellow to orange, including all of cells bc, c, br, r_1 and r_{2+3} and pterostigma. Cell c with nonmicrotrichose posteromedial area 0.10–0.40 width of cell. C-band and S-band broadly connected along vein R_{4+5} and in specimens from Costa Rica, Panamá and Venezuela also along costa, hyaline area in cell br elongate, oblique, reaching or narrowly separated from vein R_{4+5}, 0.5–1.0 times as long as distal colored area of cell; cell dm with basal hyaline area small, but usually

extending to posterior margin. Basal half of S-band mostly to entirely yellow to orange, occasionally pale brown in posterior third or less of cell cu_1; posterior margin with distinct incision in cell cu_1; distal section of band yellow to orange, usually darker orange to orange brown distal to crossvein dm-cu, occasionally with part of posterior margin very narrowly brown; moderately broad, at apex of vein R_{2+3} 0.71–0.79 times width of cell r_{2+3}, even in width to distinctly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3} or narrowly separated from it. Hyaline basomarginal spot in cell r_1 narrow triangular, extended to or almost to vein R_{4+5} in specimens from Belize, Guatemala and México, its apex aligned proximal to crossvein r-m; in specimens from Costa Rica, Panamá and Venezuela reduced to 1–2 small diffuse spots in cell r_1 or completely absent. V-band complete, narrowly to moderately broadly connected to S-band in cell r_{2+3}; proximal arm entirely dark brown except band apex and in anterior third or less of cell r_{4+5}, extremely broad, ovoid, without basal extension along wing margin, at level of vein M 3.25–5.00 times as wide as distal arm and 2.36–4.33 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, yellow to orange anteriorly, pale to moderate brown posteriorly, medially often mottled or with narrow brown margin on proximal side.

Abdomen (Fig. 7): Mostly yellow to orange, syntergite 1+2 and tergites 3 and 4 with broad dark brown bands.

Male terminalia: Lateral surstylus short, extended beyond prensisetae by 1.0–1.5 times length of prensiseta; in lateral view slightly posteriorly curved and very broad, prensisetae equidistant from anterior and posterior margins, posteroapical corner bluntly acute; in posterior view gradually tapered to blunt apex, lateral and medial margins convex. Proctiger with sclerotized areas connected laterally and dorsally. Phallus 8.14–9.58 mm long, 3.08–3.51 times as long as mesonotum; glans 0.62 mm long.

Female terminalia: Oviscape 4.69–7.47 mm long, 1.72–2.42 times as long as mesonotum; distal 0.5–0.8 brown; spiracle at basal 0.17–0.22. Eversible membrane (Figs. 68, 97) with ca. 45 long, slender, hooklike dorsobasal scales in 3–4 irregular transverse rows, separated from minute basal denticles by row of smaller, weakly sclerotized scales. Aculeus (Fig. 111) straight to slightly ventrally curved in lateral view, 4.79–7.00 mm long; in ventral view base 0.16–0.18 mm wide; shaft 0.08–0.09 mm wide at midlength; tip (Figs. 169–170) 0.10–0.17 mm long, 0.055–0.065 mm wide, 2.0–2.46 times as long as wide, 0.050–0.065 mm wide in lateral view, 0.91–1.00 times ventral width, in ventral view triangular, evenly tapering, with lateral margin straight to slightly concave, nonserrate. Spermathecae weakly sclerotized.

Egg (30 dissected from abdomen of holotype): Slender, 1.23–1.36 mm long, 0.13–0.14 mm wide at broadest point, slightly curved, posterior end strongly tapered to slender point. Anterior end without lobe distal to micropyle, micropyle nipple-shaped.

Distribution. *Anastrepha cordata* is known from México (Veracruz, Oaxaca, Chiapas), Belize, Guatemala, Costa Rica, Panamá, and Venezuela.

Biology. The only reported host plant is *Tabernaemontana alba* Mill. (Apocynaceae) (Hernández-Ortiz 1992, Hernández-Ortiz & Pérez-Alonso 1993, Aluja *et al*. 2000). The larvae feed in the fruit. An examined female was collected on a species of *Brysonima* (Malpighiaceae) which is unlikely to be a host plant.

Type Data. Holotype female (USNM USNMENT00104303), BELIZE: Belize [date and collector unknown] [examined]. It bears the following labels: British Honduras / Collection J M Aldrich / [red] Type No. 26839 U.S.N.M. /Wing No. 16 / Anastrepha cordata Ald. The terminalia and both wings have been slide mounted.

Other specimens examined. BELIZE: Stann Creek, Mile 10, on *Brysonima*, 19 Sep 1966, L. Chan, 1♀ (BMNH). COSTA RICA: Heredia: Parque Nacional Braulio Carrillo, Estación Magsasay, LN 264600 531100, 200 m, Nov 1990, M. Zumbado, 1♀ (INBio INBioCRI001111264). GUATEMALA: Petén: Poptún, Poptún, Barrio El Porvenir, 16°19'50"N 89°25'25"W, McPhail trap, 20 Jun 1995, J. López, 1♀ (USNM USNMENT00050350). MÉXICO: Veracruz: Gutierrez Zamora, 4 mi. N of, 30 m, 26 Jun 1953, Univ. Kans. Mex. Expedition, 1♂ (UKaL USNMENT00215384); Tuxpan, Feb 1987, A. Cisneros, 1♀ (UNAM). PANAMA: Panamá: El Cermeño, 5 Dec 1939, J. Zetek 4600, 1♀ (USNM USNMENT000104297); same, 6

Feb 1940, J. Zetek 4630, 1♂ (USNM USNMENT000104299); same, 22 Oct 1940, J. Zetek 4692, 1♂ (USNM USNMENT000104295); same, 12 Aug 1941, J. Zetek 4850, 1♀ (USNM USNMENT000104296); same, 15 Oct 1941, J. Zetek 4885, 1♂ (USNM USNMENT000104294); same, 28 Oct 1941, J. Zetek 4891, 1♀ (USNM USNMENT000104298); La Campana, Muñoz Grove, fruit fly trap, 6 Feb 1940, J. Zetek 4286, 1♂ (USNM USNMENT000104301). VENEZUELA: Puerto Caballo, fruit fly trap, 13 Jan 1940, P. Anduze 4286, 1♂ (USNM USNMENT000104300).

***Anastrepha cryptostrepha* Hendel**
Figs. 29–30, 69, 112, 146, 171

Anastrepha cryptostrepha Hendel 1914a: 68 [description in key, Peru]; Norrbom *et al*. 1999a: 78 [in catalog]; Norrbom *et al*. 1999b: 333 [classification].

Anastrepha cryptostrepha Hendel 1914b: 17 [preoccupied by Hendel 1914a; description, Peru, wing]; Greene 1934: 158 [wing]; Lima 1934: 523; Hering 1941: 137 [in key], 138; Stone 1942a: 101 [aculeus tip]; Foote 1967: 9 [in catalog]; Hardy 1968: 109 [lectotype designation]; Korytkowski & Ojeda Peña 1970: 69; Steyskal 1977: 28 [in key]; Norrbom 1985: 96 [wing, aculeus tip, Surinam]; Korytkowski 1997: 48 [in key]; Norrbom *et al*. 1999a: 78 [in catalog]; Korytkowski 2001: 115; Korytkowski 2004: 65 [in key].

[not] *Anastrepha cryptostrepha*: Molineros *et al*. 1992: 40 [misidentification of *A. amaryllis*, see Tigrero 1998: 48].

Diagnosis. *Anastrepha cryptostrepha* differs from most species of *Anastrepha* in having the basomarginal hyaline mark in cell r_1 not extending into cell r_{2+3} and with its apex aligned with or distal to crossvein r-m. It differs from other species with that wing character in having the distal arm of the V-band complete and connected to the proximal arm and the scutum mostly nonmicrotrichose,

Description. Mostly yellow to orange, with white to pale yellow markings. Setae red brown to dark red brown.

Head: Yellow to orange except ocellar tubercle brown and usually a faint brown pair of spots or slender U-shaped mark on posterior half of orbital plate and vertex, extending laterally to level of orbital setae, connected only to posterior side of mark on ocellar tubercle. 2–3 frontal setae; 2 orbital setae (Surinam female with 3 on left side), posterior seta well developed. Ocellar seta weak, approximately as long as ocellar tubercle. Facial carina, in profile, straight to very slightly convex dorsally and medially. Antenna extended 0.71–0.77 distance to ventral facial margin.

Thorax: Mostly yellow to orange. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) not differentiated in dried specimens examined, probably present in live or fluid preserved material. Posterior margin of scutum with brown band in Peruvian specimens (absent in Surinam female), not extended beyond acrostichal seta anteriorly, laterally with narrow extension including intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 2.98–3.20 mm long. Scutum microtrichose only lateral to intra-alar line posterior to transverse suture; scutellum entirely microtrichose; setulae mostly yellow to orange. Katepisternal seta undifferentiated or weak and shorter than postocellar seta.

Wing (Figs. 29–30): Length 7.30–7.75 mm, width 2.23–2.40 mm, ratio 2.26–2.34. Apex of vein R_1 at 0.59–0.60 wing length. Cell c 0.92–0.97 times as long as pterostigma; pterostigma 3.95–4.72 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.62–0.66 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.36–1.47 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe relatively short, length of bcu 1.45–1.55 times as long as anterior margin. Wing pattern mostly dark brown and yellow. C-band with cell bc yellowish; cell c yellowish, distal 0.67–0.75 of anterior margin brown, broadening distally, posteriorly with elongate medial paler area, not extended into pterostigma or cell r_1. Remainder of C-band dark brown except for small orange subapical areas in cells r_1 and r_{2+3}. Cell c entirely microtrichose or with elongate nonmicrotrichose posteromedial area very narrow, 0.10

width of cell. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br elongate, oblique, reaching or narrowly separated from vein R_{4+5}, 1.0–1.5 times as long as distal colored area of cell; cell dm with basal hyaline area relatively small, but extending to posterior margin. Basal half of S-band with large orange area bordering crossvein r-m and in anterior 0.67 of cell dm, with margins, except proximal margin in cell dm, dark brown and posterior third of band in cell dm and most of cell cu_1 also dark brown; posterior margin with shallow but distinct incision in cell cu_1; distal section of band orange, with posterior margin narrowly brown in Peruvian specimens, both margins more broadly brown in Surinam female; moderately broad, at apex of vein R_{2+3} 0.69–0.70 times width of cell r_{2+3}, even in width to distinctly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}, narrowly separated from R_{2+3} (lectotype), or extended very slightly into cell r_1 (Surinam female). Hyaline basomarginal spot in cell r_1 short, triangular, sometimes with blunt apex, extended to or almost to vein R_{2+3} but not beyond, its apex aligned with or distal to crossvein r-m. V-band complete, mostly brown, broadly to very broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area from apex to anterior 0.50–0.67 of dm-cu; proximal arm moderately broad, gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.50–1.63 times as wide as distal arm and 1.29–1.65 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, entirely brown.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Lateral surstylus short, extended beyond prensisetae by 1.5– 2.0 times length of prensiseta; in lateral view slightly posteriorly curved and very broad, prensisetae closer to anterior than to posterior margin, posteroapical corner bluntly acute; in posterior view gradually tapered to blunt apex, lateral and medial margins convex. Proctiger with sclerotized areas connected laterally and dorsally. Phallus 5.67–6.00 mm long, 1.88–2.00 times as long as mesonotum; glans 0.65 mm long.

Female terminalia: Oviscape 4.27–4.50 mm long, 1.40–1.41 times as long as mesonotum; distal 0.67–0.75 brown, in Surinam female becoming paler on distal fifth; spiracle at basal 0.27–0.28. Eversible membrane (Fig. 69) with ca. 35 slender, medium length, hooklike dorsobasal scales in 3–4 irregular rows in semicircular pattern. Aculeus (Fig. 112) straight to slightly ventrally curved in lateral view, 3.71–3.73 mm long; in ventral view base slightly expanded, 0.18 mm wide; shaft 0.10 mm wide at midlength; tip (Figs. 146, 171) 0.14–0.17 mm long, 0.08 mm wide, 1.75–2.10 times as long as wide, 0.065 mm wide in lateral view, 0.81 times ventral width, in ventral view triangular, evenly tapering, with lateral margin straight to slightly concave, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha cryptostrepha* is known from Peru and Surinam. The record from Ecuador reported by Molineros *et al*. (1992) was based on a misidentification of *A. amaryllis* (Tigrero 1998: 48).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Lectotype female (NMW), PERU: Ucayali: Urubamba River, Meshagua [Mishagua], Oct, Schnuse coll. [examined]. Hendel's (1914a) description was based on an unstated number of specimens from Peru; his later (1914b) description was based on an unstated number of male and female specimens from "Peru – Meshagua, Urubambafluss, Oktober" in the SMT and his personal collection, now in the NMW. Since Hardy (1968) cited only the Hendel (1914b) description, his lectotype designation applies only for that name. To avoid any possible future confusion, this specimen is here designated as the lectotype of *Anastrepha cryptostrepha* Hendel (1914a) as well. The lectotype was examined by ALN during a visit to the NMW. The terminalia were slide mounted by Stone.

Other specimens examined. PERU: Ucayali: Mishagua, Río Urubamba, 8 Oct 1903, [Schnuse coll.], 1♂ paralectotype (SMT USNMENT00104288); Mishagua, Río Urubamba, 6 Oct 1903, [Schnuse coll.], 1♂ (USNM USNMENT00104289). SURINAM: Paramaribo, 20 Jul 1960, P. H. v. Doesburg Jr., 1♀ (USNM USNMENT00216571).

***Anastrepha cryptostrephoides*, new species**
Figs. 31, 194–196

Anastrepha cryptostrephoides Norrbom 1985: 98 [*nomen nudum*; wing, male terminalia].

Diagnosis. *Anastrepha cryptostrephoides* differs from other species of *Anastrepha* except *A. cryptostrepha*, *A. cordata*, and probably *A. disticrux* (whose male is unknown) in having the sclerotized areas of the proctiger connected dorsally. It differs from *A. cordata* in lacking brown scutal vittae and in having a typical wing pattern, with the proximal arm of the V-band not exceptionally broad and dark. It differs from *A. cryptostrepha* in having the basomarginal hyaline mark in cell r_1 extending to vein R_{4+5} and its apex proximal to crossvein r-m. It differs from *A. disticrux* in the more proximal position of crossvein r-m, and from both species in its more extensively orange wing pattern and longer terminalia. The female is unknown, but extrapolating from the phallus length and the lengths of the phallus and oviscape in *A. cryptostrepha*, the oviscape in *A. cryptostrephoides* may be approximately 7 mm long and 2 times as long as the mesonotum.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae red brown to dark red brown.

Head: Yellow to orange except ocellar tubercle brown and pair of slender faint brown L-shaped marks almost forming U on posterior half of orbital plate and vertex, extending laterally to level of orbital setae; occiput with faint brown diamond shaped mark medially. 5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, approximately as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.78 distance to ventral facial margin.

Thorax: Mostly yellow to orange. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) not differentiated in holotype, probably present in live or fluid preserved material. Posterior margin of scutum with broad brown band, extended to acrostichal seta anteriorly, laterally with narrow extension including intra-alar seta. Subscutellum slightly and diffusely darkened laterally, mediotergite entirely orange. Mesonotum 3.50 mm long. Scutum microtrichose only lateral to intra-alar line posterior to transverse suture; scutellum entirely microtrichose; setulae mostly yellow to orange. Katepisternal seta weak and shorter than postocellar seta.

Wing (Fig. 31): Length 8.72 mm, width 3.82 mm, ratio 2.28. Apex of vein R_1 at 0.55 wing length. Cell c 0.92 times as long as pterostigma; pterostigma 4.33 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.68 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.26 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe relatively short, length of bcu 1.43 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band with cell bc yellowish; cell c yellowish, distal half of anterior margin and apex narrowly brown, posteriorly with elongate medial paler area, not extended into pterostigma or cell r_1. Remainder of C-band predominantly orange; pterostigma, most of band in cell br, and extreme bases and narrow distal margins of band in cell cells r_1 and r_{2+3} moderate brown. Cell c with elongate nonmicrotrichose posteromedial area 0.40 width of cell. C-band and S-band moderately broadly connected along vein R_{4+5}; hyaline area in cell br elongate, oblique, reaching vein R_{4+5}, as long as distal colored area of cell; cell dm with basal hyaline area relatively small, but extending to posterior margin. Basal half of S-band mostly orange with narrow brown margins, except proximal margin in cell dm orange; most of band in cell cu_1 moderate brown; posterior margin with shallow incision in cell cu_1; distal section of band orange, with posterior margin narrowly brown; moderately broad, at apex of vein R_{2+3} 0.72 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 narrow triangular, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with broad medial orange area from apex to posterior end of dm-cu; proximal arm moderately broad, gradually broadening posteriorly, with basal extension along wing

margin, at level of vein M 1.54 times as wide as distal arm and approximately as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, mostly brown.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 194–196): Lateral surstylus short, extended beyond prensisetae by 1.5– 2.0 times length of prensiseta; in lateral view slightly posteriorly curved and very broad, prensisetae equidistant from anterior and posterior margins, posteroapical corner bluntly acute; in posterior view gradually tapered to blunt apex, lateral and medial margins convex. Proctiger with sclerotized areas connected laterally and dorsally. Phallus 9.68 mm long, 2.77 times as long as mesonotum; glans 0.60 mm long.

Female terminalia: Unknown.

Distribution. *Anastrepha cryptostrephoides* is known only from Peru.

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type data. Holotype male (SMT USNMENT00104290), PERU: Río Urubamba, Umahuankilia, 19 Sep 1903, [Schnuse collection]. The holotype bears a green label with "Peru - Urubambafl. 19.9.03 Umahuankilia".

Etymology. The name of this species is a Latin adjective referring to its similarity to *A. cryptostrepha*.

***Anastrepha disticrux*, new species**

Figs. 3, 32, 70, 113

Diagnosis. *Anastrepha disticrux* differs from most species of *Anastrepha* in having crossvein r-m more than 0.7 times the distance from bm-cu to dm-cu. It differs from other species with that wing character in having the distal arm of the V-band complete and connected to the proximal arm and the scutum mostly nonmicrotrichose. It is similar to *A. cryptostrepha* in the latter two characters and in relative terminalia length, but differs in having the basomarginal hyaline mark in cell r_1 extending into cell r_{2+3} and with its apex aligned proximal to crossvein r-m.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae red brown to dark red brown.

Head: Yellow to orange except ocellar tubercle brown. 3–4 frontal setae; 2 orbital setae (1 on right side), posterior seta well developed. Ocellar seta weak, 1.2 times as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.71 distance to ventral facial margin.

Thorax (Fig. 3): Mostly yellow to orange. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) not differentiated in dried specimens examined, probably present in live or fluid preserved material. Scutum without brown markings. Subscutellum and mediotergite entirely orange. Mesonotum 2.31 mm long. Scutum microtrichose only lateral to intra-alar line posterior to transverse suture; scutellum entirely microtrichose; setulae mostly yellow to orange. Katepisternal seta weak, yellowish, slightly longer than postocellar seta.

Wing (Fig. 32): Length 5.98 mm, width 2.40 mm, ratio 2.49. Apex of vein R_1 at 0.60 wing length. Cell c 0.83 times as long as pterostigma; pterostigma 5.31 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.73 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.13 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe relatively short, length of bcu 1.32 times as long as anterior margin. Wing pattern mostly orange and brown. C-band with cell bc yellowish; cell c mostly mottled orange brown, apex dark brown. Pterostigma and anterior half of band in cell r_1 dark brown; remainder of band in cells r_1 and r_{2+3} orange except narrow distal margin. Cell c entirely microtrichose. C-band and S-band narrowly connected along vein R_{4+5}; hyaline area in cell br elongate, oblique, reaching vein R_{4+5}, 1.3 times as long as distal colored area of cell; cell dm with basal hyaline area

relatively small, but extending to posterior margin. Basal half of S-band mostly orange with narrow brown margins, except proximal margin in cell dm orange and distal margin in dm broadening posteriorly and dark brown; most of band in cell cu_1 dark brown; posterior margin without incision in cell cu_1; distal section of band orange, with anterior margin broadly and posterior margin narrowly brown; moderately broad, at apex of vein R_{2+3} 0.79 times width of cell r_{2+3}, even in width, well separated from apex of vein M; hyaline area proximal to it narrowly separated from vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular with blunt apex, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area from apex to near posterior end of dm-cu, darkening to orange brown bordering dm-cu; proximal arm moderately broad, gradually broadening posteriorly, with long basal extension along wing margin, at level of vein M 1.38 times as wide as distal arm and 1.10 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, orange brown medially anterior to vein M.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Unknown.

Female terminalia: Oviscape (Fig. 3) 3.24 mm long, 1.40 times as long as mesonotum; distal fourth brown; spiracle at basal 0.25. Eversible membrane (Fig. 70) ca. 35 slender, medium length, hooklike dorsobasal scales in 3–4 irregular rows in semicircular pattern. Aculeus (Fig. 113) slightly ventrally curved in lateral view, 2.83 mm long; in ventral view base 0.14 mm wide; shaft 0.09 mm wide at midlength; tip broken in holotype, 0.06 mm wide. Spermathecae not dissected.

Distribution. *Anastrepha disticrux* is known only from Jamaica.

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type data. Holotype female (USNM USNMENT00104287), JAMAICA: St. Thomas, 14–21 Mar 1986, R. C. Murray.

Etymology. The name of this species is a Latin noun in reference to the distal position of crossvein r-m.

Anastrepha fenestrata Lutz & Lima

Figs. 33, 71, 114, 147, 197

Anastrepha fenestrata Lutz & Lima 1918: 8 [description, wing, Brazil]; Greene 1934: 169; Lima 1934: 527 [wing, male terminalia], 1937a: 38 [comparison to *A. phaeoptera*]; Stone 1942a: 100; Steyskal 1977: 8; Zucchi 1978: 47; Foote 1967: 10 [in catalog]; Norrbom 1985: 157; Zucchi *et al*. 1996: 260 [type data]; Korytkowski 1997: 49 [in key]; Norrbom *et al*. 1999a: 78 [in catalog]; Norrbom *et al*. 1999b: 306 [wing, classification]; Zucchi 2000a: 21 [in key]; Zucchi 2000b: 43 [in list]; Silva & Ronchi-Teles 2000: 203 [Brazil: Amazonia]; Korytkowski 2004: 58 [in key].

Diagnosis. *Anastrepha fenestrata* differs from most species of *Anastrepha* in having an extension from the basal part of the S-band to the posterior wing margin in the middle of cell cu_1 that is not connected to the posterior end of the proximal arm of the V-band. It differs from the other species having that wing character, except *A. fenestrella*, in having an orange area in cell r_1 posterior to the pterostigma and another bordering crossvein r-m and extending into cell dm, and in having the apex of vein M strongly curved, the width of cell r_{4+5} at apex less than 0.80 its width at dm-cu. It differs from *A. fenestrella* in having longer terminalia (oviscape 2.49 mm long, 0.59 times as long as mesonotum vs. 1.65–1.90 mm long, 0.37–0.42 times mesonotum length; aculeus 1.76 mm long vs. 0.84–0.92 mm) and the aculeus tip only slightly longer than wide (ratio 1.14) and less sagittate, not strongly expanded basally.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 4–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 1.5 times as long as ocellar tubercle. Facial carina, in profile, straight to slightly convex dorsally and medially. Antenna extended 0.7–0.8 distance to ventral facial margin.

Thorax: Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse inverted T-shaped medial vitta, posterior part extended laterally almost to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum usually with broad brown band (present in holotype, according to Zucchi 1978: 47 "Faixa escura sobre a sutura escuto-escutelar"; absent in Rio Trombetas female), broadest laterally, not including acrostichal or dorsocentral setae, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 4.15–4.21 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, sometimes brownish laterally. Katepisternal seta weak, yellow, less than 0.40 as large as anepimeral seta.

Wing (Fig. 33): Length 8.9–9.2 mm (9.5 mm in holotype), width 3.60–3.95 mm, ratio 2.33–2.47. Apex of vein R_1 at 0.54–0.58 wing length. Cell c 1.11–1.16 times as long as pterostigma; pterostigma 3.64–3.83 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.51–0.61 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.54–1.75 times as long as anterior margin. Wing pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish; cell c yellowish basally and distally, anterior margin yellowish to subhyaline, narrowly brown distally, posteriory with elongate medial hyaline to subhyaline nonmicrotrichose area; yellow area extended into posterobasal corner of pterostigma and broadly into cell r_1, broadly reaching R_{2+3}, and extending distally to about midlength of pterostigma; remainder of band in pterostigma, r_1, r_{2+3}, and br dark brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br small, not reaching vein R_{4+5} and shorter than distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly dark brown, with large medial orange area broadly bordering crossvein r-m and extending broadly into anterior 0.50–0.67 of cell dm, sometimes narrowly reaching proximal margin of band in dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 but not connected to proximal arm of V-band along wing margin; section between vein M and costa and distal section of band also with orange areas with broad brown margins, distal section relatively broad, at apex of vein R_{2+3} 0.70–0.73 times width of cell r_{2+3}, broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 narrowly triangular with blunt apex, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with slender medial orange area bordering anterior 0.80 of dm-cu and extending to vein R_{4+5}; proximal arm moderately broad anteriorly, gradually broadening posteriorly, without basal extension along wing margin, at level of vein M 1.5–1.6 times as wide as distal arm and 1.24–1.40 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm relatively broad, connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Fig. 197): Lateral surstylus short, extended beyond prensisetae by ca. 2 times length of prensiseta; in lateral view posteriorly curved; in posterior view similar to *A. pittieri*, gradually tapered to bluntly acute apex, lateral margin slightly concave, medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.80 mm long, 0.68 times as long as mesonotum; glans 0.40 mm long.

Female terminalia: Oviscape 2.49 mm long, 0.59 times as long as mesonotum; entirely orange; spiracle at basal 0.41. Eversible membrane (Fig. 71) with ca. 15 moderately long hooklike dorsobasal scales in 2 irregular rows distal to similar number of small, stout scales. Aculeus (Fig. 114) slightly ventrally curved in lateral view, 1.76 mm long; in ventral view base expanded, 0.27 mm wide; shaft 0.15 mm wide at midlength; tip (Fig. 147) 0.16 mm long, 0.14 mm wide, 1.14 times as long as wide, 0.07 mm wide in lateral view, 0.5 times ventral width, in ventral view distal 0.84 triangular with margins straight and with medium sized serrations, at base of serrate part barely wider than at base of tip. Spermathecae spherical.

Distribution. *Anastrepha fenestrata* is known only from northern Brazil (Amazonas, Pará).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype male (IOC), Brazil: "Amazonia", O. Cruz [not examined].

Other specimens examined. BRAZIL: Amazonas: ca. 60 km N of Manaus, Hwy ZF 2, km 20.7, 2°30'S 60°15'W, Terra firme / Canopy fogging project TRS#08, Tray #590, 16 Aug 1979, Adis, Erwin, Montgomery, *et al*., 1♂ (USNM USNMENT00216235). Pará: Oriximiná, Rio Trombetas, Alcoa mine, Km 22, 25 Nov 1982, N. D. Penny, 1♀ (INPA USNMENT00052104).

Comments. The female of this species previously was undescribed. The male holotype was not available for loan. The two examined specimens are consistent with the previous brief descriptions of that specimen and the photo of its wing (Lima 1934). The female lacks a brown band posteriorly on the scutum, but this character varies in some other species of the *robusta* group.

Anastrepha fenestrella, new species

Figs. 14, 34–35, 72, 104, 115, 148, 172, 198

Anastrepha fenestrata: Norrbom 1985: 158 [misidentification, Panamanian specimens; wing, aculeus tip, male terminalia]; Korytkowski 1997: 49 [Panamanian specimens]; Norrbom *et al*. 1999b: 328 [aculeus tip].
Anastrepha fenestrella Norrbom & Korytkowski in Korytkowski 2004: 58 [*nomen nudum*; in key].

Diagnosis. *Anastrepha fenestrella* differs from most species of *Anastrepha* in having an extension from the basal part of the S-band to the posterior wing margin in the middle of cell cu_1 that is not connected to the posterior end of the proximal arm of the V-band. It differs from the other species having that wing character, except *A. fenestrata*, in having an orange area in cell r_1 posterior to the pterostigma and another bordering crossvein r-m and extending into cell dm, and in having the apex of vein M strongly curved, the width of cell r_{4+5} at apex less than 0.80 its width at dm-cu. It differs from *A. fenestrata* in having shorter terminalia (oviscape 1.65–1.90 mm long, 0.37–0.42 times as long as mesonotum vs. 2.49 mm long, 0.59 times mesonotum length; aculeus 0.84–0.92 mm long vs. 1.76 mm) and the aculeus tip distinctly longer than wide (ratio 1.43–1.72), sagittate, and distinctly expanded basally.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–5 (usually 4–5) frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 2 times as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.60–0.85 distance to ventral facial margin.

Thorax (Fig. 14): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse medial vitta, inverted T-shaped or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad brown band with more or less straight anterior margin, sometimes extended to but not completely including acrostichal seta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.9–4.43 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta weak, yellow, less than 0.33 as large as anepimeral seta.

Wing (Figs. 34–35): Length 8.75–10.10 mm, width 3.55–4.07 mm, ratio 2.46–2.65. Apex of vein R_1 at 0.54–0.55 wing length. Cell c 1.03–1.30 times as long as pterostigma; pterostigma 3.11–4.69 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65–0.67 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.56–0.81 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.56–1.68 times as long as anterior margin. Wing

pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish to subhyaline; cell c yellowish basally and posterodistally, anterior margin narrowly yellowish, brown on distal 0.25–0.50, posteriorly with broad elongate medial hyaline to subhyaline nonmicrotrichose area; yellow area extended into posterobasal corner of pterostigma and broadly into cell r_1, broadly reaching R_{2+3}, and extending distally to 0.33–0.50 length of pterostigma; remainder of band in pterostigma, r_1, r_{2+3}, and br dark brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br small, usually reaching vein R_{4+5} but shorter than distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly dark brown, with large medial orange area broadly bordering crossvein r-m and extending broadly into anterior 0.50–0.67 of cell dm, occasionally (usually narrowly) reaching proximal margin of band in dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 but not connected to proximal arm of V-band along wing margin; section between vein M and costa often and distal section of band always also with orange areas with broad brown margins, distal section relatively broad, at apex of vein R_{2+3} 0.76–0.82 times width of cell r_{2+3}, usually broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it usually ending at vein R_{2+3} (very narrowly separated from vein in Costa Rican male). Hyaline basomarginal spot in cell r_1 triangular, sometimes with blunt apex, usually extended to R_{4+5} (except in Costa Rican male), its apex aligned slightly proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with slender medial orange area bordering anterior 0.80 or more of dm-cu, narrowing posteriorly, and extending anteriorly at least midway across cell r_{4+5} or often beyond vein R_{4+5}; proximal arm moderately broad anteriorly, gradually broadening posteriorly, without basal extension along wing margin, at level of vein M 1.8–2.3 times as wide as distal arm and 1.2–1.6 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm relatively broad, connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Fig. 198): Lateral surstylus short, extended beyond prensisetae by ca. 2 times length of prensiseta; in lateral view posteriorly curved; in posterior view similar to *A. pittieri*, gradually tapered to bluntly acute apex, lateral margin slightly concave to slightly convex, medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.17–2.30 mm long, 0.52–0.58 times as long as mesonotum; glans 0.45 mm long.

Female terminalia: Oviscape 1.65–1.90 mm long, 0.37–0.42 times as long as mesonotum; usually dark orange to brown dorsally, yellow to paler orange ventrally; spiracle at basal 0.42–0.45. Eversible membrane (Fig. 72) with 8–12 moderately long hooklike dorsobasal scales in 1 irregular row distal to similar number of small, stout scales. Aculeus (Fig. 115) slightly ventrally curved in lateral view, 0.84–0.92 mm long; in ventral view base expanded, 0.18–0.24 mm wide; shaft 0.07–0.09 mm wide at midlength; tip (Figs. 148, 172) 0.14–0.15 mm long, 0.09–0.105 mm wide, 1.43–1.72 times as long as wide, 0.04–0.06 mm wide in lateral view, 0.44–0.60 times ventral width, in ventral view triangular with margins straight and with medium sized serrations to or slightly beyond base, serrate part 0.93–1.13 times as long as tip, at base of serrate part distinctly flared and wider than at shaft. Spermathecae (Fig. 104) spherical.

Distribution. *Anastrepha fenestrella* is known from Costa Rica and Panamá.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT00214679), PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora, Villa Myrtha, McPhail trap 561, 16 Feb 2002, C. A. Korytkowski. Paratypes: COSTA RICA: Guanacaste: Río Naranjo, 3 km SE, 15–30 Apr 1993, F. D. Parker, 1♀ (USU USNMENT00216240). Heredia: 3 km S of Puerto Viejo, Estación Biológica La Selva, Malaise trap M/01/064, 15 Apr 1993, ALAS project, 1♀ (USNM USNMENT00104276). Limón: Sector Cerro Cocori, Finca de E. Rojas, LN 286000 567500, 150 m, Mar 1991, E. Rojas, 1♂ (INBio INBio000197389). San José: Zurquí de Moravia, 1600 m, Malaise trap, Jun 1995, P. Hanson, 1♀ (USNM USNMENT00048495). PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora, McPhail trap, 2006, C. A. Korytkowski, 3♀ (USNM USNMENT00671178-80); Altos de Pacora, Villa Myrtha, McPhail trap 561, 16 Feb 2002, C. A.

Korytkowski, 4♂ 3♀ (USNM USNMENT00214672-78), 1♂ 1♀ (FSCA USNMENT00214670, USNMENT00214683); Altos de Pacora, Lote H4, McPhail trap, 9 Aug 2002, 4♂ 1♀ (MEUP USNMENT00214897-901); Altos de Pacora, Migdalia Fuentes, McPhail trap 540, 7 Jun 2002, 1♀ (MEUP); same, McPhail trap 534, 11 Aug 2001, 4♂ 3♀ (MEUP); Arraijan, 14 Aug 1947, J. Zetek 5294, 1♀ (USNM USNMENT00216308); same, 14 Aug 1947, J. Zetek 5298, 1♂ (USNM USNMENT00216305); same, 15 Sep 1949, J. Zetek 5424, 1♂ (USNM USNMENT00052103); same, 27 Oct 1949, J. Zetek 5431, 1♀ (USNM USNMENT00216309); Barro Colorado Island, 8 May 1945, J. Zetek 5191, 1♀ (USNM USNMENT00216310); same, Sep 1944, J. Zetek 5155, 1♂ (USNM USNMENT00216307); El Cermeño, 2 Jun 1942, J. Zetek 4950, 1♀ (USNM USNMENT00216304); same, 21 Jul 1942, J. Zetek 4963, 1♀ (USNM USNMENT00216306).

Etymology. The name of this species is a Latin adjective meaning having a small window, in reference to the oval medial hyaline area of the wing.

Anastrepha furcata Lima

Figs. 5, 36–39, 73–74, 116–117, 149, 173–174, 199–200

Anastrepha furcata Lima 1934: 529 [description, wing, male terminalia, Brazil: Amazonas]; Lima 1937b: 64 [wing, female abdomen, aculeus tip, Brazil: Pará]; Stone 1942a: 91 [Panamá]; Foote 1967: 11 [in catalog]; Zucchi 1978: 55; Nascimento & Zucchi 1981: 765 [Brazil: Bahia]; Norrbom 1985: 152 [aculeus tip, male terminalia]; Steyskal 1977: 33; Zucchi *et al*. 1996: 262 [type data]; Korytkowski 1997: 65 [in key]; Norrbom *et al*. 1999a: 79 [in catalog, French Guiana]; Norrbom *et al*. 1999b: 333 [classification]; Zucchi 2000a: 21 [in key]; Zucchi 2000b: 43 [in list]; Silva & Ronchi-Teles 2000: 203 [Brazil: Amazonia]; Nascimento & Carvalho 2000: 236 [Brazil: Bahia]; Martins *et al*. 2000: 256 [Brazil: Espírito Santo]; Korytkowski 2004: 61 [in key].

Anastrepha furcaia Aczél 1950: 212. Misspelling of *furcata* Lima.

Diagnosis. *Anastrepha furcata* differs from other species of *Anastrepha* except *A. amaryllis*, *A. fuscata*, and *A. robusta* in having the aculeus strongly dorsally curved. It differs from *A. amaryllis* in having shorter terminalia, from *A. robusta* in the shape of the aculeus tip (lateral margins not concave), and from both species in having the wing pattern more extensively brown. It differs from *A. fuscata* in having a shorter aculeus tip (less than 0.30 vs. 0.38 mm long).

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown to black.

Head: Yellow to orange except brown ocellar tubercle. 4–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, straight to slightly convex dorsally and medially. Antenna extended 0.65–0.85 distance to ventral facial margin.

Thorax (Fig. 5): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse medial vitta, inverted T-shaped or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad dark orange brown to dark brown band with more or less straight anterior margin, sometimes extended to but not completely including acrostichal seta, sometimes with short anterior extensions laterally along sublateral white vitta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange, or subscutellum sometimes (Panamanian specimens) with moderate to dark brown dorsolateral mark. Mesonotum 3.58–4.70 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, usually brownish laterally. Katepisternal seta weak, yellow to medium brown, at most 0.33 as large as anepimeral seta.

Wing (Figs. 36–39): Length 8.0–10.1 mm (7.75 in Rio Cuminá female according to Lima (1937b)), width 3.4–3.9 mm, ratio 2.29–2.73. Apex of vein R_1 at 0.54–0.56 wing length. Cell c 1.21–1.35 times as long as pterostigma; pterostigma 3.06–3.85 times as long as wide. Vein R_{2+3} without sharp bends or undulations.

Crossvein r-m at 0.62–0.67 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.64–0.92 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.58–1.84 times as long as anterior margin. Wing pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish; cell c yellowish basally, anterior margin narrowly yellowish, brown on distal 0.20–0.67, posteriorly with broad elongate medial subhyaline to yellowish nonmicrotrichose area; yellow area extended slightly into posterobasal corner of pterostigma but not into cell r_1, except in Panamanian specimens as small mottled area posterior to bend in vein Sc; remainder of band in pterostigma, r_1, r_{2+3}, and br usually entirely dark brown, rarely (Bahia female) r_1 and r_{2+3} with small subapical orange area. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br small, often not reaching vein R_{4+5}, at most 1.1 times as long as distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly dark brown, with large medial orange area broadly bordering crossvein r-m and extending broadly into anterior 0.50–0.75 of cell dm, rarely (holotype, Manaus female, Lima 1937 female) narrowly reaching proximal margin of band in dm; posterior margin with distinct incision in cell cu_1; section between vein M and costa and distal section of band also with orange areas with broad brown margins, distal section relatively broad, at apex of vein R_{2+3} 0.72–0.85 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}; in most South American specimens extended to or almost to apex of vein M, but well separated in holotype and Panamanian specimens; hyaline area proximal to it usually ending at vein R_{2+3} (very narrowly separated from vein in Manaus female). Hyaline basomarginal spot in cell r_1 triangular, generally slightly narrower in South American specimens, sometimes with blunt apex, extended to R_{4+5}, its apex aligned slightly proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area extending across cell r_{4+5}, extending slightly into cell dm bordering anterior fourth or less of dm-cu or sometimes (Bahia specimens, French Guiana male) extending narrowing posteriorly (in Bahia male almost full length of dm-cu); proximal arm moderately broad anteriorly, gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.8–2.8 times as wide as distal arm and 1.1–1.5 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender to moderately broad, connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 199–200): Lateral surstylus short, extended beyond prensisetae by less than 1 times length of prensiseta; in lateral view bluntly truncate; in posterior view similar to *A. nigrifascia,* lateral and medial margins convex, apex blunt. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.47 mm long, 0.67 times as long as mesonotum in Brazilian male, 4.35 mm long, 0.93 times as long as mesonotum in Panamanian male; glans 0.38 mm long in Brazilian male, 0.55 mm long in Panamanian male.

Female terminalia: Oviscape (Fig. 5) 1.79–3.00 mm long, 0.50–0.65 times as long as mesonotum; entirely orange or darker orange to moderate brown dorsally; spiracle at basal 0.37–0.44. Eversible membrane (Figs. 73–74) with 5–7 moderately long hooklike dorsobasal scales in 1–2 rows distal to 10–15 small, stout scales. Aculeus (Figs. 116–117) strongly dorsally curved more than 45° in lateral view, 1.19–2.27 mm long; in ventral view base expanded, 0.18–0.26 mm wide; shaft 0.065–0.11 mm wide at midlength; tip (Figs. 149, 173–174) 0.22–0.28 mm long, 0.065–0.11 mm wide, 2.56–4.00 times as long as wide, 0.065–0.09 mm wide in lateral view, 0.64–1.14 times ventral width, in ventral view gradually tapered, slightly more rapidly on distal half, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha furcata* is known from Panamá, French Guiana, and northern and eastern Brazil (Amazonas, Pará, Bahia, Espírito Santo).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype male (IOC, no. 1825), Brazil: Amazonas: Manaus, Rio Negro, 16 Jul 1927, J. F. Zikan [not examined, unavailable for loan].

Other specimens examined. BRAZIL: Amazonas: near Manaus, forest fragment R-1208, 3 Sep 1985, B. Klein, 1♀ (INPA USNMENT00216209); Manaus, Reserva Ducke, 7 Mar 1968, 1♀ (INPA USNMENT00216172). Bahia: Cruz das Almas, Fazenda Chapadinha, 3 Aug 1977, A. S. Nascimento, 1♂ (ESALQ USNMENT00052097); Muritiba, 14 Sep 1977, A. S. Nascimento, 1♀ (ESALQ USNMENT00052098). Pará: Belém, [no date], C. F. Baker, 1♀ (CAS USNMENT00216236). FRENCH GUIANA: La Mana [Mana River?], 1864, Mélinon, 1♂ (MNHNP USNMENT00216210). PANAMÁ: Chiriquí: La Fortuna, blacklight trap, 13–19 Aug 1977, H. Wolda, 1♀ (FSCA USNMENT00216175). Coclé: Cerro La Vieja, McPhail trap with protein lure, 12 Jun 2007, P. Rodriguez, 1♀ (MEUP). Panamá: El Cermeño, fruit fly trap, 13 Jun 1939, J. Zetek 4448, 1♂ (USNM USNMENT00052099); same, 16 Jul 1940, J. Zetek 4666, 1♂ (USNM USNMENT00052100).

Comments. The holotype and the female from Rio Cuminá, Brazil (also in IOC) described by Lima (1937b) were unavailable for loan. The examined specimens from South America match the descriptions of these specimens by Lima and Zucchi (1978), except that in the photo of the wing of the holotype in Lima (1934, fig. 28), vein M appears less curved apically than in all of the other specimens, with the ratio of cell r_{4+5} width apically to that at dm-cu approximately 1.0.

The examined specimens from Panamá are slightly larger than those from South America (mesonotum length 4.5–4.7 vs. 3.58–4.2 mm, wing length 9.4–10.1 vs. 8.0–8.7 mm) and differ slightly in vein M ratio (0.64–0.67 vs. 0.62–0.65) and cell r_{4+5} ratio (0.84–0.92 vs. 0.64–0.83, except in holotype). The terminalia in the Panamanian specimens are longer (oviscape length 3.00–3.08 vs. 1.79–2.35 mm, aculeus length 2.26–2.27 vs. 1.19–1.57 mm in specimens examined), although the Rio Cuminá, Brazil female is somewhat intermediate (aculeus 1.8 mm long according to Lima (1937b)), and the oviscape ratio is only slightly greater in the Panamanian females (0.65–0.66 vs. 0.50–0.56). The aculeus tip is stouter in the Panamanian females (Fig. 121), 2.56 times as long as wide vs. 3.0–4.0 times in the South American females (Fig. 146), but is similar in shape. The Panamanian specimens also have a brown dorsolateral mark on the subscutellum, although the mark varies in color. Further study of the specimens reported by Lima and additional material or characters is needed to determine whether the Panamanian population represents a distinct species. Pending discovery of additional information, we treat it as conspecific with other populations of *A. furcata*.

***Anastrepha fuscata*, new species**
Figs. 6, 40, 75, 118–119

Diagnosis. *Anastrepha fuscata* differs from other species of *Anastrepha* except *A. amaryllis*, *A. furcata*, and *A. robusta* in having the aculeus strongly dorsally curved. It differs from the latter two species in having a longer aculeus tip (0.38 mm long vs. 0.21–0.28 in the other 2 species). It further differs from *A. robusta* in having the wing pattern more extensively brown and the margins of the aculeus tip convex. The subscutellum has a dark brown lateral mark, which is lacking in *A. robusta* and variable in *A. furcata* (present to varying extent in Panamanian specimens). We have not examined *A. amaryllis*, but it appears to differ in having a more extensively orange wing pattern and longer terminalia (oviscape 3.43 mm long, aculeus 2.59 mm long vs. 2.3 mm and 2.1 in *A. fuscata*).

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 4–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, 1.5 times as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.60 distance to ventral facial margin.

Thorax (Fig. 6): Mostly orange with following areas white: postpronotal lobe; inverted T-shaped medial vitta, posterior part extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with dark brown band, with straight anterior margin, not extended to acrostichal seta, ending laterally at sublateral white

vitta, not extended to intra-alar seta. Subscutellum orange with dark brown dorsolateral mark; mediotergite entirely orange. Mesonotum 4.87 mm long. Scutum and scutellum entirely microtrichose; setulae orange, brownish laterally and on scutellum. Katepisternal seta weak, pale brown, 0.33 as long as anepimeral seta.

Wing (Fig. 40): Length 10.1 mm, width 4.2 mm, ratio 2.40. Apex of vein R_1 at 0.54 wing length. Cell c 1.47 times as long as pterostigma; pterostigma 3.0 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.63 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.72 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.85 times as long as anterior margin. Wing pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish; cell c yellowish basally and anteriorly, anterodistal corner brown, posteriorly with elongate medial subhyaline area; cell r_1 with small orange, distally mottled area posterior to bend in vein Sc, extended to 0.25 length of pterostigma; remainder of band in pterostigma, r_1, r_{2+3}, and br dark brown. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, not reaching vein R_{4+5} and 0.8 times as long as distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly brown, with large medial orange area broadly bordering crossvein r-m and extending into anterior 0.67 of cell dm, broadly reaching proximal margin of band in dm; posterior margin with distinct incision in cell cu_1; distal section of S-band mostly moderate brown with orange medial areas in cells r_1 and r_{2+3}, moderately broad, at apex of vein R_{2+3} 0.70 times width of cell r_{2+3}, broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 narrowly triangular, distal side slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with slender medial orange area bordering anterior 0.20 of dm-cu and extending into cell r_{4+5}, reaching R_{4+5}; proximal arm moderately broad anteriorly, gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.6 times as wide as distal arm and as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, narrowly connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Unknown.

Female terminalia: Oviscape (Fig. 6) 2.30 mm long, 0.47 times as long as mesonotum; dark orange, paler on basal half ventrally; spiracle at basal 0.48. Eversible membrane (Fig. 75) with ca. 9 moderately long hooklike dorsobasal scales in 1 irregular row distal to similar number of smaller, stouter scales. Aculeus (Fig. 118–119) slightly and gradually dorsally curved ca. 15° in lateral view, 2.10 mm long; base expanded, 0.25 mm wide; shaft 0.065–0.11 mm wide at midlength; tip (Fig. 75) 0.38 mm long, 0.09 mm wide, 4.22 times as long as wide, 0.08 mm wide in lateral view, 0.89 times ventral width, in ventral view gradually tapered, nonserrate. Spermathecae not examined.

Distribution. *Anastrepha fuscata* is known only from Peru (Huánuco).

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type Data. Holotype female (SENASA; USNMENT00212047), PERU: Huánuco: Huallaga Central, Aucayacu, Pueblo Nuevo, Puerto Angel, UTM : E 18L-0383700, N 8992958, 595 m, 18 Oct 2006, Trampa 01-01-02-022-MP.

Etymology. The name of this species is an adjective meaning dark, in reference to its dark wing pattern.

***Anastrepha isolata*, new species**
Figs. 8, 41, 76, 120–121, 150

Anastrepha pittieri: Silva & Ronchi-Teles 2000: 205 [misidentification].
Anastrepha isolata Norrbom & Korytkowski in Korytkowski 2004: 57 [*nomen nudum*; in key].

Diagnosis. *Anastrepha isolata* differs from most species of *Anastrepha* in having an extension from the base of the S-band in the middle of cell cu_1 that is connected to the proximal arm of the V-band on the posterior wing margin. It differs from other species having that wing character, except *A. pittieri*, in having vein M strongly curved apically and the C-band with a well defined, yellow or subhyaline area in cell r_1 posterior to the basal third to half of the pterostigma. It differs from *A. pittieri* in having the aculeus tip sagittate, with large serrations.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–4 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 2 times as long as ocellar tubercle. Facial carina, in profile, straight to slightly convex dorsally and medially. Antenna extended 0.7–0.8 distance to ventral facial margin.

Thorax (Fig. 8): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse quadrate area between dorsocentral setae, sometimes absent; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum sometimes slightly darker orange brown, but without brown markings. Subscutellum and mediotergite entirely orange. Mesonotum 4.15–4.31 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta weak, yellow, less than 0.40 as large as anepimeral seta.

Wing (Fig. 41): Length 9.0–9.5 mm, width 3.68–4.14 mm, ratio 2.29–2.54. Apex of vein R_1 at 0.56–0.59 wing length. Cell c 1.12–1.22 times as long as pterostigma; pterostigma 3.20–3.78 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.63–0.67 distance from bm-cu to dm-cu on vein M. Vein M strongly curved apically; cell r_{4+5} 0.62–0.67 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.69–1.92 times as long as anterior margin. Wing pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish; cell c yellowish basally and anteriorly, anterodistal 0.25–0.50 brown, posteriorly with elongate medial subhyaline or hyaline area, yellow area extending into posterobasal corner of pterostigma and across cell r_1, broadly reaching R_{2+3}, and extending distally to level of 0.50–0.67 length of pterostigma; remainder of band in pterostigma, r_1, r_{2+3}, and br dark brown except posterobasal corner of pterostigma and sometimes small paler brown or dark orange brown subapical areas in r_1 and/or r_{2+3}. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, not reaching vein R_{4+5} and 0.41–0.68 times as long as distal orange and brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly brown, with large medial orange area broadly bordering crossvein r-m and extending into anterior 0.25–0.50 of cell dm, sometimes reaching proximal margin of band in dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 broadly connected to proximal arm of V-band along wing margin; distal section of S-band orange with broad brown margins or mostly moderate brown, moderately broad, at apex of vein R_{2+3} 0.61–0.80 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular with blunt apex, distal side sometimes slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with slender medial orange area bordering anterior 0.50–0.75 of dm-cu and extending into cell r_{4+5}, usually reaching R_{4+5}; proximal arm moderately broad anteriorly, slightly gradually broadening posteriorly, with basal extension along wing margin, in one female with narrow connection to S-band in distal fourth of cell dm, at level of vein M 1.35–1.6 times as wide as distal arm and 1.0–1.55 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm relatively broad, connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Very similar to *A. fenestrella*. Lateral surstylus short, extended beyond prensisetae by ca. 2 times length of prensiseta; in lateral view posteriorly curved; in posterior view similar to *A. pittieri*,

gradually tapered to bluntly acute apex, lateral margin slightly concave, medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.80 mm long, 0.68 times as long as mesonotum; glans 0.50 mm long.

Female terminalia: Oviscape (Fig. 8) 1.96–2.01 mm long, 0.45–0.47 times as long as mesonotum; entirely orange; spiracle at basal 0.44–0.46. Eversible membrane (Fig. 76) with 16–18 hooklike dorsobasal scales in 2 irregular rows distal to similar number of shorter stouter scales in triangular pattern. Aculeus (Figs. 120–121) ventrally curved in lateral view, 1.08 mm long; in ventral view base expanded, 0.25 mm wide; shaft 0.11 mm wide at midlength; tip (Fig. 150) 0.14 mm long, 0.125 mm wide, 1.12 times as long as wide, 0.05 mm wide in lateral view, 0.4 times ventral width, in ventral view sagittate, triangular with margins straight and with large serrations to slightly beyond base, serrate part 1.14 times as long as tip, at base of serrate part distinctly flared and wider than at shaft. Spermathecae spherical.

Distribution. *Anastrepha isolata* is known from Amazonian Ecuador and Brazil (Amazonas).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (Pontificia Universidad Católica, Quito; held in trust at USNM USNMENT00054682), ECUADOR: Napo: Reserva Etnica Waorani, Onkone Gare Camp, 1 km S, Transect Ent., Trans. 9, Sta. 3, 0°39'10"S 76°26'W, 220 m, insecticidal fogging, terra firme forest, 10 Feb 1996, T. L. Erwin *et al*., Project MAXUS Lot 1483. Paratypes: BRAZIL: Amazonas: Coari, Rio Urucu, Angelim, 5°3'33"S 65°14'48"W, black light trap, 27–28 Nov 1992, P. F. Buhrnheim & N. O. Aguiar, 1♂ (INPA USNMENT00216231). ECUADOR: Napo: Reserva Etnica Waorani, Onkone Gare Camp, 1 km S, Transect Ent., Trans. 5, Sta. 6, 0°39'10"S 76°26'W, 220 m, insecticidal fogging, terra firme forest, 12 Feb 1995, T. L. Erwin *et al*., Project MAXUS lot 1045, 1♀ (USNM USNMENT00054600); same, Trans. 10, Sta. 1, 10 Feb 1996, Project MAXUS Lot 1491, 1♀ (USNM USNMENT00054603).

Etymology. The name of this species is a Latin adjective referring to the isolated hyaline area between the base of the S-band and the proximal arm of the V-band on the wing.

Anastrepha jamaicensis, new species

Figs. 42, 77, 122–123, 151–152

Anastrepha jamaicensis Norrbom & Korytkowski in Korytkowski 2004: 62 [*nomen nudum*; in key].

Diagnosis. *Anastrepha jamaicensis* is similar to *A. nigrifascia*, *A. pseudorobusta*, and *A. simulans* in having the C-band and S-band connected, vein M strongly curved apically, the S-band largely orange in cells br and dm-cu, and the aculeus straight and between 1–3 mm long with a nonserrate, awl-shaped tip about as broad in lateral view as in ventral view and between 0.2–0.4 mm long, 2.5–4.5 times as long as wide. In the key of Steyskal (1977: 25) it runs to *A. nigrifascia*. It differs from those three species in having the pterostigma distinctly darker than the brown areas of the S-band and V-band and in having the length/width ratio of the aculeus tip shorter (2.67 vs. greater than 3.0 in the other species). It further differs from *A. nigrifascia* in having the proximal arm of the V-band not interrupted nor constricted in cell r_{4+5} and the distal arm widely separated. It further differs from *A. nigrifascia* and *A. pseudorobusta* in having 2 rather than one distal row of large hooklike denticles on the eversible membrane. The terminalia are longer than those of *A. simulans* (oviscape 2.42 mm long, 0.72 times as long as mesonotum, aculeus 1.92 mm long vs. 1.7–2.08 mm, 0.43–0.53 times mesonotum length, and 1.33–1.37 mm in *A. simulans*).

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–4 frontal setae; 2 orbital setae, posterior seta well developed (only 1 on right side of holotype between normal positions of anterior and posterior setae). Ocellar seta weak, 1.5 times as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.8 distance to ventral facial margin.

Thorax: Mostly yellow to orange with following areas white or pale yellow (not well differentiated in holotype): postpronotal lobe; diffuse inverted T-shaped medial vitta, posterior part extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad dark brown band with more or less straight anterior margin, extended almost to acrostichal seta, ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.38 mm long. Scutum entirely microtrichose; setulae mostly yellow, brownish laterally. Katepisternal seta weak, medium brown, 0.40 as large as anepimeral seta.

Wing (Fig. 42): Length 7.5 mm, width 2.9 mm, ratio 2.8. Apex of vein R_1 at 0.55 wing length. Cell c 1.13 times as long as pterostigma; pterostigma 3.41 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.70 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.85 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.53 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band mostly yellowish to orange; anterodistal corner of cell c and all of pterostigma dark brown; posterior and distal margins including all of band in cell br moderate brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br moderate sized, elongate, reaching vein R_{4+5}, almost 2 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly orange with narrow brown margins in radial cells and distally in cell dm, proximal margin in cell dm orange; mostly moderate brown in cell cu_1; posterior margin without incision in cell cu_1; distal section of band orange, with broad brown margin in cell r_{2+3} and entirely brown in cell r_{4+5}; relatively broad, at apex of vein R_{2+3} 0.74 times width of cell r_{2+3}, even in width to very slightly broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular, extended to R_{4+5}, its apex aligned slightly proximal to crossvein r-m. V-band mostly brown, proximal arm broadly connected to S-band in cell r_{2+3}; proximal arm orange with narrow brown margins anterior to vein M and with slender orange area, narrowing posteriorly, bordering crossvein dm-cu; proximal arm moderately broad anteriorly, gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.5 times as wide as distal arm and 1.4 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm moderately broad, widely separated from proximal arm, extending to vein R_{4+5}.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Unknown.

Female terminalia: Oviscape 2.42 mm long, 0.72 times as long as mesonotum; entirely orange; spiracle at basal 0.41. Eversible membrane (Fig. 77) with 12 long hooklike dorsobasal scales in 2 irregular rows distal to similar number of small, stout scales. Aculeus (Fig. 122–123) straight in lateral view, 1.92 mm long; in ventral view base strongly expanded, 0.31 mm wide; shaft 0.08 mm wide at midlength; tip (Figs. 151–152) 0.24 mm long, 0.09 mm wide, 2.67 times as long as wide, 0.10 mm wide in lateral view, 1.11 times ventral width, in ventral view slightly expanded subbasally, then gradually tapered, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha jamaicensis* is known only from Jamaica.

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT00216351), JAMAICA: Saint Andrew: Barbican area, 22 Millsborough Ave., 18.0195N 76.4578W, 24 Feb 1986, R. C. Murray.

Etymology. The name of this species is a Latin adjective referring to the country of origin of the holotype.

***Anastrepha lambda* Hendel**
Figs. 43, 78, 124, 175

Anastrepha lambda Hendel 1914a: 67 [description in key, Peru]; Norrbom *et al*. 1999a: 80 [in catalog]; Norrbom *et al*. 1999b: 333 [classification].

Anastrepha lambda Hendel 1914b: 17 [preoccupied by Hendel 1914a: 67; description, wing, Peru]; Greene 1934: 164 [wing]; Lima 1934: 503; Hering 1941: 137 [in key], 139; Stone 1942a: 109; Foote 1967: 12 [in catalog]; Korytkowski & Ojeda 1970: 53; Steyskal 1977: 33; Norrbom 1985: 155 [mesonotum, aculeus tip]; Korytkowski 1997: 48 [in key]; Korytkowski 2001: 124 [type data]; Korytkowski 2004: 56 [in key].

Diagnosis. *Anastrepha lambda* and *nigrivittata* differ from all other species of *Anastrepha* in having the base of the S-band interrupted along vein Cu_1, but with a posterior extension to the wing margin in cell cu_1 that is connected to the proximal arm of the V-band. A few other species of the *robusta* group have a similar extension, but in those species the base of the S-band is uninterrupted. *Anastrepha lambda* and *nigrivittata* also differ from all other species of *Anastrepha* except *A. cordata* Aldrich by their scutal color pattern, which includes 3 pairs of dark brown vittae (Fig. 15), of which the postsutural sublateral pair is fused to a dark band on the posterior margin to form a U-shaped mark, although the band does not extend laterally to include the intra-alar seta as in *A. cordata*. *Anastrepha lambda* differs from *A. nigrivittata* in having more of the scutellum brown, longer terminalia (oviscape 3.13 mm long, 0.78 times as long as mesonotum; aculeus 2.3 mm long), and the aculeus tip longer (0.33 mm long, 2.2 times as long as wide) and with barely perceptible serrations.

Description. Mostly orange, with dark brown and white to pale yellow markings. Setae dark brown to black.

Head: Mostly yellow to orange. Frons with narrow reddish medial vitta, but without brown markings except ocellar tubercle. Median occipital sclerite with 3 moderate brown vittae, the medial one broader dorsally and extending to ocellar tubercle. 3 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, as long as ocellar tubercle. Facial carina, in profile, slightly concave dorsally and medially. Antenna extended 0.75 distance to ventral facial margin.

Thorax: Mostly yellow to orange with dark brown markings. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; apex of disk and all of sides of scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) poorly differentiated in lectotype, probably present in live or fluid preserved material. Scutum with 3 paired brown vittae; submedial vitta between acrostichal and dorsocentral lines, extended from anterior margin to slightly more than half distance from transverse suture to posterior margin, isolated, anteriorly as broad as space between vittae, narrower near midlength; narrow, mostly presutural, sublateral vitta, slightly oblique, extended almost to postsutural supra-alar seta; postsutural sublateral vitta between dorsocentral and intra-alar lines, extended anteriorly almost to transverse suture, connected to band on posterior scutal margin to form U-shaped mark; posterior band narrowest medially, extended to acrostichal seta anteriorly and broadly onto basal 0.67 of disk of scutellum (almost but not including basal seta), fading posteriorly, laterally not extended to intra-alar seta. Subscutellum and mediotergite dark brown except very narrowly medially. Posteroventral spot on anatergite and katatergite also brown. Mesonotum 4.01 mm long. Scutum entirely microtrichose; setulae mostly brownish. Katepisternal seta weak, yellowish, barely longer than setulae.

Wing (Fig. 43): Length 9.80 mm, width 3.97 mm, ratio 2.47. Apex of vein R_1 at 0.53 wing length. Cell c 1.25 times as long as pterostigma; pterostigma 3.95 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.67 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.20 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.54 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band with cell bc yellowish; cell c yellowish basally and anteriorly, posteriorly fading to subhyaline elongate medial area; pterostigma and anterodistal corner of cell c orange brown; cell r_1 proximal to fork of Rs and cell br moderate to dark brown; remainder of band in cells r_1 and r_{2+3} orange except narrow brown distal margin.

C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, reaching vein R_{4+5} but 0.52 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Base of S-band completely interrupted in cells dm and cu_1; basal section brown; medial section mostly orange with narrow brown margins, except proximal margin in cell dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1, broadly connected to proximal arm of V-band along wing margin; distal section of S-band orange with brown margins, moderately broad, at apex of vein R_{2+3} 0.76 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular with blunt apex, distal side slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, separated from S-band along vein R_{4+5}; proximal arm with slender medial orange area bordering anterior 0.67 of dm-cu and extending slightly into cell r_{4+5}; moderately broad anteriorly, gradually broadening posteriorly, at level of vein M 1.23 times as wide as distal arm and about as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm moderately broad.

Abdomen: Mostly orange. Syntergite 1+2 with diffuse moderate brown sublateral mark on distal half ca. 0.25 width of tergite, tergites 3 and 4 with similar but progressively paler sublateral brownish areas.

Male terminalia: Unknown.

Female terminalia: Oviscape 3.13 mm long, 0.78 times as long as mesonotum; entirely orange brown; spiracle at basal 0.39. Eversible membrane (Fig. 78) with ca. 15 relatively short, stout, hooklike dorsobasal scales in 2–3 rows distal to similar number of shorter stouter scales in triangular pattern. Aculeus (Fig. 124) slightly ventrally curved in lateral view, 2.30 mm long; in ventral view base 0.36 mm wide; shaft 0.17 mm wide at midlength; tip (Fig. 175) 0.33 mm long, 0.15 mm wide, 2.2 times as long as wide, 0.11 mm wide in lateral view, 0.73 times ventral width, in ventral view elongate triangular, apical 0.39 with barely perceptible serrations. Spermathecae spherical.

Distribution. *Anastrepha lambda* is known only from Amazonian Peru.

Biology. The host plants and other aspects of the biology of *A. lambda* are unknown.

Type Data. Lectotype female [here designated] of *lambda* Hendel 1914a and holotype female of *lambda* Hendel 1914b (SMT USNMENT00216173), with following labels: “Peru Pinipini, O. Garlepp c.” [green]; “Coll. W. Schnuse 1911 – 3” [green]; “Typus Anastrepha lambda Hend” [red]; “Anastrepha lambda H. [Hendel’s writing] det. Hendel”; “LECTOTYPE ♀ Anastrepha lambda Hendel 1914a: 67 by Norrbom & Korytkowski” [Norrbom’s writing]. This species was twice described as a new species by Hendel (1914a, b), but as neither description mentions the other, technically there are two available names that are primary homonyms. The 1914a name, included in Hendel’s key but not extensively described, was based on specimens (number, sex, and depository unstated) from Peru. The 1914b name was based on a single female (holotype by monotypy) from “Peru, Pini-Pini, Dresd. Mus.” To avoid any possible confusion about the status of these names, the holotype of *lambda* Hendel 1914b is here designated as lectotype of *lambda* Hendel 1914a. The type locality is presumably the Río Piñipiñi on or near the border of Cusco and Madre de Dios Departments. According to Papavero (1973), Otto Garlepp collected with Schnuse in Chile, Bolivia and Peru during 1902–1904. The above locality is not mentioned in Schnuse’s itinerary, but the closest places listed were visited in July and August, 1903.

***Anastrepha miza*, new species**

Figs. 44, 79, 125, 153

Diagnosis. This species is very similar to *A. rojasi* and especially *A. binodosa*, which have very similar aculeus tips with two pairs of ridges that project in ventral view as small lateral protuberances. In the key of Steyskal (1977) it runs to *A. binodosa*. It differs from *A. rojasi* in having orange to red brown setae (dark red brown to black in *rojasi*) and the hyaline area in cell br large, 1.0–1.5 times as long as the distal colored area

of the cell (0.33–0.64 times as long in *rojasi*), and from both species in terminalia length (oviscape 2.65–2.84 mm long, 0.90–0.93 times as long as mesonotum, aculeus 2.01–2.17 mm long vs. 2.9–3.45 mm long, 0.73–0.86 times mesonotum length, and 2.6–3.0 mm in *A. rojasi* and 4.79–5.70 mm long, 1.10–1.36 times mesonotum length, and 4.28–5.00 mm in *A. binodosa*).

Description. Mostly yellow to orange, with white to pale yellow markings. Setae orange to red brown.

Head: Yellow to orange except brown ocellar tubercle. 2–3 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, 1.0–1.5 times as long as ocellar tubercle. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.6–0.8 distance to ventral facial margin.

Thorax: Mostly orange with following areas white or pale yellow (poorly differentiated in the dried specimens examined): postpronotal lobe; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Scutum orange medially, without pale vitta; posterior margin sometimes with broad slightly darker orange band, with straight anterior margin, not extended beyond acrostichal seta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.43–3.90 mm long. Scutum entirely microtrichose; setulae yellow to orange. Katepisternal seta undifferentiated or small, weak, and yellowish.

Wing (Fig. 44): Length 8.3–9.3 mm, width 3.5–3.94 mm, ratio 2.36–2.57. Apex of vein R_1 at 0.57–0.59 wing length. Cell c 0.97–1.03 times as long as pterostigma; pterostigma 3.7–4.3 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65–0.69 distance from bm-cu to dm-cu on vein M. Vein M slightly curved apically; cell r_{4+5} 0.93–1.02 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.55–1.89 times as long as anterior margin. Wing pattern mostly orange. C-band with cells bc and c mostly yellowish, cell c posteriorly sometimes with elongate subhyaline area; pterostigma pale brown, except posterobasal corner, and portions of distal and posterior margins of band in cells br, r_1 and r_{2+3} narrowly pale brown. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br large, reaching vein R_{4+5}, more elongate anteriorly, 0.9–1.2 times as long as distal colored area of cell; cell dm with basal hyaline area moderate sized. S-band with margins narrowly pale brown, except proximal margin in cell dm orange, posterior margin of basal part broadly pale brown in cells dm and especially cu_1 and with small incision in cell cu_1; distal section relatively broad, at apex of vein R_{2+3} 0.63–0.77 times width of cell r_{2+3}, even in width or slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3} or extending slightly into cell r_1. Hyaline basomarginal spot in cell r_1 subtriangular, often with blunt apex, extended to vein R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly pale brown, proximal arm with medial orange area from connection with S-band to anterior 0.75 to entire length of dm-cu; broadly connected to S-band in cell r_{2+3}; proximal arm moderately broad, gradually and slightly broadening posteriorly to vein Cu_1, and with broad basal entension along wing margin, at level of vein M 1.6–1.8 times as wide as distal arm, 0.9–1.0 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Similar to *A. rojasi* (Figs. 209–210). Lateral surstylus very short, extended beyond prensisetae by 0.5 times length of prensiseta; in lateral view tapered to very slightly posteriorly curved, acute apex; in posterior view gradually tapered to blunt apex, ventrolateral margin less produced than in *A. rojasi*. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 4.0 mm long, 1.17 times as long as mesonotum; glans 0.52 mm long.

Female terminalia: Oviscape 2.65–2.84 mm long, 0.90–0.93 times as long as mesonotum; entirely orange; spiracle at basal 0.32–0.39. Eversible membrane (Fig. 79) with 50–60 long slender hooklike dorsobasal scales in 3–4 irregular transverse rows separated from minute basal denticles by several rows of weakly sclerotized to membranous smaller thin more widely spaced scales. Aculeus (Fig. 125) straight to slightly ventrally curved in lateral view, 2.01–2.17 mm long; in ventral view base expanded, 0.22–0.24 mm wide; shaft ca. 0.07 mm wide at midlength; tip (Fig. 153) 0.38–0.39 mm long, 0.07–0.075 mm wide, 5.07–5.57 times as long as

wide, 0.03 mm wide in lateral view, 0.40–0.43 times ventral width, in ventral view with 2 pairs of small lateral protuberances, 1 subbasal, the other near distal fourth, both continuing on dorsal side as weak ridges; parallel-sided until distal protuberances then slightly expanded and gradually tapered to blunt apex, distal 0.26–0.29 very finely serrate, sides of serrate part slightly convex. Spermathecae spherical.

Distribution. *Anastrepha miza* is known only from southeastern Venezuela (Bolívar).

Biology. The host plants and other aspects of the biology of this species other than date of capture of adults are unknown.

Type Data. Holotype female (IZAM USNMENT000214908), VENEZUELA: Bolívar: Alto Caura, Cuchime, 12 Apr 1963, Exp. "La Salle". Paratypes: same data as holotype, 1♂ 1♀ (IZAM USNMENT000214909-10), 1♀ (USNM USNMENT000214907).

Etymology. The name is a noun in apposition formed from an arbitrary combination of letters referring to a common acronym for the institution in which the type series was preserved. It is dedicated to the many scientists and collectors who built that superb collection.

Anastrepha nigra, new species

Figs. 10, 45–46, 80–81, 126–127, 154, 201–202

Anastrepha nigra Norrbom & Korytkowski in Korytkowski 2004: 57 [*nomen nudum*; in key].

Diagnosis. *Anastrepha nigra* differs from most species of *Anastrepha* in having a posterior extension from the basal part of the S-band to the wing margin in the middle of cell cu_1 that is connected to the proximal arm of the V-band along the wing margin. It differs from the other species having that wing character in having the wing pattern more extensively brown, including the C-band in cells r_1 and r_{2+3} posterior to pterostigma entirely brown. It is similar to *A. partita* in having a very slender aculeus with a short tip, but *A. partita* has shorter terminalia with the distal part of the aculeus tip less distinctly constricted. In *A. nigra* the oval distal part is strongly ventrally projected and demarcated by ridges. *Anastrepha nigra* also differs from *A. partita* in that the orange area bordering crossvein dm-cu does not extend into cell r_{4+5} or is absent. Other useful diagnostic characters include: mesonotum and abdomen without brown markings; C-band and S-band and S-band and V-band broadly connected; and vein M only slightly curved apically, cell r_{4+5} 1.13–1.31 times as wide at apex as at level of dm-cu.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae orange to dark red brown.

Head: Yellow to orange except brown ocellar tubercle. 3–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 1.5 times as long as ocellar tubercle. Facial carina, in profile, straight or slightly convex dorsally and medially. Antenna extended 0.75–0.85 distance to ventral facial margin.

Thorax (Fig. 10): Without brown markings. Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; paired sublateral scutal vitta from transverse suture to posterior margin, including base of intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Scutum orange medially, without pale vitta; posterior margin without darker band. Subscutellum and mediotergite entirely orange. Mesonotum 3.87–4.36 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta weak, less than half as large as anepimeral seta.

Wing (Figs. 45–46): Length 8.95–10.2 mm, width 3.75–4.1 mm, ratio 2.29–2.55. Apex of vein R_1 at 0.50–0.55 wing length. Cell c 1.20–1.41 times as long as pterostigma; pterostigma 2.78–4.23 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65–0.68 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.13–1.31 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.55–1.70 times as long as anterior margin. Wing

pattern mostly moderate to dark brown. C-band with cell bc yellowish to subhyaline; cell c yellowish, slightly darker basally, distal 0.33–0.67 anteriorly dark brown, yellow area extended into posterobasal 0.20–0.33 of pterostigma and narrowly into adjoining part of cell r_1; remainder of band in pterostigma, cells r_1, r_{2+3}, and br, except base of br, dark brown or occasionally with small, irregular orange areas subapically in r_1 and r_{2+3}. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br relatively small, usually reaching vein R_{4+5}, and 1.00–1.25 times as long as distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band dark brown except for large medial orange area from anterior end of r-m to or almost to vein Cu_1, proximal margin in cell dm without brown margin; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 broadly connected to proximal arm of V-band along wing margin; distal section of S-band dark brown, usually with small orange area in cell r_{2+3} proximal to connection with V-band, and with large orange medial area distally, moderately broad, at apex of vein R_{2+3} 0.73–0.83 times width of cell r_{2+3}, even in width or very slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it usually ending at vein R_{2+3} (narrowly separated from vein in 2 females). Hyaline basomarginal spot in cell r_1 triangular with blunt apex, distal side slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm usually with very narrow medial orange area bordering most or all of dm-cu but not extending into cell r_{4+5}; moderately broad anteriorly, gradually slightly broadening posteriorly, at level of vein M 1.6–2.33 times as wide as distal arm and 0.87–1.36 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, sometimes broader basally.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 201–202): Lateral surstylus short, extended beyond prensisetae by ca. 1.5 times length of prensiseta; in lateral view posteriorly curved to bluntly triangular apex; in posterior view gradually tapered to blunt apex, lateral margin slightly concave, medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 6.49–7.00 mm long, 1.51–1.71 times as long as mesonotum; glans 0.45–0.54 mm long.

Female terminalia: Oviscape (Fig. 10) 4.07–4.83 mm long, 1.05–1.13 times as long as mesonotum; distal 0.40 or more brown; spiracle at basal 0.24–0.28. Eversible membrane (Figs. 80–81) with 12–15 long slender hooklike dorsobasal scales in 1–2 irregular rows separated from minute basal denticles by several rows of weakly sclerotized small more widely spaced scales. Aculeus (Figs. 126–127) slightly ventrally curved in lateral view, 4.02–4.06 mm long; in ventral view base 0.18–0.20 mm wide; shaft 0.04–0.05 mm wide at midlength; tip (Fig. 154) 0.09–0.12 mm long, 0.03–0.045 mm wide, 2.25–2.78 times as long as wide, 0.03–0.04 mm wide in lateral view, 0.87–0.89 times ventral width, in ventral view with strong subbasal constriction, distal 0.70–0.78 oval, produced ventrally, lateral margin irregular but nonserrate. Spermathecae spherical.

Distribution. *Anastrepha nigra* is known only from Panamá.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (National Museum of Natural History, Washington, USNMENT00215494), PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora [9°15'28"N 79°21'24"W], Lote H4, McPhail trap 567, 28 Jul 2000, C. A. Korytkowski. Paratypes: PANAMÁ: Panamá: Altos de Pacora, 1998, 2♂ (USNM USNMENT00214872-73); Altos de Pacora, Chayotera, 10 Jul 1998, trap 547, 1♀ (MEUP); same, trap 548, 13 Jul 2001, 1♂ (MEUP); Altos de Pacora, Lote H4, Lote H4, McPhail trap 567, 28 Jul 2000, C. A. Korytkowski, 1♂ 4♀ (USNM USNMENT00215489-93); Altos de Pacora, trap 551, 14 Aug 1997, 1♀ (MEUP USNMENT00214902); same, trap 537, 14 Aug 1997, 2♂ (USNM USNMENT00215487-88); same, 14 Aug 1997, trap 567, 1♀ (MEUP); Altos de Pacora, Migdalia Fuentes, McPhail trap 542, 22 Jul 1997, C. A. Korytkowski, 1♀ (MEUP); Altos de Pacora, Villa Myrtha, McPhail trap 519, 25 Jul 2000, C. A. Korytkowski, 2♀ (MEUP USNMENT00214903-04).

Etymology. The name of this species is a Latin adjective referring to the dark wing pattern.

***Anastrepha nigrifascia* Stone**
Figs. 9, 47–49, 82–83, 98, 128–129, 155, 176–177, 186, 203–204

Anastrepha nigrifascia Stone 1942a: 91 [description, wing, aculeus tip, host plants, USA: Florida]; Foote 1965: 673 [in catalog]; Wasbauer 1972: 107 [host list]; Weems 1967: 1 [review]; Steyskal 1977: 25 [in key]; Norrbom 1985: 147 [female terminalia, male terminalia, egg, host list]; Norrbom & Kim 1988: 40 [host list]; Norrbom & Foote 1989: 20 [egg]; Foote *et al*. 1993: 100 [review]; Korytkowski 1997: 66 [in key]; Norrbom *et al*. 1999a: 81 [in catalog, Bahamas]; Norrbom *et al*. 1999b: 316 [male terminalia, eversible membrane, classification]; Korytkowski 2004: 62 [in key]; Norrbom 2004 [host database].

Diagnosis. *Anastrepha nigrifascia* is similar to *A. jamaicensis*, *A. simulans*, and *A. pseudorobusta* in having the C-band and S-band connected, vein M strongly curved apically, the S-band largely orange in cells br and dm-cu, and the aculeus straight and between 1–3 mm long with a nonserrate, awl-shaped tip about as broad in lateral view as in ventral view and between 0.2–0.4 mm long, 2.5–4.5 times as long as wide. It differs from those three species in having large nonmicrotrichose areas on the scutum and the proximal arm of the V-band interrupted or constricted in cell r_{4+5}. It further differs from *A. jamaicensis* and *A. simulans* in having only one distal row of large hooklike denticles on the eversible membrane. It further differs from *A. pseudorobusta* in having shorter terminalia and a shorter aculeus tip.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark orange brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–7 (usually 4–5) frontal setae; 2 (rarely 3) orbital setae, posterior seta well developed. Ocellar seta weak, at most 1.5 times as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.60–0.80 distance to ventral facial margin.

Thorax (Fig. 9): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; inverted T-shaped medial vitta, posterior part extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; most or all of scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad dark brown band with more or less straight anterior margin, sometimes extended to but not completely including acrostichal seta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Scutellum with disc entirely white or yellow, often (especially in Bahamian specimens) with basal third or more of side (at most extending to apical seta) orange to medium brown. Subscutellum and mediotergite entirely orange. Mesonotum 2.87–3.40 mm long. Scutum largely nonmicrotrichose, microtrichia present medially (between acrostichal lines at and anterior to transverse suture, gradually broadening posteriorly to intra-alar seta) and laterally (on and lateral to sublateral vitta); setulae mostly yellow to orange, brownish laterally, or mostly brownish. Katepisternal seta weak, yellow to medium brown, at most 0.40 as large as anepimeral seta.

Wing (Figs. 47–49): Length 5.98–7.10 mm, width 2.4–2.9 mm, ratio 2.43–2.96. Apex of vein R_1 at 0.55–0.57 wing length. Cell c 1.22–1.38 times as long as pterostigma; pterostigma 3.14–4.10 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.64–0.69 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.83–0.94 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.50–1.64 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band mostly orange; cells bc and c yellowish, cell c posteriorly with elongate subhyaline nonmicrotrichose area, anterodistal corner of cell c and all of pterostigma moderate brown; cells r_1, br, and r_{2+3} orange except posterior and distal margins partially narrowly moderate brown. C-band and S-band narrowly connected along vein R_{4+5}, hyaline area in cell br large, elongate, reaching vein R_{4+5}, 1.5–3 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band relatively narrow, mostly orange, usually with narrow brown margins in radial cells and distally

in cell dm, proximal margin in cell dm orange; mostly moderate brown in cell cu_1; posterior margin with or without small incision in cell cu_1; distal section of band orange with brown margin in cell r_1, occasionally extending into cell r_{2+3}, entirely brown distally; relatively broad, at apex of vein R_{2+3} 0.71–0.93 times width of cell r_{2+3}, distinctly broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}, often narrowed or rarely narrowly divided along vein R_{4+5}. Hyaline basomarginal spot in cell r_1 triangular, often narrow and/or with blunt apex, usually extended to R_{4+5} (occasionally narrowly separated from vein), its apex aligned proximal to crossvein r-m. V-band entirely brown, proximal arm narrowed or more commonly interrupted in middle of cell r_{4+5}, at least distal arm narrowly connected to S-band in cell r_{2+3}; proximal arm moderately broad anteriorly, gradually slightly broadening posteriorly, without or with short basal extension along wing margin, at level of vein M 1.0–1.5 times as wide as distal arm and 0.9–1.3 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm moderately broad, often narrowed anteriorly.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 203–204): Lateral surstylus short, extended beyond prensisetae by ca. 0.5 times length of prensiseta; in lateral view with apex blunt or with posterodistal margin concave; in posterior view lateral and medial margins convex, apex blunt. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.65–2.99 mm long, 0.84–0.92 times as long as mesonotum; glans 0.37–0.41 mm long.

Female terminalia: Oviscape (Fig. 9) 1.91–2.23 mm long, 0.61–0.69 times as long as mesonotum; entirely orange; spiracle at basal 0.40–0.48. Eversible membrane (Figs. 82–83, 98) with 6–9 moderately long hooklike dorsobasal scales in 1 irregular row distal to similar number of small, stout scales. Aculeus (Figs. 128–129) straight in lateral view, 1.50–1.74 mm long; in ventral view base 0.21–0.29 mm wide; shaft 0.065–0.075 mm wide at midlength; tip (Figs. 155, 176–177, 186) 0.22–0.26 mm long, 0.070–0.075 mm wide, 3.29–3.71 times as long as wide, 0.07–0.08 mm wide in lateral view, 1.0–1.14 times ventral width, in ventral view parallel-sided or very slightly expanded subbasally, then gradually tapered to relatively blunt apex, nonserrate. Spermathecae spherical.

Egg (1 dissected from abdomen of female USA: Key Largo, USNMENT00216379): Very slender, 2.23 mm long, 0.13 mm wide at broadest point, slightly curved, subcylindrical, posterior end only slightly tapered. Anterior end with elongate lobe distal to micropyle 0.45 times as long as main part of egg.

Distribution. *Anastrepha nigrifascia* is known from the extreme southeastern USA (Florida Keys) and the Bahamas.

Biology. Stone (1942a) reported two species of *Manilkara* (Sapotaceae) as host plants of *A. nigrifascia*: *M. jaimiqui* (C. Wright) Dubard ssp. *emarginata* (L.) Cronquist [as *Mimusops emarginata*], and *M. zapota* (L.) P. Royen [as *Achras zapota*]. Only the former species is native to the known range of *A. nigrifascia*. The record from mango, *Mangifera indica* L., by Wasbauer (1972), based only on larvae and citing an unpublished list of R. H. Foote, is doubtful.

Type Data. Holotype female (USNM, USNMENT000104284), USA: Florida: Big Pine Key, fruit fly trap, 21 May 1935, G. B. Merrill, SPB Fla 55661 [examined].

Other specimens examined. BAHAMAS: Grand Bahama Island, Freeport, McPhail trap, 8 May 1990, H. Knowles, 1♂ (USNM USNMENT00216342); Freeport, E end, Parker Groves, McPhail trap in guava tree, 9 Jun 1986, 1♂ 1♀ (USNM USNMENT00216343, USNMENT00216378); Hawksbill, McPhail trap in *Annona*, 11 Jun 1986, 1♂ (USNM USNMENT00216341); Holmes Rock, McPhail trap in *Manilkara zapota*, Jun 1986, 4♂ 4♀ (USNM USNMENT00216335-40, USNMENT00216352, USNMENT00216355). UNITED STATES: Florida: Big Pine Key, fruit fly trap, 17 May 1935, G. B. Merrill, 9♂ 5♀ paratypes (USNM); same, 21 May 1935, 5♂ 5♀ paratypes (USNM); same, 14 May 1935, 3♂ 5♀ paratypes (USNM); same, 24–28 May 1935, J. F. Cooper, 1♂ 1♀ paratypes (USNM); same, 28 May 1935, J. F. Cooper, 11♂ 12♀ paratypes (USNM); same, in McPhail trap, 19 Apr 1935, J. C. Bell, 1♂ (FSCA); same, 3 May 1935, G. D. Barcus, 1♀ (FSCA); same, 10 May 1935, 5♀ (FSCA); same, 21 May 1935, 11♂ 6♀ (FSCA); same, 25 May 1935, Barcus & Cruz, 1♂ (FSCA); Boca Chica Key, 11 May 1935, J. C. Bell, 1♂ (FSCA); same, fruit fly trap, 15 May

1935, G. B. Merrill, 1♀ paratype (USNM); Cudjoe Key, fruit fly trap, 20 May 1935, G. B. Merrill, 3♂ 3♀ paratypes (USNM); same, in McPhail trap, 9 May 1935, J. C. Bell, 1♀ (FSCA); same, 16 May 1935, 6♂ 1♀ (FSCA); same, 20 May 1935, 5♂ 4♀ (FSCA); Key Largo, in McPhail trap, 1 Jul 1935, A. S. Mason, 1♀ (FSCA); same, 13 Jul 1936, Stirling & Barcus, 1♀ (FSCA); same, 16 Dec 1936, G. D. Barcus, 1♂ (FSCA); Key West, trap in guava tree, 26 Jan 1934, Sealy & Bragassa, 1♀ paratype (USNM); same, in McPhail trap, 19 Jan 1934, J. H. Sealey, 1♀ (FSCA); same, 3 May 1935, 1♀ (FSCA); same, 29 Jun 1935, J. Menendez, 1♀ (FSCA); Lower Matecumbe Key, in McPhail trap, 24 May 1935, A. S. Mason, 1♂ (FSCA); No Name Key, at *Achras zapota*, 26 Jan 1936, J. F. Cooper, 1♀ (FSCA); same, 7 Feb 1936, J. F. Cooper, 1♂ (FSCA); No Name Key, in McPhail trap, 22 Apr 1935, J. H. Sealey, 1♂ (FSCA); same, 20 May 1935, G. D. Barcus, 2♂ 2♀ (FSCA); same, 13 May 1935, Barcus & Cruz, 1♂ 1♀ (FSCA); same, 14 May 1935, 1♂ (FSCA); same, 16 May 1935, 2♂ (FSCA); same, 26 May 1935, 1♂ 1♀ (FSCA); same, 17 Aug 1935, Barcus & Moore, 1♀ (FSCA); No Name Key, emerged 2 Jun 1935 reared ex *Mimusops emarginata*, J. F. Cooper, 7♂ paratypes (USNM); same, emerged 3 Jun 1935, 14♂ 9♀ paratypes (USNM); Stock Island, in McPhail trap, 18 May 1935, J. H. Sealey, 1♂ (FSCA); same, 21 May 1935, 1♂ (FSCA); same, 6 May 1935, A. Bragassa & R. K. Johnson, 1♂ 1♀ (FSCA); same, 3 Aug 1936, Herring & Hume, 1♀ (FSCA); Stock Island, at *Mimusops emarginata*, 6 May 1935, R. K. Johnson, 2♂ (FSCA); same, 15 May 1935, Hart & Cooper, 1♂ 1♀ (FSCA); Sugarloaf Key, in McPhail trap, 16 May 1935, J. C. Bell, 1♂ (FSCA); same, 20 May 1935, 1♂ (FSCA); Sugarloaf Key, fruit fly trap, 15 May 1935, G. B. Merrill, 1♂ paratype (USNM); Torch Key, in McPhail trap, 21 May 1936, J. C. Bell, 1♀ (FSCA).

***Anastrepha nigrivittata*, new species**
Figs. 15, 50, 84, 130, 156, 178

Anastrepha nigrivittata Norrbom & Korytkowski in Korytkowski 2004: 56 [*nomen nudum*; in key].

Diagnosis. *Anastrepha lambda* and *nigrivittata* differ from all other species of *Anastrepha* in having the base of the S-band interrupted along vein Cu_1, but with a posterior extension to the wing margin in cell cu_1 that is connected to the proximal arm of the V-band. A few other species of the *robusta* group have a similar extension, but in those species the base of the S-band is uninterrupted. *Anastrepha lambda* and *nigrivittata* also differ from all other species of *Anastrepha* except *A. cordata* Aldrich by their scutal color pattern, which includes 3 pairs of dark brown vittae (Fig. 15), of which the postsutural sublateral pair is fused to a dark band on the posterior margin to form a U-shaped mark, although the band does not extend laterally to include the intra-alar seta as in *A. cordata*. *Anastrepha nigrivittata* differs from *A. lambda* in having less of the scutellum brown, shorter terminalia (oviscape 2.01 mm long, 0.52 times as long as mesonotum; aculeus 1.35 mm long), and the aculeus tip shorter (0.15 mm long, 1.2 times as long as wide) and with more distinct serrations.

Description. Mostly yellow to orange, with dark brown and white to pale yellow markings. Setae dark red brown to dark brown.

Head: Mostly yellow to orange. Frons with diffuse oval brown mark anteriorly, but otherwise without brown markings except ocellar tubercle. Median occipital sclerite with 3 moderate brown vittae and with medial brown spot dorsally, connected to brown area on ocellar tubercle, almost connected to medial vitta. 3 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, 1.5 times as long as ocellar tubercle. Postocellar seta absent. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.85 distance to ventral facial margin.

Thorax (Fig. 15): Mostly yellow to orange with dark brown markings. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; apical 0.67 of disk and all of sides of scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) poorly differentiated in holotype, probably present in live or fluid preserved material. Scutum with 3 paired brown vittae; submedial vitta between acrostichal and dorsocentral lines,

extended from anterior margin to 0.60 distance from transverse suture to posterior margin, isolated, anteriorly almost as broad as space between vittae, narrower near midlength; narrow, mostly presutural, sublateral vitta, slightly oblique, extended almost to postsutural supra-alar seta; postsutural sublateral vitta between dorsocentral and intra-alar lines, extended anteriorly almost to transverse suture, connected to band on posterior scutal margin to form U-shaped mark; posterior band narrowest medially, extended almost to acrostichal seta anteriorly and broadly onto basal third of disk of scutellum (but not including basal seta), fading posteriorly, lateral margin extended almost to intra-alar seta. Subscutellum and mediotergite dark brown except very narrowly medially. Posteroventral spot on anatergite and katatergite also brown. Mesonotum 3.85 mm long. Scutum entirely microtrichose; setulae mostly brownish. Katepisternal seta weak, yellowish, twice as long as setulae.

Wing (Fig. 50): Length 9.40 mm, width 3.96 mm, ratio 2.37. Apex of vein R_1 at 0.53 wing length. Cell c 1.22 times as long as pterostigma; pterostigma 3.87 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.65 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.14 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.61 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band with cell bc yellowish to subhyaline; cell c yellowish basally, anteriorly and distally, fading to subhyaline posteromedially; anterodistal corner of cell c and all of pterostigma orange brown, cell r_1 proximal to fork of Rs, cell br and narrow distal margin in cells r_1 and r_{2+3} moderate brown; remainder of band in cells r_1 and r_{2+3} orange. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, reaching vein R_{4+5} but 0.40 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Base of S-band completely interrupted in cells dm and cu_1; basal section brown; medial section mostly orange with narrow brown margins, except proximal margin in cell dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1, broadly connected to proximal arm of V-band along wing margin; distal section of S-band orange with broad brown margins, moderately broad, at apex of vein R_{2+3} 0.67 times width of cell r_{2+3}, even in width, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular with blunt apex, distal side slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, separated from S-band along vein R_{4+5}; proximal arm with small medial orange area bordering anterior 0.60 of dm-cu and extending slightly into cell r_{4+5}; moderately broad anteriorly, gradually very slightly broadening posteriorly, at level of vein M ca. 2 times as wide as distal arm and as broad as hyaline area proximal to it in cells r_{4+5} and dm; distal arm relatively broad and straight.

Abdomen: Mostly orange brown. Base and narrow lateral margin of syntergite 1+2, and narrow medial vitta on syntergite 1+2 and tergite 3 yellow.

Male terminalia: Unknown.

Female terminalia: Oviscape 2.01 mm long, 0.52 times as long as mesonotum; entirely orange; spiracle at basal 0.42. Eversible membrane (Fig. 84) with ca. 15 relatively short, stout, hooklike dorsobasal scales distal to similar number of smaller stouter scales in triangular pattern. Aculeus (Fig. 130) slightly ventrally curved in lateral view, 1.35 mm long; in ventral view base expanded, 0.28 mm wide; shaft 0.12 mm wide at midlength; tip (Figs. 156, 178) 0.15 mm long, 0.125 mm wide, 1.2 times as long as wide, 0.07 mm wide in lateral view, 0.56 times ventral width, in ventral view broadly triangular with sides very slightly convex, apical 0.53 finely serrate. Spermathecae spherical.

Distribution. *Anastrepha nigrivittata* is known only from Guyana.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT00052101), GUYANA: Mazaruni-Potaro: Takutu Mountains, 6°15'N 59°5'W, 19 Dec 1983, W. E. Steiner & P. J. Spangler.

Etymology. The name of this species is a Latin adjective referring to the dark stripes on the scutum.

***Anastrepha partita*, new species**
Figs. 51, 85, 131, 157–158

Anastrepha nigra Norrbom & Korytkowski in Korytkowski 2004: 57 [*nomen nudum*; in key].

Diagnosis. *Anastrepha partita* differs from most species of *Anastrepha* in having a posterior extension from the basal part of the S-band to the wing margin in the middle of cell cu_1 that is connected to the proximal arm of the V-band along the wing margin. It differs from the other species having that wing character by the following combination of characters: mesonotum and abdomen without brown markings; C-band and S-band and S-band and V-band broadly connected; vein M only slightly curved apically, cell r_{4+5} 1.09 times as wide at apex as at level of dm-cu; proximal arm of V-band with orange area bordering crossvein dm-cu broad and extending anteriorly to apex of band; does not extend into cell r_{4+5}; and C-band in cells r_1 and r_{2+3} posterior to pterostigma with orange subapical area. *A. partita* is similar to *A. nigra* in having a very slender aculeus with a short tip, but *A. nigra* has longer terminalia with the distal part of the aculeus tip more distinctly constricted.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae orange to orange brown.

Head: Yellow to orange except brown ocellar tubercle. 3–4 frontal setae; 2 orbital setae, posterior seta well developed (frons setae lost on holotype, but size estimated from size of alveoli). Ocellar seta weak, small. Facial carina, in profile, straight dorsally and medially. Antenna extended 0.70 distance to ventral facial margin.

Thorax: Without brown markings. Mostly yellow to orange. Typical white or pale yellow areas (postpronotal lobe; paired sublateral scutal vitta from transverse suture to intra-alar seta; medial scutal vitta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite) not well differentiated in holotype, probably present in live or fluid preserved material. Scutum orange medially, apparently without pale vitta; posterior margin without darker band. Subscutellum and mediotergite entirely orange. Mesonotum 3.82 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta weak, only twice as long as setulae, yellow.

Wing (Fig. 51): Length 8.58 mm, width 3.72 mm, ratio 2.31. Apex of vein R_1 at 0.54 wing length. Cell c 1.35 times as long as pterostigma; pterostigma 3.02 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.66 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.09 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.67 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band with cell bc yellowish; cell c yellowish, base and anterior margin slightly darker, anterior margin brown distally, yellow area extended into posterobasal fifth of pterostigma and narrowly into adjoining part of cell r_1; remainder of pterostigma and distal margin in cells r_1 and r_{2+3} moderate brown; section of br, r_1 and r_{2+3} between fork of R_1 and Rs to level of midlength of pterostigma darker brown, somewhat mottled; subapical areas in r_1 and r_{2+3} orange. C-band and S-band broadly connected along vein R_{4+5}; cell dm with basal hyaline area small but broadly reaching vein Cu_1. Basal half of S-band mostly orange anterior to vein Cu_1, with brown margins except for proximal margin in cell dm; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 broadly connected to proximal arm of V-band along wing margin; distal section of S-band orange with broad brown margins, moderately broad, at apex of vein R_{2+3} 0.78 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular with blunt apex, distal side slightly elongated, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, broadly connected to S-band in cell r_{2+3}, brown except orange apex, connection to S-band, and broad medial area in proximal arm from R_{4+5} almost to posterior end of dm-cu; proximal arm broad anteriorly, gradually slightly broadening posteriorly, at level of vein M 1.6 times as wide as distal arm and hyaline area proximal to it in cells r_{4+5} and dm; distal arm broad and nearly straight.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Unknown.

Female terminalia: Oviscape 3.58 mm long, 0.94 times as long as mesonotum; distal half brown; spiracle at basal 0.29. Eversible membrane (Fig. 85) with ca. 15 slender, sclerotized, hooklike dorsobasal scales in 2 irregular rows distal to several rows of shorter, weakly sclerotized scales. Aculeus (Fig. 131) ventrally curved in lateral view, 2.76 mm long; in ventral view base 0.18 mm wide; shaft 0.04 mm wide at midlength; tip (Figs. 157–158) 0.08 mm long, 0.03 mm wide, 2.67 times as long as wide, 0.03 mm wide in lateral view, 1.0 times ventral width, in ventral view with basal constriction, elongate oval, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha partita* is known only from the Amazon region.

Biology. The host plants and other aspects of the biology of this species are unknown.

Type Data. Holotype female (BMNH USNMENT00052108), with only the following labels: "Amazons." and "Trypeta ethalea Walker". There is no accession label. The type locality is presumably in Brazil: Pará or Amazonas or Peru: Loreto.

Etymology. The name of this species is a Latin adjective referring to the divided hyaline areas of the wing.

Anastrepha phaeoptera Lima

Figs. 52, 205

Anastrepha phaeoptera Lima 1937a: 38 [description, wing, male terminalia, host, Brazil: Bahia]; Stone 1942a: 92; Foote 1967: 14 [in catalog]; Steyskal 1977: 8; Zucchi 1978: 74; Norrbom 1985: 172; Korytkowski 1997: 47 [in key]; Kovaleski *et al*. 1999: 232 [Brazil: Rio Grande do Sul]; Norrbom *et al*. 1999a: 81 [in catalog]; Norrbom *et al*. 1999b: 334 [classification]; Zucchi 2000a: 21 [in key]; Zucchi 2000b: 46 [in host list]; Nacimento & Carvalho 2000: 236 [Brazil: Bahia]; Kovaleski *et al*. 2000: 290 [Brazil: Rio Grande do Sul]; Korytkowski 2004: 58 [in key].

Diagnosis. *Anastrepha phaeoptera* differs from most species of *Anastrepha* in having the hyaline basomarginal spot in cell r_1 with its apex aligned slightly distal to crossvein r-m. It differs from other species with this wing character by the following combination of characters: S-band basally without extension to the posterior wing margin in the middle of cell cu_1; wing pattern mostly brown, C-band in cells r_1 and r_{2+3} and S-band in cell dm without orange areas; V-band with distal arm present but separated from proximal arm.

Description. Mostly dark orange. Setae black. Body length 9.75 mm (head + thorax 6.25 mm, abdomen 3.5 mm).

Head: Antenna and palpus orange.

Thorax: Mesonotum length 5.0 mm (Zucchi 1978). Scutum with pale yellow vittae weak. Sides of scutellum brown, dorsum and apex yellow. Subscutellum brown. Mediotergite entirely reddish brown. Katepisternal seta small, weak, 0.33 length of anepimeral seta.

Wing (Fig. 52): Length 9.0 mm (10.0 according to Zucchi 1978), length/width ratio 2.24. Apex of vein R_1 at 0.54 wing length. Cell c 1.33 times as long as pterostigma; pterostigma 3.2 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.62 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.75 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.6 times as long as anterior margin. Wing pattern mostly dark brown. C-band with cell bc yellowish; cell c mostly yellowish, base and extreme apex brown; yellow area not extended into pterostigma nor cell r_1; remainder of band in pterostigma, r_1, r_{2+3}, and br entirely dark brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br small, narrowly separated from vein R_{4+5}, ca. half as long as distal brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly dark brown, with small medial orange area narrowly bordering crossvein r-m but not extending into cell dm; posterior margin with distinct incision in cell cu_1 and with narrow extension towards proximal arm of V-band at distal third of cell dm; section between vein M and costa and distal section of band with orange areas with broad brown margins, distal section broad, at apex of vein R_{2+3} as broad as cell r_{2+3}, distinctly broadening in cell r_{2+3}; extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline

basomarginal spot in cell r_1 triangular, with blunt apex, extended to R_{4+5}, its apex aligned slightly distal to crossvein r-m. V-band incomplete, mostly brown, proximal arm very broadly connected to S-band in cell r_{2+3}; proximal arm with narrow medial orange area extending across cell r_{4+5} and into cell dm bordering anterior half of dm-cu; proximal arm moderately broad anteriorly, gradually broadening posteriorly, with short basal extension along wing margin, at level of vein M 1.67 times as wide as distal arm and 1.67 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender to moderately broad, well separated from proximal arm, extended almost to vein R_{4+5}.

Male terminalia (Fig. 205): Lateral surstylus short, extended beyond prensisetae by ca. 0.5 times length of prensiseta; in lateral view with posterodistal margin concave.

Female terminalia: Unknown.

Distribution. *Anastrepha phaeoptera* is known only from southern and eastern Brazil (Bahia, Rio Grande do Sul).

Biology. Lima (1937a) reported that the holotype was reared from "amora preta," which he later (Lima 1938: 64) said was *Helixanthostylis poppigiana* [sic] Trec. The valid name of this plant is *Helicostylis tomentosa* (Poepp. & Endl.) Rusby (= *Helicostylis poeppigiana* (Mart.) Trécul) (Moraceae).

Type Data. Holotype male (IOC), Brazil: Bahia, G. Bondar [not examined].

Comments. The holotype was unavailable for loan. The above description is based on the original description and wing photo of Lima (1937a) and the description of Zucchi (1978). The male from Vacaria, Rio Grande do Sul reported by Kovaleski *et al*. (1999: 232) unfortunately was destroyed except for the wings (R. A. Zucchi, pers. comm.).

Anastrepha pittieri **Caraballo**

Figs. 53, 86, 99, 132–133, 159, 179, 190, 207–208

Anastrepha pittieri Caraballo 1981: 138 [*nomen nudum*; description, wing, aculeus tip, Venezuela].

Anastrepha pittieri Caraballo 1985: 27 [description, wing, aculeus tip, Venezuela]; Norrbom 1985: 159 [eversible membrane, aculeus tip, male terminalia, egg]; Norrbom & Foote 1989: 20 [egg]; Korytkowski 1997: 48 [in key]; Norrbom *et al*. 1999a: 81 [in catalog, Panamá]; Norrbom *et al*. 1999b: 327 [eversible membrane, classification]; Korytkowski 2004: 56 [in key].

[not] *Anastrepha pittieri*: Silva & Ronchi-Teles 2000: 205 [misidentification of *A. isolata*].

Diagnosis. *Anastrepha pittieri* differs from most species of *Anastrepha* in having an extension from the base of the S-band in the middle of cell cu_1 that is connected to the proximal arm of the V-band on the posterior wing margin. It differs from other species having that wing character, except *A. isolata*, in having vein M strongly curved apically and the C-band with a well defined, yellow or subhyaline area in cell r_1 posterior to the basal third to half of the pterostigma. It differs from *A. isolata* in having the aculeus tip not expanded basally and with smaller serrations.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–6 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 1.5 times as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.7–0.8 distance to ventral facial margin.

Thorax: Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse medial vitta, inverted T-shaped or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; part or all of scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad brown band with straight anterior margin or narrowest medially, where not extended anteriorly beyond acrostichal seta, sometimes with short anterior extensions towards or to dorsocentral seta or

laterally along sublateral white vitta, ending laterally at sublateral white vitta, not extended to intra-alar seta; occasionally extended onto extreme base of disc of scutellum or (1♂ 1♀ Rancho Grande) with scutellum, including sides, largely pale brown except large medial white area on disk and apex and smaller lateral white area including basal seta. Subscutellum and mediotergite entirely orange. Mesonotum 4.00–4.35 mm long (3.88–4.36 according to Caraballo 1985). Scutum entirely microtrichose; setulae yellow or orange medially, brownish laterally, or mostly brownish. Katepisternal seta weak, yellow or orange, no more than 0.33 as large as anepimeral seta.

Wing (Fig. 53): Length 8.9–10.6 mm, width 3.6–4.1 mm, ratio 2.40–2.63. Apex of vein R_1 at 0.54–0.57 wing length. Cell c 1.14–1.31 times as long as pterostigma; pterostigma 3.18–4.07 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.64–0.69 distance from bm-cu to dm-cu on vein M. Vein M strongly curved apically; cell r_{4+5} 0.61–0.81 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.58–1.82 times as long as anterior margin. Wing pattern mostly moderate to dark brown and orange. C-band with cell bc yellowish; cell c yellowish basally and anteriorly, distal 0.20–0.75 of anterior margin brown, posteriorly with elongate medial subhyaline or hyaline area; yellow area sometimes extending into posterobasal corner of pterostigma and always into cell r_1, broadly reaching or usually almost reaching R_{2+3}, and extending distally to level of 0.33–0.67 length of pterostigma; remainder of band in pterostigma, r_1, r_{2+3}, and br dark brown except pterostigma sometimes paler brown apically or r_1 and/or r_{2+3} sometimes with dark orange brown subapical areas. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, usually not reaching vein R_{4+5} and 0.50–1.33 times as long as distal orange and brown area of cell; cell dm with basal hyaline area moderately large. Basal half of S–band mostly brown, with large medial orange area broadly bordering crossvein r-m and extending into anterior 0.50–0.80 of cell dm, proximal margin of band in dm with brown margin except in Rio Caruai female; with brown, lobelike projection to posterior wing margin in middle of cell cu_1 broadly connected to proximal arm of V-band along wing margin; distal section of S-band orange with broad brown margins, moderately broad, at apex of vein R_{2+3} 0.62–0.83 times width of cell r_{2+3}, even in width to distinctly broadening in cell r_{2+3}, extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 narrowly triangular, sometimes with blunt apex, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, broadly connected to S-band in cell r_{2+3}; proximal arm with slender medial orange area bordering anterior half to entire length of dm-cu and extending into cell r_{4+5}, usually reaching to or beyond vein R_{4+5}; proximal arm moderately broad anteriorly, slightly gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.4–2.0 times as wide as distal arm and 1.20–1.75 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender to moderately broad, connected to proximal arm.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 207–208): Lateral surstylus short, extended beyond prensisetae by ca. 1.5 times length of prensiseta; in lateral view slightly posteriorly curved; in posterior view gradually tapered to bluntly acute apex, lateral margin slightly convex to slightly concave, medial margin convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.30–2.40 mm long, 0.54–0.58 times as long as mesonotum; glans 0.41–0.50 mm long.

Female terminalia: Oviscape 1.72–2.02 mm long, 0.39–0.50 times as long as mesonotum; entirely orange; spiracle at basal 0.39–0.46. Eversible membrane (Figs. 86, 99) with 9–10 long hooklike dorsobasal scales in 2 irregualr rows distal to similar number of small, stout scales. Aculeus (Figs. 132–133) slightly ventrally curved in lateral view, 1.05–1.10 mm long; in ventral view base 0.24–0.26 mm wide; shaft 0.08–0.09 mm wide at midlength; tip (Figs. 159, 179) 0.14–0.16 mm long, 0.08–0.095 mm wide, 1.63–1.88 times as long as wide, 0.055–0.06 mm wide in lateral view, 0.63–0.71 times ventral width, in ventral view triangular, at most slightly broader than shaft of aculeus, distal 0.81 to entirely serrate, serrations relatively large. Spermathecae spherical.

Egg (Fig. 190) (8 dissected from abdomen of female, Venezuela: Rancho Grande): Slender, 1.38–1.55 mm long, 0.15–0.18 mm wide at broadest point, slightly curved, subcylindrical, posterior end only slightly tapered. Anterior end with elongate lobe distal to micropyle 0.63 times as long as main part of egg, micropyle nipple-shaped.

Distribution. *Anastrepha pittieri* is known from Panamá and Venezuela (Aragua, Bolívar). The record from Brazil (Amazonas) (Silva & Ronchi-Teles 2000) was based on a male of *A. isolata* misidentified by Norrbom.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (IZAM), Venezuela: Aragua: Rancho Grande, 1100 m, 6 Mar 1969, J. Salcedo [not examined].

Other specimens examined. PANAMÁ: Panamá: Barro Colorado Island, 8 May 1945, J. Zetek 5191, 1♂ (USNM USNMENT00216183). VENEZUELA: Aragua: Rancho Grande, 10–21 Feb 1969, Duckworth & Dietz, 1♀ (USNM USNMENT00052102); same, 1100 m, 28 May 1953, C. J. Rosales, 1♂ 1♀ paratypes (USNM USNMENT00216180, USNMENT00216187); same, 1100 m, 28 May 1953, J. A. Gonzalez, 1♂ (USNM USNMENT00216182); same, 1100 m, 27 Nov 1967, G. I. Stange, 1♀ (USNM USNMENT00216181); 1100 m, 8 May 1967, F. Fernández Yépez & J. Salcedo, 1♀ (USNM USNMENT00216186); same, cloud forest, 1100 m, blacklight, 15–16 Mar 1978, J. B. Heppner, 1♂ 1♀ (USNM USNMENT00216184-85). Bolívar: Caruai River, 765 m, Feb 1953, E. McGuire, 1♀ (AMNH USNMENT00216188).

Comments. This species was well described by Caraballo (1985) and we examined paratypes. One female (USNMENT00216184) and one male (USNMENT00216182) from Rancho Grande, Venezuela have an unusual scutellum color, with the base of the disk brown, extending to the sides between the basal and apical setae, isolating a broad oval yellow medial area. These specimens have the posterior scutal band relatively dark, so this may be the full expression of this species' color pattern. The female from the Caruai River has the least serrate aculeus tip and several slight differences in wing pattern, but is tentatively considered conspecific with the other specimens.

Anastrepha pseudorobusta, new species

Figs. 16, 54, 87–88, 134–136, 160, 180

Anastrepha robusta Greene 1934: 144 [in part, Venezuelan specimen]; Caraballo 1981: 136.
Anastrepha pseudorobusta Norrbom 1985: 144 [*nomen nudum*; wing, aculeus tip]; Korytkowski 1997: 67 [*nomen nudum*; in key]; Korytkowski 2004: 63 [*nomen nudum*; in key].

Diagnosis. *Anastrepha pseudorobusta* is similar to *A. jamaicensis*, *A. nigrifascia*, and *A. simulans* in having the C-band and S-band connected, vein M strongly curved apically, the S-band largely orange in cells br and dm-cu, and the aculeus straight and between 1–3 mm long with a nonserrate, awl-shaped tip about as broad in lateral view as in ventral view and between 0.2–0.4 mm long, 2.5–4.5 times as long as wide. It differs from those three species in having the aculeus tip longer (0.33–0.39 mm long vs. 0.22–0.27 in the other species). It further differs from *A. jamaicensis* and *A. simulans* in having only one distal row of large hooklike denticles on the eversible membrane, and from *A. nigrifascia* in having the scutum entirely microtrichose and the proximal arm of the V-band not interrupted nor constricted in cell r_{4+5}. In the key of Steyskal (1977) it runs to p. 29 but not well to any of the species on that page. It differs from all of them by the combination of the aculeus less than 2.3 mm long, the subscutellum and mediotergite without lateral dark brown marks, and the S-band and V-band connected.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae red brown to dark brown.

Head: Yellow to orange except brown ocellar tubercle. 3–5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.60–0.75 distance to ventral facial margin.

Thorax (Fig. 16): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; inverted T-shaped medial vitta, sometimes diffuse or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum usually with dark orange to orange brown band, slightly darker than other orange parts of scutum (fainter in Venezuelan and Peruvian females), with more or less straight anterior margin, not extended to acrostichal seta, ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.9–4.2 mm long. Scutum entirely microtrichose; setulae yellow to orange, sometimes brownish laterally. Katepisternal seta weak, yellow to medium brown, at most 0.33 as large as anepimeral seta.

Wing (Fig. 54): Length 7.94–8.50 mm, width 3.0–3.45 mm, ratio 2.36–2.65. Apex of vein R_1 at 0.54–0.56 wing length. Cell c 1.15–1.38 times as long as pterostigma; pterostigma 3.25–3.66 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.62–0.67 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.68–0.84 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.63–1.73 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band mostly yellowish to orange; cell bc yellowish; cell c yellowish, base slightly darker, posteriorly sometimes with elongate subhyaline area; pterostigma mostly moderate brown; cells r_1, br, and r_{2+3} orange except posterior and distal margins partially narrowly moderate brown. C-band and S-band broadly connected along vein R_{4+5}, hyaline area in cell br moderately large, elongate, reaching vein R_{4+5}, 1.0–1.45 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly orange with narrow brown margins in radial cells and distally in cell dm, proximal margin in cell dm orange; at least posterior half of part in cell cu_1 moderate brown; posterior margin with distinct incision in cell cu_1; distal section of band orange with brown margins, entirely brown in cell r_{4+5}; medium width to moderately broad, at apex of vein R_{2+3} 0.63–0.81 times width of cell r_{2+3}, slightly broadening in cell r_{2+3}, not extended to apex of vein M; hyaline area proximal to it ending at vein R_{2+3} or occasionally (Trinidad male) extended slightly into cell r_1. Hyaline basomarginal spot in cell r_1 triangular, often narrow and/or with blunt apex, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly brown, connected, usually narrowly, to S-band in cell r_{2+3}; proximal arm with medial orange area bordering anterior half to entire length of dm-cu and extending to or beyond vein R_{4+5}; proximal arm slender anteriorly, gradually broadening posteriorly, with basal extension along wing margin, at level of vein M 1.25–1.50 times as wide as distal arm and 0.75–0.90 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender to moderately broad.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Similar to *A. nigrifascia*. Lateral surstylus short, extended beyond prensisetae by ca. 0.5 times length of prensiseta; in lateral view with apex blunt or with posterodistal margin concave; in posterior view lateral and medial margins convex, apex blunt. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 3.50 mm long, 0.83 times as long as mesonotum; glans 0.40 mm long.

Female terminalia: Oviscape 2.45–2.91 mm long, 0.60–0.71 times as long as mesonotum; entirely orange; spiracle at basal 0.32–0.41. Eversible membrane (Figs. 87–88) with 9–10 long hooklike dorsobasal scales in 1 row distal to similar number of small, stout scales. Aculeus (Figs. 134–136) straight or sometimes with base very weakly dorsally curved in lateral view, 2.00–2.23 mm long; base strongly expanded, 0.25–0.27 mm

wide; shaft 0.07–0.09 mm wide at midlength; tip (Figs. 160, 180) 0.33–0.39 mm long, 0.08–0.095 mm wide, 3.47–4.38 times as long as wide, 0.08–0.09 mm wide in lateral view, 1.0 times ventral width, in ventral view parallel-sided basally or slightly expanded subbasally, then gradually tapered, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha pseudorobusta* is known from Trinidad, southeastern Venezuela (Bolívar), and Amazonian Peru (Madre de Dios).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT00216167), TRINIDAD: area VII (coastal St. David or northcoastal St. Andrew Parish), trap #181, in sapodilla, 20 Dec 1989. Paratypes: PERU: Madre de Dios: Manu, Río Manu, Pakitza, 12°7'S 70°58'W, 250 m, 9–23 Sep 1988, A. Freidberg, 1♀ (USNM USNMENT00216334). TRINIDAD: area VI (southeastern St. George Parish), trap #179, in orange tree, 1990, 1♀ (USNM USNMENT00216242); area XVII (northeastern Victoria Parish), trap #349, in orange tree, 2 Apr 1990, 1♂ (USNM USNMENT00216232); area XV (southeastern Caroni Parish), trap #286, 10 Apr 1990, 1♂ (USNM USNMENT00216168). VENEZUELA: Bolívar: C. [Ciudad or Cerro?] Bolívar, 14 May 1898, Collection C. W. Johnson, paratype *Anastrepha robusta* Greene, 1♀ (MCZ USNMENT00216401).

Etymology. The name of this species is an adjective from the Greek pseudos (false) and the epithet of *A. robusta*, which this species resembles but is not most closely related.

Anastrepha rafaeli, new species

Figs. 11, 55, 89–90, 137, 161

Anastrepha rafaeli Norrbom & Korytkowski in Korytkowski 2004: 59 [*nomen nudum*; in key].

Diagnosis. *Anastrepha rafaeli* differs from most species of *Anastrepha* in having an extension from the basal part of the S-band to the posterior wing margin in the middle of cell cu_1 that is not connected to the posterior end of the proximal arm of the V-band. It differs from all of the other species having that wing character except *A. amazonensis* in having the basomarginal hyaline area in cell r_1 aligned with or slightly distal to crossvein r-m, and from all of those species except *A. speciosa* in usually having a brown posterior band on the scutum with a lateral extension to the intra-alar seta. It differs from *A. amazonensis* in having small hyaline areas in cells br and dm proximal to crossvein r-m.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae orange brown to dark brown.

Head: Yellow to orange except ocellar tubercle brown and often with U-shaped brown mark on posterior half of orbital plate and vertex, touching eye, connected only to posterior side of mark on ocellar tubercle. 3 (rarely 2 or 4) frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most 1.5 times as long as ocellar tubercle. Facial carina, in profile, straight to slightly concave dorsally and medially. Antenna extended 0.75–0.85 distance to ventral facial margin.

Thorax (Fig. 11): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; quadrate medial area between dorsocentral setae, often diffuse or absent; paired sublateral scutal vitta from transverse suture almost to but not including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad brown band, broadest medially, including acrostichal seta and extended almost to dorsocentral seta, laterally with narrower extension including intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 2.96–3.19 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta well developed, nearly as dark as and 0.67 times as large as to subequal to anepimeral seta.

Wing (Fig. 55): Length 6.17–6.83 mm, width 2.74–3.07 mm, ratio 2.11–2.26. Apex of vein R_1 at 0.52–0.54 wing length. Cell c 1.14–1.30 times as long as pterostigma; pterostigma 2.50–2.83 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.60–0.65 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.06–1.22 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.62–1.70 times as long as anterior margin. Wing pattern mostly dark brown. C-band with cell bc yellowish to subhyaline; cell c yellowish to brownish basally and narrowly brown anteriorly and distally, posteriorly with elongate medial hyaline area, not extended into pterostigma or cell r_1; remainder of C-band dark brown. Cell c with elongate nonmicrotrichose posteromedial area small, 0.25–0.50 width of cell. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, usually not reaching vein R_{4+5} and at most 0.67 times as long as distal brown area of cell; cell dm with basal hyaline area relatively small, but extending to posterior margin. Basal half of S-band entirely brown, without orange area in cell dm or bordering crossvein r-m; with lobelike projection to posterior wing margin in middle of cell cu_1; distal section of band orange with brown margins or sometimes mostly brown (at least with orange medial area between r-m and costa), moderately broad, at apex of vein R_{2+3} 0.64–0.87 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 short triangular, extended beyond vein R_{2+3} but usually not to R_{4+5}, its apex aligned with or slightly distal to crossvein r-m. V-band complete, mostly brown, narrowly to broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area bordering anterior 0.33–0.50 of dm-cu, extending anteriorly beyond vein R_{4+5}; proximal arm moderately broad, gradually broadening posteriorly, without basal extension along wing margin, at level of vein M 1.5–2.8 times as wide as distal arm and 1.45–2.30 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Lateral surstylus short, extended beyond prensisetae by 1.0–1.5 times length of prensiseta; in lateral view broad, posteroapical corner bluntly acute; in posterior view gradually tapered to blunt, truncate apex, lateral and medial margins convex. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.45–2.75 mm long, 0.82–0.93 times as long as mesonotum; glans 0.40–0.50 mm long.

Female terminalia: Oviscape (Fig. 11) 2.00–2.17 mm long, 0.65–0.68 times as long as mesonotum; distal half to two-thirds brown; spiracle at basal 0.38–0.39. Eversible membrane (Figs. 89–90) with 20–25 large, hooklike dorsobasal scales in triangular pattern. Aculeus (Fig. 137) straight to slightly ventrally curved in lateral view, 1.71–1.72 mm long; in ventral view base 0.18–0.19 mm wide; shaft 0.10 mm wide at midlength; tip (Fig. 161) 0.16 mm long, 0.08–0.09 mm wide, 1.78–2.39 times as long as wide, 0.04–0.05 mm wide in lateral view, 0.50–0.56 times ventral width, in ventral view basal part nearly parallel-sided with lateral margin slightly concave, apical 0.69–0.75 triangular, finely serrate, basal serrations curving slightly onto dorsal side. Spermathecae spherical.

Distribution. *Anastrepha rafaeli* is known from Brazil (Roraima) and possibly western Venezuela.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (INPA, USNMENT00216288), BRAZIL: Roraima: Rio Uraricoera, Ilha de Maraca, armadilha de Malaise, 2–13 May 1987, J. A. Rafael, J. E. B. Brasil & L. S. Aquino. Paratypes: same data as holotype, 5♂ 2♀ (INPA USNMENT00216289-90, USNMENT00216295-99) 2♂ 3♀ (USNM USNMENT00052106, USNMENT00216287, USNMENT00216292-94); same, 20–30 Mar 1987, L. S. Aquino, 1♂ (USNM USNMENT00216300).

Other specimens examined. VENEZUELA: Zulia: Lake Maracaibo, 1913, 1 adult (UMSP USNMENT00054868); this specimen, which lacks most of its abdomen, is tentatively identified, but matches *A. rafaeli* in wing pattern and setal color. It is not designated as a paratype.

Etymology. This species is named for Dr. J. A. Rafael (INPA), one of the collectors of the type series.

***Anastrepha robusta* Greene**
Figs. 12, 56–57, 91, 102, 105, 138–139, 181, 187, 206

Anastrepha robusta Greene 1934: 144 [description, wing, Guatemala, México: Veracruz]; Stone 1942a: 90 [wing, aculeus tip, Panamá]; Fernández Yépez 1953: 36; Foote 1967: 15 [in catalog]; Steyskal 1977: 25 [in key]; Zucchi 1978: 55; Caraballo 1981: 136; Norrbom 1985: 151 [eversible membrane, aculeus tip, male terminalia]; Aluja et al. 1987: 324 [México: Chiapas, Oaxaca]; Hernández-Ortiz 1992: 65 [México]; Aluja 1993: 391 [male behavior]; Korytkowski 1997: 66 [in key]; Norrbom *et al*. 1999a: 82 [in catalog, Costa Rica]; Norrbom *et al*. 1999b: 306 [wing, aculeus tip, classification]; Korytkowski 2004: 61 [in key]; Hernández-Ortiz 2007: 59 [México].

Diagnosis. *Anastrepha robusta* differs from other species of *Anastrepha* except *A. amaryllis*, *A. fuscata*, and *A. furcata* in having the aculeus strongly dorsally curved. It differs from those three species in the shape of the aculeus tip, with the lateral margins strongly concave. It further differs from *A. fuscata* and *A. furcata* in having the wing pattern more extensively orange, and from *A. amaryllis* in having shorter terminalia.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown to black.

Head: Yellow to orange except brown ocellar tubercle. 3–6 (usually 4–5) frontal setae; 2 orbital setae, posterior seta well developed (very rarely absent; 1 of 102 specimens checked). Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.55–0.75 distance to ventral facial margin.

Thorax (Fig. 12): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; inverted T-shaped medial vitta, sometimes diffuse or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with orange brown to dark brown band, at least slightly darker than other orange parts of scutum, with more or less straight anterior margin, at most extended to but not entirely including acrostichal seta, ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.35–4.27 mm long. Scutum entirely microtrichose; setulae yellow to orange, brownish laterally. Katepisternal seta weak, yellow to medium brown, at most 0.40 as large as anepimeral seta.

Wing (Figs. 56–57): Length 7.06–8.87 mm, width 2.7–3.6 mm, ratio 2.44–2.66. Apex of vein R_1 at 0.52–0.55 wing length. Cell c 1.19–1.49 times as long as pterostigma; pterostigma 2.93–4.17 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.61–0.68 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.63–0.83 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.55–1.75 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band mostly yellowish to orange; cell bc yellowish; cell c yellowish, base slightly darker, posteriorly sometimes with elongate subhyaline area; pterostigma mostly moderate brown, brown area sometimes extended into cell r_1; remainder of cells r_1, br, and r_{2+3} orange except posterior and distal margins partially narrowly moderate brown. C-band and S-band narrowly to broadly connected along vein R_{4+5}, hyaline area in cell br moderately large, elongate, reaching vein R_{4+5} or rarely [2 Veracruz specimens] very narrowly separated from it, 1.0–2.0 times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly orange with narrow brown margins in radial cells and distally in cell dm, proximal margin in cell dm orange; at least posterior half of part in cell cu_1 moderate brown; posterior margin with distinct incision in cell cu_1; distal section of band orange with brown margins between vein R_{4+5} and costa and often more distally, entirely brown in cell r_{4+5}; medium width to moderately broad, at apex of vein R_{2+3} 0.62–0.85 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}, usually narrowly separated from apex of vein M, occasionally more separated or barely extended to it; hyaline area proximal to it usually ending at vein R_{2+3}, rarely (1 Panamanian female) narrowly separated from vein or occasionally (12 males, 1 female) extended slightly into cell r_1. Hyaline basomarginal spot in cell

r_1 triangular, with blunt apex, often narrow, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band usually complete, mostly to entirely brown, connected, usually narrowly, to S-band in cell r_{2+3}; proximal arm often with medial orange area bordering part to entire length of dm-cu and extending to or beyond vein R_{4+5}, often interrupted; proximal arm slender anteriorly, gradually broadening posteriorly, usually with at least short basal extension along wing margin, at level of vein M 1.3–2.1 times as wide as distal arm and 0.55–1.0 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, usually connected to proximal arm, sometimes narrowly, rarely (2 Costa Rican, 2 Guatemalan of 121 specimens examined) narrowly separated from proximal arm but reaching or almost reaching vein R_{4+5}.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Fig. 206): Lateral surstylus short, extended beyond prensisetae by ca. 0.5 times length of prensiseta; in lateral view with apex blunt or with posterodistal margin concave; in posterior view lateral and medial margins convex, apex blunt. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 3.12–3.41 mm long, 0.76–0.93 times as long as mesonotum; glans 0.40–0.45 mm long.

Female terminalia: Oviscape 2.27–2.52 mm long, 0.57–0.63 times as long as mesonotum; entirely orange; spiracle at basal 0.35–0.46. Eversible membrane (Figs. 91, 102) with ca. 8–10 moderately long hooklike dorsobasal scales in 1 row distal to several row of smaller stout scales. Aculeus (Figs. 138–139) strongly dorsally curved ca. 45° in lateral view, 1.55–1.75 mm long; in ventral view base expanded, 0.18–0.25 mm wide; shaft 0.07–0.08 mm wide at midlength; tip (Figs. 181, 187) 0.21–0.26 mm long, 0.08–0.09 mm wide, 2.44–2.89 times as long as wide, 0.075–0.08 mm wide in lateral view, 0.83–1.00 times ventral width, in ventral view tapered, slightly expanded, then tapered to blunt apex, lateral margins concave, nonserrate. Spermathecae (Fig. 105) spherical.

Distribution. *Anastrepha robusta* is known from México (Veracruz, Oaxaca, Chiapas), Guatemala, Costa Rica, and Panamá. Records from Venezuela and Brazil were based on misidentifications. The paratype from Venezuela is *A. pseudorobusta*. Stone (1942a: 91) suggested that the female of *A. furcata* from Rio Cumina, Brazil recorded by Lima (1937b) is *A. robusta*, but according to Zucchi (1978: 55) it is in fact *A. furcata*.

Biology. The host plants of this species are unknown. Aluja (1993) reported observations on the calling behavior of the male.

Type Data. Holotype female (USNM USNMENT000104285), Guatemala: Cayuga, Jul 1915, W. Schaus [examined]. The wings of the holotype are rather tattered and there is a large crack in its scutum. The terminalia are mounted on slide 36.III.13c.

Other specimens examined. COSTA RICA: Guanacaste: W side Volcan Orosi, Estación Maritza, LN 326900 373000, 600 m, May 1990, R. Blanco, 1♀ (INBio INBioCRI000264297); same, 28 Feb – 10 Mar 1992, K. Taylor, 2♂ 1♀ (INBio INBioCRI000394949-50, INBioCRI000744263); same, 28 Feb – 10 Mar 1992, C. Cano, 4♂ 3♀ (INBio INBioCRI000763688-92, INBioCRI000763695-96) 1♂ 1♀ (USNM INBioCRI000763682-83); same, 28 Feb – 10 Mar 1992, E. Lopez, 1♂ 2♀ (INBio INBioCRI000800487-88, INBioCRI000800566) 1♂ 1♀ (USNM INBioCRI000800568-69); same, 28 Feb – 10 Mar 1992, R. Guzman, 2♂ 1♀ (INBio INBioCRI000441295-96, INBioCRI000441315); same , 28 Feb – 10 Mar 1992, D. Garcia, 2♂ 1♀ (INBio INBioCRI000535651-52, INBioCRI000535656); same, 28 Feb – 10 Mar 1992, G. Gallardo, 1♀ (INBio INBioCRI000724735); same, 27 Feb – 11 Mar 1992, D. Brenes, 1♂ (INBio INBioCRI000482439); same, 27 Feb – 11 Mar 1992, F. A. Quesada, 1♀ (INBio INBioCRI000814514); same, 27 Feb – 11 Mar 1992, R. Vargas, 1♂ (INBio INBioCRI000468399); Río Los Ahogados, 11.3 km ENE of Quebrada Grande, 10°51'54"N 85°25'22"W, 470 m, 7 Mar 1986, R. Holzenthal & Rasth, 1♂ (USNM USNMENT00051790); Río Naranjo, 3 km SE, 19–22 Feb 1992, F. D. Parker, 1♀ (USU USNMENT00212099); same, 11–18 Mar 1992, 1♀ (USU USNMENT00212100); same, 1–15 May 1992, 1♀ (USU USNMENT00051789); same, 21–30 Jun 1992, 1♀ (USNM USNMENT00212103); same, Jul 1992, 1♀ (USNM USNMENT00051788); same, 1–10 Sep 1992, 1♀ (USU USNMENT00212102); same, 8–12 Jun 1993, 1♂ (USU USNMENT00212101); same, 30–31 Jul 1993, 1♂ (USU USNMENT00216241); Parque Nacional Rincón de

la Vieja, Estación Las Pailas, LN 306300 388600, 800 m, 10–18 Apr 1994, K. Taylor, 1♂ (INBio INBioCRI001793067); same, 8–26 May 1994, 1♂ (USNM INBioCRI001860468). Puntarenas: San Luis Monteverde, Finca Buen Amigo, LN 250850 449250, 1000–1350 m, 20 Mar – 14 Apr 1995, M. Segura, 1♀ (USNM INBioCRI000191330). GUATEMALA: Escuintla: Palín, Granja El Coronel, Km 36.5, McPhail trap, 26 Mar 1992, J. López, 1♀ (USNM USNMENT00051794); Palín, Granja María Santísima, km 51, 23 Apr 1992, F. Acabajón, 2♂ 2♀ (USNM USNMENT00051795-98). Petén: Dolores, El Quetzal, 16°41'44"N 89°42'32"W, McPhail trap, 17 Jul 1995, J. López 55, 1♀ (USNM USNMENT00050352). MEXICO: Veracruz: Córdoba, "11.6", F. K. Knab, 1♂ paratype (USNM USNMENT00051791); Tampico Alto, trap in chico zapote, Jun – Jul 1940, 1♂ 1♀ (USNM USNMENT00051792-93). PANAMÁ: Panamá: Arraijan, 23 Jun 1949, J. Zetek 5411, 2♂ 2♀ (USNM USNMENT00216246, USNMENT00216327, USNMENT00216349-50); same, May 1949, J. Zetek 5405, 1♂ 1♀ (USNM USNMENT00052109, USNMENT00216454); same, 11 May 1950, J. Zetek 5459, 4♂ (USNM USNMENT00216326, USNMENT00216328, USNMENT00216447-48); same, 1 Jul 1948, J. Zetek 5349, 1♂ (USNM USNMENT00216312); Balboa, Jan 1939, J. Zetek 4316, 1♂ (USNM USNMENT00216449); El Cermeño, 16 Jul 1940, J. Zetek 4666, 1♂ (USNM USNMENT00216451); same, 23 Jan 1940, J. Zetek 4624, 2♂ (USNM USNMENT00216233, USNMENT00216452); same, 6 Feb 1940, J. Zetek 4630, 10♂ 7♀ (USNM USNMENT00216234, USNMENT00216243, USNMENT00216252, USNMENT00216313-14, USNMENT00216316-17, USNMENT00216320-21, USNMENT00216344, USNMENT00216346-47, USNMENT00216453, USNMENT00216358, USNMENT00216366, USNMENT00216369, USNMENT00216373); same, 13 Feb 1940, J. Zetek 4632, 9♂ 10♀ (USNM USNMENT00216244, USNMENT00216311, USNMENT00216319, USNMENT00216322-25, USNMENT00216329, USNMENT00216333, USNMENT00216345, USNMENT00216356-57, USNMENT00216362, USNMENT00216364-65, USNMENT00216370-72, USNMENT00216445); same, 5 Jul 1939, J. Zetek 4499, 1♂ (USNM USNMENT00216450); same, 28 Feb 1940, J. Zetek 4635, 1♂ 2♀ (USNM USNMENT00216315, USNMENT00216348, USNMENT00216363); same, 30 Jan 1940, J. Zetek 4628, 3♂ 2♀ (USNM USNMENT00216245, USNMENT00216318, USNMENT00216330, USNMENT00216361, USNMENT00216368); same, 5 Mar 1940, J. Zetek 4637, 1♂ 1♀ (USNM USNMENT00216248, USNMENT00216367); same, 5 Jul 1939, J. Zetek 4495, 1♂ (USNM USNMENT00216249); same, 4 Apr 1939, J. Zetek 4346, 1♂ (USNM USNMENT00216247); same, 11 Apr 1939, J. Zetek 4347, 1♂ (USNM USNMENT00216250); same, 16 May 1939, J. Zetek 4385, 1♂ (USNM USNMENT00216251); La Campana, Feb 1939, J. Zetek 4326, 1♂ 1♀ (USNM USNMENT00216332, USNMENT00216359-60); same, 28 Dec 1938, J. Zetek 4310, 1♂ (USNM USNMENT00216331); same, 18 May 1938, J. Zetek 4163, 1♂ (USNM USNMENT00216446).

***Anastrepha rojasi*, new species**
Figs. 58, 92, 106, 140, 162, 209–210

Anastrepha rojasi Norrbom & Korytkowski in Korytkowski 2004: 64 [*nomen nudum*; in key].

Diagnosis. This species is very similar to *A. binodosa* and *A. miza*, which have very similar aculeus tips with two pairs of ridges that project in ventral view as small lateral protuberances. In the key of Steyskal (1977) it runs to *A. binodosa*. It differs from both species in having dark red brown to black setae, the hyaline area in cell br small, 0.33–0.64 times as long as the distal colored area of the cell, and in terminalia length, shorter than in *A. binodosa* but longer than in *A. miza*.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown to black.

Head: Yellow to orange except brown ocellar tubercle. 2–4 (usually 3) frontal setae; 2 orbital setae, posterior seta well developed (rarely absent, on 1 side in 2 specimens, on both sides in 1 specimen of 57 specimens examined). Ocellar seta weak, at most 1.2 times as long as ocellar tubercle. Facial carina, in

profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.62–0.80 distance to ventral facial margin.

Thorax: Mostly orange with following areas white or pale yellow (usually poorly differentiated in the dried specimens examined): postpronotal lobe; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Scutum orange medially, without white vitta; posterior margin sometimes with broad dark orange band (brown in Panamanian specimens), with straight anterior margin, not extended beyond acrostichal seta, and ending laterally at sublateral white vitta, not extended to intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 3.85–4.32 mm long. Scutum entirely microtrichose; setulae yellow to orange. Katepisternal seta undifferentiated or small, weak, and yellowish.

Wing (Fig. 58): Length 8.33–9.40 mm, width 3.5–4.0 mm, ratio 2.28–2.53. Apex of vein R_1 at 0.53–0.57 wing length. Cell c 1.08–1.27 times as long as pterostigma; pterostigma 3.37–4.25 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.66–0.69 distance from bm-cu to dm-cu on vein M. Vein M slightly curved apically; cell r_{4+5} 1.00–1.13 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.57–1.74 times as long as anterior margin. Wing pattern mostly orange. C-band with cells bc and c mostly yellowish, cell c posteriorly sometimes with elongate subhyaline area; pterostigma usually pale brown, except posterobasal corner, and portions of distal and posterior margins of band in cells br, r_1 and r_{2+3} narrowly pale brown. C-band and S-band broadly to very broadly connected along vein R_{4+5}; hyaline area in cell br small, reaching vein R_{4+5}, 0.33–0.64 times as long as distal colored area of cell; cell dm with basal hyaline area small to moderate sized. S-band with margins narrowly pale brown, except proximal margin in cell dm orange, posterior margin of basal part broadly pale brown in cells dm and especially cu_1 and with distinct incision in cell cu_1; distal section relatively broad, at apex of vein R_{2+3} 0.70–0.78 times width of cell r_{2+3}, even in width or slightly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it usually ending at vein R_{2+3}, rarely (1 Costa Rican female) narrowly separated from vein or occasionally (5 Costa Rican males) extending slightly into cell r_1. Hyaline basomarginal spot in cell r_1 subtriangular, sometimes with blunt apex, extended to vein R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly pale brown, proximal arm with medial orange area from connection with S-band to anterior 0.67 to entire length of dm-cu; broadly connected to S-band in cell r_{2+3}; proximal arm moderately broad, gradually and slightly broadening posteriorly to vein Cu_1, and with broad basal entension along wing margin, at level of vein M 1.2–1.7 times as wide as distal arm, 0.8–1.3 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm usually slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia (Figs. 209–210): Lateral surstylus very short, extended beyond prensisetae by at most 0.5 times length of prensiseta; in lateral view tapered to blunt apex; in posterior view gradually tapered to blunt apex, ventrolateral margin strongly produced. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 5.05–5.20 mm long, 1.17–1.26 times as long as mesonotum; glans 0.55–0.58 mm long.

Female terminalia: Oviscape 2.90–3.44 mm long, 0.73–0.86 times as long as mesonotum; base orange, distal 0.33–0.45 brown; spiracle at basal 0.30–0.36. Eversible membrane (Fig. 92) with 50–60 long slender hooklike dorsobasal scales in 3–4 irregular transverse rows separated from minute basal denticles by several rows of weakly sclerotized to membranous smaller thin more widely spaced scales. Aculeus (Fig. 140) straight to slightly ventrally curved in lateral view, 2.60–3.00 mm long; in ventral view base expanded, 0.20–0.22 mm wide; shaft ca. 0.08–0.09 mm wide at midlength; tip (Fig. 162) 0.30–0.36 mm long, 0.08–0.09 mm wide, 3.75–4.00 times as long as wide, 0.03–0.04 mm wide in lateral view, 0.38–0.50 times ventral width, in ventral view with 2 pairs of small lateral protuberances, 1 subbasal, the other near distal two-fifths, both continuing on dorsal side as weak ridges; parallel-sided until distal protuberances then slightly expanded and gradually tapered to blunt apex, distal 0.34–0.41 very finely serrate, sides of serrate part slightly convex. Spermathecae (Fig. 106) spherical.

Distribution. *Anastrepha rojasi* is known from Costa Rica and Panamá.

Biology. Most of the type specimens were reared from fruits of *Moutabea longifolia* Poepp. & Endl. (Polygalaceae). The larvae feed in the seeds. The host plant is a woody vine which occurs from Costa Rica to Bolivia and Brazil (central Amazon) (TROPICOS database). Vouchers of the host plant were determined by botanists at the INBio herbarium and are deposited there.

Type Data. Holotype female (INBio INBio0003033727), COSTA RICA: Limón: ACLA-C, Res. Biol. Hitoy Cerere, Sendero Espavel, 400 m despues de la cuesta, LS 400742 570120, 500–600 m, emerged 7 Jan 1999 reared by E. Rojas from fruits, larvae feeding in seeds of *Moutabea longifolia* Poepp. & Endl. (no. 335 ERojas) coll. 9 Dec 1998, E. Rojas, A. L. Norrbom, M. A. Zumbado, B. Gamboa, F. A. Quesada & D. Briceño, 98-ER-037.5; mounted with puparium in gel cap on pin. Paratypes: Same data as holotype, emerged 4 Jan 1999, 98-ER-037.2, 2♀ 2 puparia (INBio INBio0003033713-15, INBio0003033750); same, emerged 5 Jan 1999, 98-ER-037.3, 1♂ 6♀ 7 puparia (USNM INBio0003033716-22, INBio0003033753); same, emerged 6 Jan 1999, 98-ER-037.4, 1♂ 12♀ 14 puparia (INBio INBio0003033705, INBio0003033737, INBio0003033742-46, INBio0003033748-49, INBio0003033751-52, INBio0003033754-57); same, emerged 7 Jan 1999, 98-ER-037.5, 1♂ 4♀ 9 puparia (INBio INBio0003033728, INBio0003033736, INBio0003033739-41, INBio0003033747) 2♀ (USNM INBio0003033735, INBio0003033738); same, emerged 8 Jan 1999, 98-ER-037.6, 7♂ 1♀ 14 puparia (INBio INBio0003033709-11, INBio0003033729-34) 3♂ 1♀ 1 puparium (USNM INBio0003033708, INBio0003033723-25); same, emerged 9 Jan 1999, 98-ER-037.7, 2♂ 4 puparia (INBio INBio0003033706, INBio0003033712, INBio0003033726); same locality, emerged 12 Feb 1999 reared from fruit of *Moutabea longifolia* coll. 9 Jan 1999, E. Rojas, ER-00019.1, 1♀ (USNM INBio002153969); same, emerged 13 Feb 1999, ER-00019.2, 1♂ 3♀ (USNM INBio002153970-73); same, emerged 14 Feb 1999, ER-00019.3, 1♂ (USNM INBio002153937); same, emerged 8 Feb 1999, ER-002.1, 1♂ 1♀ (MEUP INBio INBio002153963-64); same, emerged 14 Feb 1999, ER-002.2, 2♀ (INBio INBio002153965-66); same, emerged 16 Feb 1999, ER-002.3, 1♀ (USNM INBio002153967). PANAMÁ: Panamá: Barro Colorado Island, Sep 1943, J. Zetek 5101, 1♂ (USNM USNMENT00216154); same, Dec 1943, J. Zetek 5113, 1♀ (USNM USNMENT00216155).

Etymology. This species is named for Elias Rojas, the parataxonomist at INBio who reared most of the type series.

***Anastrepha simulans* Zucchi**

Figs. 59–60, 93, 103, 141, 182–184

Anastrepha simulans Zucchi 1978: 82 [*nomen nudum*].

Anastrepha simulans Zucchi 1979: 39 [description, Brazil: São Paulo]; Norrbom 1985: 150; Korytkowski 1997: 89 [in key]; Norrbom *et al*. 1999a: 82 [in catalog]; Norrbom *et al*. 1999b: 324 [eversible membrane, classification]; Zucchi 2000a: 23 [in key]; Zucchi 2000b: 43 [in list]; Souza Filho *et al*. 2000: 277 [Brazil: São Paulo]; Korytkowski 2004: 62 [in key].

Anastrepha ambigua Norrbom 1985: 146 [*nomen nudum*; wing, eversible membrane, aculeus tip].

Diagnosis. *Anastrepha simulans* is similar to *A. jamaicensis*, *A. nigrifascia*, and *A. pseudorobusta* in having the C-band and S-band connected, vein M strongly curved apically, the S-band largely orange in cells br and dm-cu, and the aculeus straight and between 1–3 mm long with a nonserrate, awl-shaped tip about as broad in lateral view as in ventral view and between 0.2–0.4 mm long, 2.5–4.5 times as long as wide. It differs from those three species in having shorter terminalia (oviscape 0.43–0.53 times as long as mesonotum, aculeus 1.33–1.37 mm long vs. 0.60–0.72 times mesonotum length and at least 1.5 mm long in the other species). It further differs from *A. nigrifascia* and *A. pseudorobusta* in having 2, rather than one, distal rows of large hooklike denticles on the eversible membrane. It further differs from *A. nigrifascia* in having the proximal arm of the V-band not interrupted nor constricted in cell r_{4+5} and the scutum entirely microtrichose, and from *A. jamaicensis* in having the pterostigma similar in color to the brown areas of the S-band and V-band.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark red brown to black.

Head: Yellow to orange except brown ocellar tubercle. 4–6 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, slightly concave to slightly convex (usually straight) dorsally and medially. Antenna extended 0.60–0.75 distance to ventral facial margin.

Thorax: Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; inverted T-shaped medial vitta, sometimes diffuse or reduced to quadrate posterior area extended laterally to dorsocentral seta; paired sublateral scutal vitta from transverse suture to posterior margin, including intra-alar seta; most or usually all of scutellum; dorsal margin of anepisternum; dorsal margin of katepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum usually with dark orange to dark brown band, occasionally absent but usually at least slightly darker than other orange parts of scutum, with more or less straight anterior margin, at most extended to but not entirely including acrostichal seta, ending laterally at sublateral white vitta, not extended to intra-alar seta. Scutellum usually entirely white or yellow, in Paraná female with side to level of apical seta pale brown. Subscutellum and mediotergite entirely orange. Mesonotum 3.7–4.2 mm long (3.0–3.5 mm according to Zucchi 1979). Scutum entirely microtrichose; setulae yellow to orange, brownish laterally. Katepisternal seta weak, yellow to medium brown, at most 0.40 as large as anepimeral seta.

Wing (Fig. 59–60): Length 7.64–8.62 mm (8.0–9.0 according to Zucchi 1979), width 3.14–3.53 mm, ratio 2.39–2.51. Apex of vein R_1 at 0.53–0.56 wing length. Cell c 1.19–1.37 times as long as pterostigma; pterostigma 3.10–3.85 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.62–0.68 distance from bm-cu to dm-cu on vein M. Vein M very strongly curved apically; cell r_{4+5} 0.73–0.91 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.51–1.66 times as long as anterior margin. Wing pattern mostly orange and moderate brown. C-band mostly yellowish to orange; cell bc yellowish; cell c yellowish, slightly darker basally and apically; pterostigma mostly moderate brown, brown area occasionally extended diffusely into cell r_1; remainder of cells r_1, br, and r_{2+3} orange except posterior and distal margins partially narrowly moderate brown. C-band and S-band narrowly to broadly connected along vein R_{4+5}, hyaline area in cell br usually moderately large amd more elongate anteriorly, reaching vein R_{4+5} or rarely (4 Peruibe females) very narrowly separated from it, usually 1.0–1.6 (in 2 Peruibe females 0.72 or 0.89) times as long as distal orange area of cell; cell dm with basal hyaline area moderately large. Basal half of S-band mostly orange with narrow brown margins in radial cells and distally in cell dm, brown margin often broadening posteriorly in dm, proximal margin in cell dm orange; at least posterior half of part in cell cu_1 moderate brown; posterior margin with distinct incision in cell cu_1; distal section of band orange with brown margins between vein R_{4+5} and costa and usually more distally, entirely brown in cell r_{4+5}; medium width to moderately broad, at apex of vein R_{2+3} 0.62–0.85 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}, usually narrowly separated from apex of vein M, rarely barely extended to it; hyaline area proximal to it usually ending at vein R_{2+3}, occasionally (7 females) narrowly separated from vein or (5 males) extended slightly into cell r_1. Hyaline basomarginal spot in cell r_1 triangular, usually with blunt apex, often narrow, extended to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band usually complete, mostly to entirely brown, connected, narrowly to moderately broadly, to S-band in cell r_{2+3}; proximal arm usually with medial orange area bordering part to entire length of dm-cu and extending beyond vein R_{4+5}, rarely (Rio de Janeiro female) reduced to orange spots in cell r_{4+5}; proximal arm slender anteriorly, gradually broadening posteriorly, with at least short basal extension along wing margin, at level of vein M 1.4–2.0 times as wide as distal arm and 0.75–1.45 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender, usually connected to proximal arm, sometimes narrowly, rarely (5 specimens) narrowly separated from proximal arm but reaching vein R_{4+5}.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Similar to *A. nigrifascia*. Lateral surstylus short, extended beyond prensisetae by ca. 0.5 times length of prensiseta; in lateral view with apex blunt or with posterodistal margin concave; in posterior view lateral and medial margins convex, apex blunt. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 2.60–2.73 mm long, 0.65–0.70 times as long as mesonotum; glans 0.33–0.40 mm long.

Female terminalia: Oviscape 1.70–2.08 mm long, 0.43–0.53 times as long as mesonotum; entirely orange; spiracle at basal 0.35–0.45. Eversible membrane (Figs. 93, 103) with 16–18 long hooklike dorsobasal scales in 2 irregular rows distal to similar number of small, stout scales. Aculeus (Fig. 141) straight in lateral view, 1.33–1.37 mm long (1.2–1.3 mm according to Zucchi 1979); base strongly expanded, 0.22–0.25 mm wide; shaft 0.07–0.075 mm wide at midlength; tip (Figs. 182–184) 0.23–0.27 mm long, 0.07–0.08 mm wide, 3.13–3.60 times as long as wide, 0.08–0.085 mm wide in lateral view, 1.06–1.14 times ventral width, in ventral view parallel-sided to slightly expanded basally, then gradually tapered, nonserrate. Spermathecae spherical.

Distribution. *Anastrepha simulans* is known only from southeastern Brazil (Paraná, Rio de Janeiro, São Paulo).

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USP), Brazil: São Paulo: Salesopolis, Estação Biologia de Boraceia, 24–27 Jun 1949, Travassos Filho & Robello [not examined].

Other specimens examined. BRAZIL: Paraná: San José Pinhais, BR277, Km 54, "Luminosa", 20 Mar 1985, C.I.I.F., 1♀ (UFPC USNMENT00216238). Rio de Janeiro: Tijuca, carca linha, 22°57'S 43°17'W, 6 Feb 1945, D. Albuquerque, 1♀ (USNM USNMENT00216398). São Paulo: Casa Grande, Estacion Biol. Boraceia, Grid 23KMP09238372, 17 Jan 1975, T. E. Rogers, 1♂ (FSCA USNMENT00216396); same, Grid 23KMP092837, 19–26 Feb 1975, 1♀ (FSCA USNMENT00216397); Salesópolis, Estacion Biol. Boraceia, 13–18 Apr 1931, Reichardt, 1♀ (IZAM USNMENT00216399); same, 24–30 Jan 1952, L.T.F., Carrera, Vanzolini, Oiticica, Pearson, 1♀ (IZAM USNMENT00216400); Peruibe, at light, Feb 1975, M. Carrera, 12♂ 19♀ (USP USNMENT00216171, USNMENT00216178-79, USNMENT00216189, USNMENT00216191-92, USNMENT00216197-99, USNMENT00216201-08, USNMENT00216211-14, USNMENT00216216-23, USNMENT00216226-27), 3♂ 8♀ (USNM USNMENT00216169-70, USNMENT00216176-77, USNMENT00216190, USNMENT00216200, USNMENT00216224-25, USNMENT00216228-30), 1♂ 1♀ (MEUP USNMENT00216194-95).

Comments. Roberto Zucchi kindly loaned paratypes and provided a drawing of the aculeus tip of the holotype.

Anastrepha speciosa Stone

Figs. 13, 17, 61–62, 94–96, 100, 107, 142, 163, 185, 188–189, 191

Anastrepha speciosa Stone 1942a: 100 [description, wing, aculeus tip, Panamá]; Foote 1967: 16 [in catalog]; Norrbom 1985: 156 [eversible membrane, aculeus tip]; Steyskal 1977: 28 [in key]; Korytkowski 1997: 49 [in key]; Norrbom *et al*. 1999a: 82 [in catalog]; Norrbom *et al*. 1999b: 327 [eversible membrane, classification]; Korytkowski 2004: 59 [in key].

Diagnosis. *Anastrepha speciosa* differs from most species of *Anastrepha* in having an extension from the basal part of the S-band to the posterior wing margin in the middle of cell cu_1 that is not connected to the posterior end of the proximal arm of the V-band. It differs from all of the other species having that wing character in having longer terminalia (oviscape more than 3.5 mm long, more than 1.2 times as long as mesonotum), and from all of them except *A. rafaeli* in usually having a brown posterior band on the scutum with a lateral extension to the intra-alar seta. The male is unusual in the small size or absence of the basal hyaline spot in cell dm (*A. amazonensis* also lacks this spot but differs in also lacking the hyaline spot in cell

br). *Anastrepha speciosa* further differs from *A. amazonensis* and *rafaeli* by having the apex of the hyaline triangle in cell r_1 proximal to crossvein r-m.

Description. Mostly yellow to orange, with white to pale yellow markings. Setae dark brown to black.

Head: Yellow to orange except ocellar tubercle brown and usually with U-shaped brown mark on posterior half of orbital plate and vertex, touching eye, connected only to posterior side of mark on ocellar tubercle. Usually 3, occasionally 4, rarely 2 or 5 frontal setae; 2 orbital setae, posterior seta well developed. Ocellar seta weak, at most twice as long as ocellar tubercle. Facial carina, in profile, straight or slightly convex dorsally and medially. Antenna extended 0.80–0.90 distance to ventral facial margin.

Thorax (Figs. 13, 17): Mostly yellow to orange with following areas white or pale yellow (not always well differentiated in dried specimens): postpronotal lobe; diffuse medial vitta, often absent, inverted T-shaped or reduced to quadrate area between dorsocentral setae; paired sublateral scutal vitta from transverse suture almost to but not including intra-alar seta; entire scutellum; dorsal margin of anepisternum; katepimeron; and most of anatergite and katatergite. Posterior margin of scutum with broad brown band, broadest medially, including acrostichal seta and extended almost to dorsocentral seta, laterally with narrower extension including intra-alar seta. Subscutellum and mediotergite entirely orange. Mesonotum 2.63–3.61 mm long. Scutum entirely microtrichose; setulae mostly yellow to orange, brownish laterally. Katepisternal seta well developed, nearly as dark to as dark as and 0.67 times as large as to subequal to anepimeral seta.

Wing (Figs. 61–62): Length 6.22–8.15 mm, width 2.45–3.43 mm, ratio 2.34–2.54. Apex of vein R_1 at 0.51–0.55 wing length. Cell c 1.26–1.50 times as long as pterostigma; pterostigma 2.62–3.33 times as long as wide. Vein R_{2+3} without sharp bends or undulations. Crossvein r-m at 0.67–0.71 distance from bm-cu to dm-cu on vein M. Vein M only slightly curved apically; cell r_{4+5} 1.21–1.41 times as wide at apex as at level of dm-cu. Cell bcu with distal lobe moderately long, length of bcu 1.32–1.64 times as long as anterior margin. Wing pattern mostly dark brown. C-band with cell bc yellowish to subhyaline; cell c narrowly yellowish basally, narrowly yellowish to subhyaline anteriorly, sometimes (especially in male) becoming brown towards apex, and usually narrowly brown distally, posteriorly with elongate medial hyaline area, not extended into pterostigma or cell r_1; remainder of C-band dark brown. Cell c with elongate nonmicrotrichose posteromedial area 0.25–0.50 width of cell in female, this area narrower or cell entirely microtrichose in male. C-band and S-band broadly connected along vein R_{4+5}; hyaline area in cell br small, usually reaching vein R_{4+5} but at most 0.60 times as long as distal brown area of cell; cell dm with basal hyaline area relatively small, but broadly extending to posterior margin in female, absent or very small in male, extending beyond midwidth of cell in only 2 specimens and well separated from bm-cu. Basal half of S-band entirely brown, without orange area in cell dm or bordering crossvein r-m; with lobelike projection to or almost to posterior wing margin in middle of cell cu_1; distal section of band orange with brown margins or occasionally mostly brown (at least with orange medial area between r-m and costa), broad, at apex of vein R_{2+3} 0.85–1.00 times width of cell r_{2+3}, slightly to distinctly broadening in cell r_{2+3}, well separated from apex of vein M; hyaline area proximal to it ending at vein R_{2+3}. Hyaline basomarginal spot in cell r_1 triangular or with distal side slightly elongated, extended beyond vein R_{2+3} and usually to R_{4+5}, its apex aligned proximal to crossvein r-m. V-band complete, mostly moderate brown, moderately broadly to broadly connected to S-band in cell r_{2+3}; proximal arm with medial orange area from vein R_{4+5} to anterior 0.25–0.80 of dm-cu, proximal arm moderately broad, gradually slightly broadening posteriorly, without basal extension along wing margin, at level of vein M 1.85–2.40 times as wide as distal arm and 1.60–2.80 times as wide as hyaline area proximal to it in cells r_{4+5} and dm; distal arm slender.

Abdomen: Mostly orange, without brown markings.

Male terminalia: Lateral surstylus short, extended beyond prensisetae by ca. 2 times length of prensiseta; in lateral view broad, slightly posteriorly curved and tapering to acute apex; in posterior view gradually tapered to acute apex, lateral margin convex, medial margin concave. Proctiger with ventral and lateral sclerotized areas connected but lateral areas separate dorsally. Phallus 5.50–6.00 mm long, 1.65–2.00 times as long as mesonotum; glans 0.40–0.45 mm long.

Female terminalia: Oviscape (Fig. 13) 3.62–4.70 mm long, 1.23–1.38 times as long as mesonotum; distal 0.80 or more brown; spiracle at basal 0.24–0.35. Eversible membrane (Figs. 94–96, 100) with ca. 50 large, hooklike dorsobasal scales in triangular to semicircular pattern. Aculeus (Fig. 142) slightly ventrally curved in lateral view, 3.40–4.70 mm long; in ventral view base 0.20–0.24 mm wide; shaft 0.10–0.14 mm wide at midlength; tip (Figs. 163, 185, 188–189) 0.26–0.31 mm long, 0.11–0.135 mm wide, 2.1–2.5 times as long as wide, 0.06–0.08 mm wide in lateral view, 0.50–0.62 times ventral width, in ventral view gradually tapering, apical 0.27–0.39 finely serrate. Spermathecae (Fig. 107) spherical.

Egg (Fig. 191): (14 dissected from abdomen of female): Slender, 1.15–1.25 mm long, 0.15–0.17 mm wide at broadest point, slightly curved. Posterior end strongly tapered. Anterior end without lobe distal to micropyle, micropyle nipple-shaped.

Distribution. *Anastrepha speciosa* is known only from Panamá.

Biology. The host plants and other aspects of the biology of this species other than dates of capture of adults are unknown.

Type Data. Holotype female (USNM USNMENT000104286), PANAMÁ: El Cermeño, 18 Jul 1939, J. Zetek 4517 [examined]. The wing and terminalia are mounted on slides 39.XI.8a and 39.XI.8b.

Other specimens examined. PANAMÁ: Panamá: Parque Nacional Chagres, Altos de Pacora, McPhail trap, 12 Apr 2002, C. A. Korytkowski, 1♀ (USNM USNMENT00214745); same, 2001, C. A. Korytkowski, 1♂ 1♀ (FSCA USNMENT00214783-84), 2♂ 1♀ (INPA USNMENT00214785-87), 13♂ 13♀ (USNM USNMENT00214788-801, USNMENT00214803-14); Altos de Pacora, Migdalia Fuentes, McPhail trap 535A, Jul 2003, C. A. Korytkowski, 1♀ (USNM USNMENT00213669); Arraijan, 13 Sep 1947, J. Zetek 5310, 1♀ (USNM USNMENT00216303); same, 20 Sep 1947, J. Zetek 5311, 1♀ (USNM USNMENT00052105); Balboa, 16 Jul 1942, J. Zetek 4966, 1♀ (USNM USNMENT00216302); El Cermeño, 3 Jun 1941, J. Zetek 4791, 1♀ (USNM USNMENT00216291); same, 21 Apr 1942, J. Zetek 4935, 1♀ (USNM USNMENT00216301).

Comments. The male of this species was previously unknown.

Relationships

The species included in the *robusta* group belong to the basal clades of the genus; they have plesiomorphic character states that indicate that they do not belong to the large clade including the *grandis-fraterculus* species groups (see Norrbom et al. 1999b). These include the spherical shape of the spermathecae (elongate or ovoid is apomorphic) and the proctiger sclerotization not divided into ventral and lateral parts.

There are no unique, clear-cut synapomorphies for the entire *robusta* group. Most species have a strong indentation in the base of the S-band, but there is intergradation in this character within the group and in other species groups and it is difficult to score.

Despite the uncertainty about the monophyly of the group, we conducted a cladistic analysis with all of the included species except *A. phaeoptera*. The characters used in the phylogenetic analysis are listed in Table 1 and the included species are scored in the character matrix in Table 2. *Anastrepha phaeoptera* is included in the matrix, but consensus trees that resulted from the early analyses that included it were poorly resolved. Presumably because so many character states are unknown for it, it occurred in various places in the resulting trees. We inactivated it in subsequent analyses.

The matrix was analyzed using the implicit enumeration option in TNT (Goloboff *et al*. 2007). All characters were treated as nonadditive. We analyzed the matrix using several different species as the outgroup, including *A. panamensis* Greene and *A. superflua* Stone. All of these species belong to the basal clades of *Anastrepha*, but it is unclear which is most closely related to the *robusta* group. We also ran the analysis with a hypothetical ancestor scored with the predominant states in the above species and other species in the basal clades of *Anastrepha*. For most characters the polarity would be the same regardless of the outgroup, but character states vary among the outgroup species for about a third (e.g., scutal microtrichia, apical curvature

of vein M, base of S-band with indentation, connection of S-band and V-band, oviscape length, eversible membrane with gap, surstylus shape).

With *A. panamensis* as outgroup a single tree of 75 steps resulted (Fig. 215). Likewise, with the hypothetical ancestor, a single tree of 74 steps was produced (Fig. 216). With *A. superflua* as the outgroup, six trees of 77 steps resulted. The concensus tree is much less resolved than the trees from the other two analyses (Fig. 217), but five clades are recognized that are also supported in the other two analyses. *A. rojasi* is grouped with *A. binodosa* + *A. miza* in all but one tree with *A. superflua* as outgroup and in both of the other analyses. Based on these results, we recognize the following subgroups within the *robusta* group, each of which appears to be monophyletic. These include: *binodosa* subgroup: *A. binodosa*, *A. miza*, *A. rojasi*; *cryptostrepha* subgroup: *A. cordata*, *A. cryptostrepha*, *A. cryptostrephoides*, *A. disticrux*; *lambda* subgroup: *A. lambda*, *A. nigrivittata*; *nigra* subgroup: *A. nigra*, *A. partita*; *robusta* subgroup: *A. amaryllis*, *A. fenestrata*, *A. fenestrella*, *A. furcata*, *A. fuscata*, *A. isolata*, *A. jamaicensis*, *A. nigrifascia*, *A. pittieri*, *A. pseudorobusta*, *A. robusta*, and *A. simulans*; *A. phaeoptera* is tentatively included here; *speciosa* subgroup: *A. amazonensis*, *A. rafaeli*, *A. speciosa*; unplaced: *A. bella*, *A. concava*.

Synapomorphies for the *binodosa* subgroup include the shape of the surstylus, the pattern of denticles on the eversible membrane (with a membranous gap; possibly a synapomorphy with other species), and especially the unique shape of the aculeus tip. Support for the monophyly of the *cryptostrepha* subgroup includes the lack of microtrichia on most of the scutum, the relatively long pterostigma, and particularly the dorsally connected proctiger sclerotization which is unique to this group. The lateral extension of the posterior brown scutal band, although not consistently present and also occuring within the *speciosa* subgroup may further indicate the monophyly of this subgroup. Synapomorphies for the *lambda* subgroup include the brown occipital and scutal vittae (latter convergent in *A. cordata*), the basal break in the S-band (unique to these two species), the base of the S-band with an extension connected to the proximal arm of the V-band (convergent in the *nigra* subgroup and *A. isolata* + *A. pittieri*), the S-band and V-band not connected anteriorly, and the aculeus tip serrate.

Synapomorphies for the *nigra* subgroup include the base of the S-band with an extension connected to the proximal arm of the V-band (convergent in the *lambda* subgroup and *A. isolata* + *A. pittieri*) and the extremely narrow aculeus. Support for the *speciosa* subgroup includes the base of the S-band with an extension not connected to the proximal arm of the V-band (convergent in *A. fenestata* and *A. fenestrella*), the base of the S-band entirely dark brown (possibly a synapomorphy with *A. concava*), the aculeus tip serrate, and possibly the lateral extension of the posterior brown scutal band (absent in *A. amazonensis*, also present in *A. cordata*, *A. cryptostrephoides*, and some *A. cryptostrepha*).

Synapomorphies for the *robusta* subgroup include the strong apical curvature of vein M (occurs convergently in other species groups of *Anastrepha*) and the egg with elongate lobe (known only for *A. nigrifascia* and *A. pittieri*), and possibly the brown posterior scutal band (not consistently present; possibly synapomorphy with *lambda* subgroup and/or *binodosa* subgroup, also occurs within the *speciosa* subgroup), and pattern of denticles on the eversible membrane, which are small except the distal 1–2 rows (possibly synapomorphy with *lambda* subgroup). Within the *robusta* subgroup two subclades are recognized in all of the analyses. The first includes *A. fenestrata*, *A. fenestrella*, *A. isolata*, and *A. pittieri*. The monophyly of this clade is supported by the lobelike pale area within the C-band (unique within the *robusta* group although occuring, presumably by convergence, in a few other *Anastrepha* species), the S-band with a basal extension, the proximal margin of the S-band in cell dm usually brown, surstylus shape, and the aculeus tip extensively serrate and triangular with straight lateral margins. The second subclade includes *A. amaryllis*, *A. furcata*, *A. fuscata*, *A. jamaicensis*, *A. nigrifascia*, *A. pseudorobusta*, *A. robusta*, and *A. simulans*. Synapomorphies for this clade are the short rounded surstylus shape and the shape of the aculeus tip (as deep as wide).

The status of other species previously included in the *cryptostrepha* group (Norrbom et al. 1999a, Hérnandez-Ortiz 2004) is unresolved and is beyond the scope of this study. Those species probably comprise 2 monophyletic clades, the *panamensis* group: *A. margarita* Caraballo, *A. panamensis Greene*, and *A. zeteki* Greene; and the *tripunctata* group: *A. maya* Hérnandez-Ortiz, *A. relicta* Hérnandez-Ortiz, and *A. tripunctata*

TABLE 1. Taxonomically useful characters of the *robusta* group.

1. Frons markings—0) orange posteriorly except ocellar tubercle; 1) with U-shaped mark on posterior margin and orbital plate (sometimes only connected more posteriorly, on occiput, in *A. cordata*).
2. Occiput markings—0) entirely orange; 1) with 3 brown vittae, the medial one broader dorsally and extending to ocellar tubercle; 2) with medial inverted triangular or V-shaped mark.
3. Scutal markings on posterior margin - 0) without brown markings; 1) at least sometimes with orange brown or brown band, not extended to intra-alar seta (variable species coded 1 in analysis); 2) with brown band, extended to intra-alar seta.
4. Scutal brown vittae—0) without brown vittae; 1) with 3 paired brown vittae.
5. Katepisternal seta—0) undifferentiated or weak, yellowish; 1) well developed, nearly as dark as and at least 0.50 times as large as anepimeral seta.
6. Mesonotal microtrichia—0) scutum and scutellum entirely microtrichose; 1) scutum with 2 large submedial nonmicrotrichose areas, scutellum microtrichose; 2) scutum nonmicrotrichose except laterally, scutellum microtrichose; 3) scutum, except laterally, and scutellum nonmicrotrichose.
7. Cell c length/ pterostigma length—0) greater than 1.1; 1) less than 1.1.
8. Vein M apical curvature—0) slightly curved (ratio of cell r_{4+5} width > 0.95); 1) strongly curved (ratio of cell r_{4+5} width < 0.95).
9. C-band in cells r_1 and r_{2+3}—0) mostly or entirely orange, at most posterior and distal margins narrowly brown (anterior margin of r_1 also brown in *A. disticrux*), or if more extensive (some *A. robusta*) with borders of orange and brown areas diffuse; 1) mostly or entirely brown, at most with orange or subhyaline area in cell r_1 posterior to cell c and base of pterostigma and/or a subapical orange area (*partita*, some *nigra*, some *cryptostrepha*); 2) mostly brown, with well defined, broad, elongate, distally rounded, orange or subhyaline area extending at least 0.67 across r_1 and to level of basal third to half length of pterostigma.
10. Basomarginal hyaline area in cell R_1—0) apex aligned proximal to crossvein r-m; 1) apex aligned with or distal to crossvein r-m.
11. Base of S-band—0) without posterior extension; 1) with posterior extension in middle of cell cu_1; 2) with extension connected to proximal arm of V-band.
12. Base of S-band in cell cu_1 —0) with posterior margin more or less straight; 1) with distinct indentation in posterior margin; 2) extreme base completely separated from rest of S-band. *A. nigrifascia* is variable and was coded with its predominant state in the final matrix.
13. S-band color bordering crossvein r-m and in cell dm - 0) with large orange area, basal margin in cell dm orange; 1) with large orange area, basal margin in cell dm mostly or entirely brown, orange medial area isolated or nearly so; 2) band entirely brown bordering r-m and in cell dm.
14. S-band and V-band connected in cell r_{2+3} —0) separated; 1) connected; 2) usually broadly connected (line extended anteriorly from dm-cu usually not crossing hyaline area between S-band and distal arm of V-band).
15. V-band, distal arm—0) connected to proximal arm (in *A. nigrifascia* proximal arm sometimes interrupted in cell r_{4+5}, but distal arm connected to S-band); 1) distal arm isolated.
16. V-band, proximal arm color bordering dm-cu—0) with orange area bordering dm-cu at least anteriorly; 1) entirely brown bordering dm-cu.
17. Lateral surstylus shape—0) moderately long, acute or lobed; 1) moderately long and subtruncate; 2) very short, extended beyond prensisetae by less than length of prensiseta, and subtruncate; 3) short, extended beyond prensisetae by 1–2 times length of prensiseta, very broad in lateral view and bluntly acute apically, posterior margin concave near level of base of surstylus; 4) short, extended beyond prensisetae by 1–2 times length of prensiseta, relatively narrow in lateral view and bluntly acute apically, posterior margin concave from base to apex; 5) short, extended beyond prensisetae by 1–2 times length of prensiseta, relatively narrow in lateral view and bluntly acute apically, posterior margin often concave near level of prensisetae; 6) very short, extended beyond prensisetae by less than length of prensiseta, and rounded apically.
18. Proctiger sclerotization—0) lateral sclerotization not connected dorsally; 1) sclerotization continuous dorsally.
19. Oviscape/mesonotum ratio—0) less than 1; 1) greater than 1.
20. Oviscape color —0) entirely yellow or orange; 1) distal 0.40 or more dark brown. *A. furcata* and *A. lambda* in which the oviscape is entirely orange brown were tentatively coded state 0; *A. fenestrella* in which the oviscape is usually darker orange to brown dorsally was coded state 1.
21. Eversible membrane, dorsobasal denticles, pattern—0) with several rows of similarly sclerotized, moderately long denticles in triangular pattern; 1) with numerous similarly sclerotized, long denticles in triangular pattern; 2) with numerous long denticles in subtriangular to semicircular pattern (as broad as long); 3) with gap of weakly sclerotized or membranous denticles proximal to 1 to several rows of strong, hooklike denticles; 4) with denticles similarly sclerotized, only 1–2 apical rows elongate or all relatively short and stout.
22. Aculeus length/ oviscape length—0) at least 0.65; 1) less than 0.65.
23. Aculeus curvature—0) straight or slightly ventrally curved; 1) strongly dorsally curved.
24. Aculeus tip width—0) more than 0.05 mm wide and without subbasal constriction; 1) less than 0.04 mm wide, with subbasal constriction.
25. Aculeus tip, lateral protuberances—0) without protuberances; 1) with 2 lateral protuberances, 1 near base and one

near apical third.

26. Aculeus tip serrations—0) non-serrate; 1) serrate on less than distal two-thirds; 2) serrate on at least distal two-thirds.
27. Aculeus tip shape, ventral view—0) variously tapering, lateral margins at least partially convex or concave; 1) sagittate or triangular, lateral margins straight.
28. Aculeus tip width/depth (width in ventral view/width in lateral view)—0) less than 0.8; 1) greater than 0.8.
29. Egg—0) without lobe on micropyle end; 1) with long lobe on micropyle end.

TABLE 2. Character state distributions in species of the *robusta* group. Those scored "?" are unknown. States in parentheses are rare in a taxon; those followed by "?" indicate where scoring was not certain. The parentheses and latter type of "?" were deleted in the TNT analyses.

										Character																		
										1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Taxon	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Outgroup																													
superflua	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	4?	0	1	0	0	0	0	0	0	0	0	0	?
panamensis	0	0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0?	0	1	0	3	0	0	0?	0	0	0	1	?
hypoth. ancestor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ingroup																													
pseudorobusta	0	0	0 1	0	0	0	0	1	0	0	0	1	0	1	0	0	6	0	0	0	4	0	0	0	0	0	0	1	?
simulans	0	0	1 0	0	0	0	0	1	0	0	0	1	0	1	0 (1)	0	6	0	0	0	4	0	0	0	0	0	0	1	?
nigrifascia	0	0	1	0	0	1	0	1	0	0	0	1 0	0	1	0	1	6	0	0	0	4	0	0	0	0	0	0	1	1
jamaicensis	0	0	1	0	0	0	0	1	0	0	0	0	0	1	1	0	?	?	0	0	4	0	0	0	0	0	0	1	?
amaryllis	0	?	1	0	0	0	0	1	0	0	0	1	0	1	0	0	?	?	0	?	4	0	1	0?	0?	0	0	?	?
robusta	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0 (1)	0 1	6	0	0	0	4	0	1	0	0	0	0	1	?
fuscata	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	?	?	0	0	4	0	1	0	0	0	0	1	?
furcata	0	0	1	0	0	0	0	1	1	0	0	1	1 0	1	0	0	6	0	0	0?	4	0	1	0	0	0	0	1 0	?
phaeoptera	0?	0?	0?	0	0	0	0	1?	1	1	0	1	2	2	1	0	6	0?	?	?	?	?	?	?	?	?	?	?	?
fenestrata	0	0	1 0	0	0	0	0	1	2	0	1	1	1	1	0	0	5	0	0	0	4	0	0	0	0	2	1	0	?
fenestrella	0	0	1	0	0	0	0	1	2	0	1	1	1	1	0	0	5	0	0	1?	4	1	0	0	0	2	1	0	?
isolata	0	0	0 1?	0	0	0	0	1	2	0	2	1	1	1	0	0	5	0	0	0	4	1	0	0	0	2	1	0	?
pittieri	0	0	1	0	0	0	0	1	2	0	2	1	1 0?	1	0	0	5	0	0	0	4	1	0	0	0	2	1	0	1
lambda	0	1	1	1	0	0	0	0	0	0	2	2	0	0	0	0	?	?	0	0?	4	0	0	0	0	1	0	0	?
nigrivittata	0	1	1	1	0	0	0	0	0	0	2	2	0	0	0	0	?	?	0	0	4	0	0	0	0	1	0	0	?
rafaeli	1 0	0	2	0	1	0	0	0	1	1	1	1	2	1	0	0	4	0	0	1	0	0	0	0	0	2	0	0	?
speciosa	1 0	0	2	0	1	0	0	0	1	0	1	1	2	1	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0
amazonensis	1	0	1	0	1	0	0	0	1	1	1	1	2	1	0	0	?	?	0	1	0	0	0	0	0	1	0	0	?
partita	0	0	0	0	0	0	0	0	1	0	2	1	0	1	0	0	?	?	0	1	3	0	0	1	0	0	0	1	?
nigra	0	0	0	0	0	0	0	0	1	0	2	1	0	1	0	0	3?	0	0	1	3	0	0	1	0	0	0	1	?
bella	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0	1	1	2	0	0	0	0	0	0	0	0
concava	0	0	0	0	1?	0	0	0	1	0	0	1	2	2	0	1	1	0	1	1	3	0	0	0	0	0	0	0	?
cryptostrepha	1 0	0	2 0	0	0	2	1	0	1	1	0	1	0	1	0	0	3	1	1	1	2	0	0	0	0	0	0	1	?
cryptostrephoides	0	2?	2	0	0	2	1	0	0	0	0	1	0	1	0	0	3	1	1?	?	?	?	?	?	?	?	?	?	?
disticrux	0	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0	?	?	1	1	2	0	0	0	0	?	?	?	?
cordata	1	2	2	1	0	2	1?	0	0	0	0	1	0	1	0	1	3	1	1	1	2	0	0	0	0	0	0	1	0
binodosa	0	0	0 1?	0	0	0	1	0	0	0	0	1	0	1	0	0	2	0	1	0	3	0	0	0	1	1	0	0	?
miza	0	0	0	0	0	0	1	0 1	0	0	0	1?	0	1	0	0	2	0	0	0	3	0	0	0	1	1	0	0	?
rojasi	0	0	0 1	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	1	3	0	0	0	1	1	0	0	?

Wulp. Monophyly of the latter group is supported by the analysis of Hérnandez-Ortiz (2004), but whether these two groups are sister taxa and exactly how they are related to the species of the *robusta* group are uncertain. Most of them have an indentation in the base of the S-band (except *A. relicta*), and all of them have vein M weakly curved apically, characters shared by many species of the *robusta* group and several other basal clades of *Anastrepha*. Most of them (except *A. maya*) largely lack scutal microtrichia like species of the *cryptostrepha* subgroup, and they have the aculeus slender, with a relatively short, stout tip (unknown for *A. relicta*), but both characters vary within other species groups of *Anastrepha* and it is unclear whether they are synapomorphies for the *panamensis* group, the *tripunctata* group and the *cryptostrepha* subgroup.

Acknowledgments

We sincerely thank the many scientists, curators and institutions who kindly loaned or provided specimens for study, particularly Ian White and John Chainey (BMNH), Norm Penny (CAS), Chen Young (CMP), Jeff Cumming (CNC), Gary Steck (FSCA), Laszlo Papp (HNHM), Manuel Zumbado (INBio), J. A. Rafael (INPA), C. J. Rosales (IZAM), Phil Perkins (MCZ), Nancy Carrejo (MEUV), Chica do Val (MZUSP), Ruth Contreras-Lichtenberg (NMW), Norma Nolazco (SENASA), Uwe Kallweit (SMT), Claudio Carvalho (UFPC), and Wilford Hanson (USU). Many of the specimens from Costa Rica were collected or reared by INBio parataxonomists supported by the Research and Scientific Exchanges Division, Foreign Agricultural Service, USDA (Project No. CS-ARS-6, Grant No. FG-CR-107). We are grateful to Juan Tigrero for providing measurements and images of the holotype of *A. amaryllis*. George Venable, Roy Larimer, Taina Litwak, and Marie Metz produced some of the illustrations, and Terrence Walters (USDA, APHIS, CPHST) secured funding for some of the illustration work. We also thank Lucrecia Rodriguez for assistance with the illustrations, and John Brown, Wayne Mathis, and Norman Woodley for their comments on previous drafts of the manuscript.

References

Aczél, M. L. (1950) Catalogo de la familia 'Trypetidae' (Dipt. Acalypt.) de la region neotropical. *Acta Zoologica Lilloana* (1949) 7, 177–328.

Aluja, M. (1993) Unusual calling behavior of *Anastrepha robusta* flies (Diptera: Tephritidae) in nature. *Florida Entomologist* 76, 391–395.

Aluja, M., Cabrera, M., Rios, E., Guillen, J. C., Celedonio H., Hendrichs, J. P. & Liedo, P. (1987) A survey of the economically important fruit flies (Diptera: Tephritidae) present in Chiapas and a few other fruit growing regions in Mexico. *Florida Entomologist* 70, 321–329.

Aluja, M., Pinero, J., Lopez, M., Ruiz, C., Zuniga, A., Piedra, E. Diaz-Fleischer, F. & Sivinski, J. (2000) New host plant and distribution records in Mexico for *Anastrepha* spp., *Toxotrypana curvicauda* Gerstacker, *Rhagoletis zoqui* Bush, *Rhagoletis* sp., and *Hexachaeta* sp. (Diptera: Tephritidae). *Proceedings of the Entomological Society of Washington* 102, 802–815.

Aluja, M., Rull, J., Sivinski, J., Norrbom, A. L., Wharton, R. A., Macias-Ordoñez, M. Diaz-Fleischer, F. & Lopez, M. (2003) Fruit flies of the genus *Anastrepha* (Diptera: Tephritidae) and associated native parasitoids (Hymenoptera) in the tropical rainforest biosphere reserve of Montes Azules, Chiapas, Mexico. *Environmental Entomology* 32, 1377–1385.

Caraballo, J. (1981) Las moscas de frutas del genero *Anastrepha* Schiner, 1868 (Diptera: Tephritidae) de Venezuela. Dissertation, Universidad Central de Venezuela, Maracay. xi + 210 p. [names in this work are unavailable for purposes of zoological nomenclature]

Caraballo, J. (1985) Nuevas especies del género *Anastrepha* Schiner, 1868 (Diptera: Tephritidae) de Venezuela. *Boletin de Entomologia Venezolana* (N.S.) 4, 25–30.

Carrejo, N. S. & González O., R. 1994. Lista preliminar de las moscas de la fruta del genero *Anastrepha* (Dip.: Tephritidae), en el Departamento del Valle de Cauca Cali, Colombia. *Boletín del Museo de Entomologia de la Universidad del Valle* 2, 85–93.

Fernández Yépez, F. (1953) Contribucion al estudio de las moscas de las frutas del genero *Anastrepha* Schiner (Diptera:

Trypetidae) de Venezuela. *II Congreso de Ciencias Naturales y Afines (Caracas)* Cuaderno No. 7, 42 p.
Foote, R. H. (1965) Family Tephritidae. *In*: Stone, A., Sabrosky, C. W., Wirth, W. W., Foote, R. H. & Coulson, J. R. (Eds.), *A catalog of the Diptera of America north of Mexico*. United States Department of Agriculture, Agricultural Handbook 276, pp. 658–678.
Foote, R. H. (1967) Family Tephritidae (Trypetidae, Trupaneidae). *In*: Papavero, N. (Ed.), *A catalogue of the Diptera of the Americas south of the United States*. Departamento de Zoologia, Secretaria da Agricultura, São Paulo. Fascicle 57, 91 pp.
Foote, R. H., Blanc, F. L. & Norrbom, A. L. (1993) *Handbook of the fruit flies (Diptera: Tephritidae) of America north of Mexico*. Comstock Publishing Associates, Ithaca. xii + 571 p.
Goloboff, P. A., Farris, J. S. & Nixon, K. C. (2007) TNT, tree analysis using new technology, version 1.1. [personal use license courtesy of Willi Hennig Society]
Greene, C. T. (1934) A revision of the genus *Anastrepha* based on a study of the wings and on the length of the ovipositor sheath (Diptera: Trypetidae). *Proceedings of the Entomological Society of Washington* 36, 127–179.
Hendel, F. G. (1914a) Analytische Ubersicht uber die *Anastrepha*-Arten (Dipt.). *Wiener Entomologische Zeitung* 33, 66–70. [1914.01.01]
Hendel, F. G. (1914b) Die Bohrfliegen Südamerikas. Übersicht und Katalog der bisher aus der neotropischen Region beschriebenen Tephritinen. *Abhandlungen und Berichte des Königlichen Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden* (1912) 14 (3), 1–84. [1914.06.15]
Hering, E. M. (1941) Trypetidae (Dipt.). *In*: Titschack, E., *Beitrage zur Fauna Perus*, Hamburg. Band 1, p. 121–176, 1 pl.
Hernández-Ortiz, V. (1992) *El genero* Anastrepha *Schiner en Mexico (Diptera: Tephritidae). Taxonomia, distribucion y sus plantas huespedes*. Instituto de Ecología and Sociedad Mexicana de Entomología, Xalapa, Veracruz, Mexico. 162 p.
Hernández-Ortiz, V. (2004) Two remarkable new species related to *Anastrepha tripunctata* (Diptera: Tephritidae) with a discussion of the affinities of the *cryptostrepha* group. Canadian Entomologist 136, 759–770.
Hernández-Ortiz, V. (2007) Diversidad y biogeografía del género *Anastrepha* en México. *In*: Hernández-Ortiz, V. (Ed.), *Moscas de la fruta en Latinoamérica (Diptera: Tephritidae): Diversidad, biología y manejo*. S y G Editores, México, D. F., pp. 53–76.
Hernández-Ortiz, V. & Pérez-Alonso, R. (1993) The natural host plants of *Anastrepha* (Diptera: Tephritidae) in a tropical rain forest of Mexico. *Florida Entomologist* 76, 447–460.
Korytkowski, C. A. (1997) Manual para la identificación de "moscas de la fruta". Tomo II: Género *Anastrepha* Schiner. Universidad de Panamá, Panamá. 137 p. [unpublished manual for identification course, names in this work are unavailable for purposes of zoological nomenclature]
Korytkowski, C. A. (2001) Situación actual del género *Anastrepha* Schiner, 1868 (Diptera: Tephritidae) en el Perú. *Revista Peruana de Entomología* 42, 97–158.
Korytkowski, C. A. (2004) Manual para la identificación de "moscas de la fruta". Género *Anastrepha* Schiner. Universidad de Panamá, Panamá. 139 p. [unpublished manual for identification course, names in this work are unavailable for purposes of zoological nomenclature]
Korytkowski, C. A. & Ojeda Peña, D. (1970) Especies del genero *Anastrepha* Schiner 1868 en el nor-oeste peruano. *Revista Peruana de Entomología* (1968) 11, 32–70.
Kovaleski, A., Uramoto, K., Sugayama, R. L., Canal, N. A. & Malavasi, A. (1999) A survey of *Anastrepha* Schiner (Diptera, Tephritidae) species in the apple growing area of the state of Rio Grande do Sul, Brazil. *Revista Brasileira de Entomología* 43, 229–234.
Kovaleski, A., Sugayama, R. L., Uramoto, K. & Malavasi, A. (2000) [Moscas-das-frutas nos estados brasileiros] Rio Grande do Sul. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado*. Holos, Riberão Preto, pp. 285–290.
Lima, A. M. da Costa (1934) Moscas de frutas do genero *Anastrepha* Schiner, 1868 (Diptera: Trypetidae). *Memórias do Instituto Oswaldo Cruz (Rio de Janeiro)* 28, 487–575.
Lima, A. M. da Costa (1937a) Novas moscas de frutas do genero *Anastrepha* (Diptera: Trypetidae) [part]. *O Campo* 8 (June), 34–38.
Lima, A. M. da Costa (1937b) Novas moscas de frutas do genero "Anastrepha" (Diptera: Trypetidae) [part]. *O Campo* 8 (October), 60–64.
Lima, A. M. da Costa (1938) Novas moscas de frutas do genero "Anastrepha" (Diptera: Trypetidae) [concl.]. *O Campo* 9 (January), 61–64.
Lutz, A. & Lima, A. M. da Costa (1918) Contribuição para o estudo das Tripaneidas (moscas de frutas) brazileiras. *Memórias do Instituto Oswaldo Cruz (Rio de Janeiro)* 10, 5–15.
Martins, D. dos Santos, Uramoto, K. & Malavasi, A. (2000) [Moscas-das-frutas nos estados brasileiros] Espírito Santo. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado*. Holos, Riberão Preto, pp. 253–258.

Molineros, J., Tigrero, J. O. & Sandoval, D. (1992) *Diagnostico de la situacion actual del problema de las moscas de la fruta en el Ecuador.* Comision Ecuatoriana de Energia Atomica, Direccion de Investigaciones, Quito. 53 p.

Nascimento, A. S. & Carvalho, R. da Silva (2000) [Moscas-das-frutas nos estados brasileiros] Bahia. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado.* Holos, Riberão Preto, pp. 235–239.

Nixon, K. C. (2002) *WinClada*. Version 1.00.08.

Norrbom, A. L. (1985) Phylogenetic analysis and taxonomy of the *cryptostrepha*, *daciformis*, *robusta*, and *schausi* species groups of *Anastrepha* Schiner (Diptera: Tephritidae). Dissertation, Pennsylvania State University, University Park. xvi + 354 + [1] p. [names in this work are unavailable for purposes of zoological nomenclature]

Norrbom, A. L. (2004) Host plant database for *Anastrepha* and *Toxotrypana* (Diptera: Tephritidae: Toxotrypanini). *Diptera Data Dissemination Disk (CD-ROM)* 2.

Norrbom, A. L. & Foote, R. H. (1989) The taxonomy and zoogeography of the genus *Anastrepha* (Diptera: Tephritidae). *In*: A. S. Robinson & G. Hooper (Eds.), *Fruit flies, their biology, natural enemies and control*. W. Helle (Ed.), *World Crop Pests*, Vol. 3(A). Elsevier Science Publishers, Amsterdam, pp. 15-26.

Norrbom, A. L. & Kim, K. C. (1988) A list of the reported host plants of the species of *Anastrepha* (Diptera: Tephritidae). *United States Department of Agriculture Animal and Plant Health Inspection Service APHIS* 81–52, 114 p.

Norrbom, A. L., Carroll, L. E., Thompson, F. C., White, I. M. & Freidberg, A. (1999a) Systematic database of names. *In*: Thompson, F. C. (Ed.), Fruit Fly Expert Identification System and Systematic Information Database. *Myia* (1998), 9, pp. 65–251, & *Diptera Data Dissemination Disk* (CD-ROM) (1998) 1.

Norrbom, A. L., Zucchi, R. A. & Hernández-Ortiz, V. (1999b) Phylogeny of the genera *Anastrepha* and *Toxotrypana* (Trypetinae: Toxotrypanini) based on morphology. *In*: Aluja, M. & Norrbom, A. L. (Eds.), *Fruit flies (Tephritidae): Phylogeny and evolution of behavior.* CRC Press, Boca Raton, pp. 299–342.

Papavero, N. (1973) *Essays on the history of Neotropical Dipterology, with special reference to collectors (1750 - 1905)*, vol. 2, pp. 217–446. Museu de Zoologia, Universidade de São Paulo, São Paulo.

Silva, N. M. da & Ronchi-Teles, B. (2000) [Moscas-das-frutas nos estados brasileiros] Amapá, Amazonas, Pará, Rondônia e Roraima. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado.* Holos, Riberão Preto, pp. 203–209.

Souza Filho, M. F. de, Raga, A. & Zucchi, R. A. (2000) [Moscas-das-frutas nos estados brasileiros] São Paulo. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado.* Holos, Riberão Preto, pp. 277–283.

Steyskal, G. C. (1977) *Pictorial key to species of the genus* Anastrepha *(Diptera: Tephritidae)*. Entomological Society of Washington, Washington, D.C. 35 p.

Stone, A. (1942a) The fruitflies of the genus *Anastrepha*. *United States Department of Agriculture Miscellaneous Publication* 439, 112 p.

Stone, A. (1942b) New species of *Anastrepha* and notes on others (Diptera, Tephritidae). *Journal of the Washington Academy of Sciences* 32, 298–304.

Tigrero, J. O. (1998) *Revisión de especies de moscas de la fruta presentes en el Ecuador.* Published by the author, Sangolquí, Ecuador. 55 p.

Wasbauer, M. S. (1972) An annotated host catalog of the fruit flies of America north of Mexico (Diptera: Tephritidae). Occasional Papers of the California Department of Agriculture Bureau of Entomology 19: [i] + 172 p.

Weems, H. V., Jr. (1967) *Anastrepha nigrifascia* Stone (Diptera: Tephritidae). *Florida Department of Agriculture, Division of Plant Industries, Entomology Circular* 66, 1 p.

White, I. M., Norrbom, A. L., Headrick, D. H. & Carroll, L. E. (1999) Glossary. *In*: Aluja, M. & Norrbom, A. L. (Eds.), *Fruit flies (Tephritidae): Phylogeny and evolution of behavior.* [16] + 944 pp., CRC Press, Boca Raton., pp. 881-924.

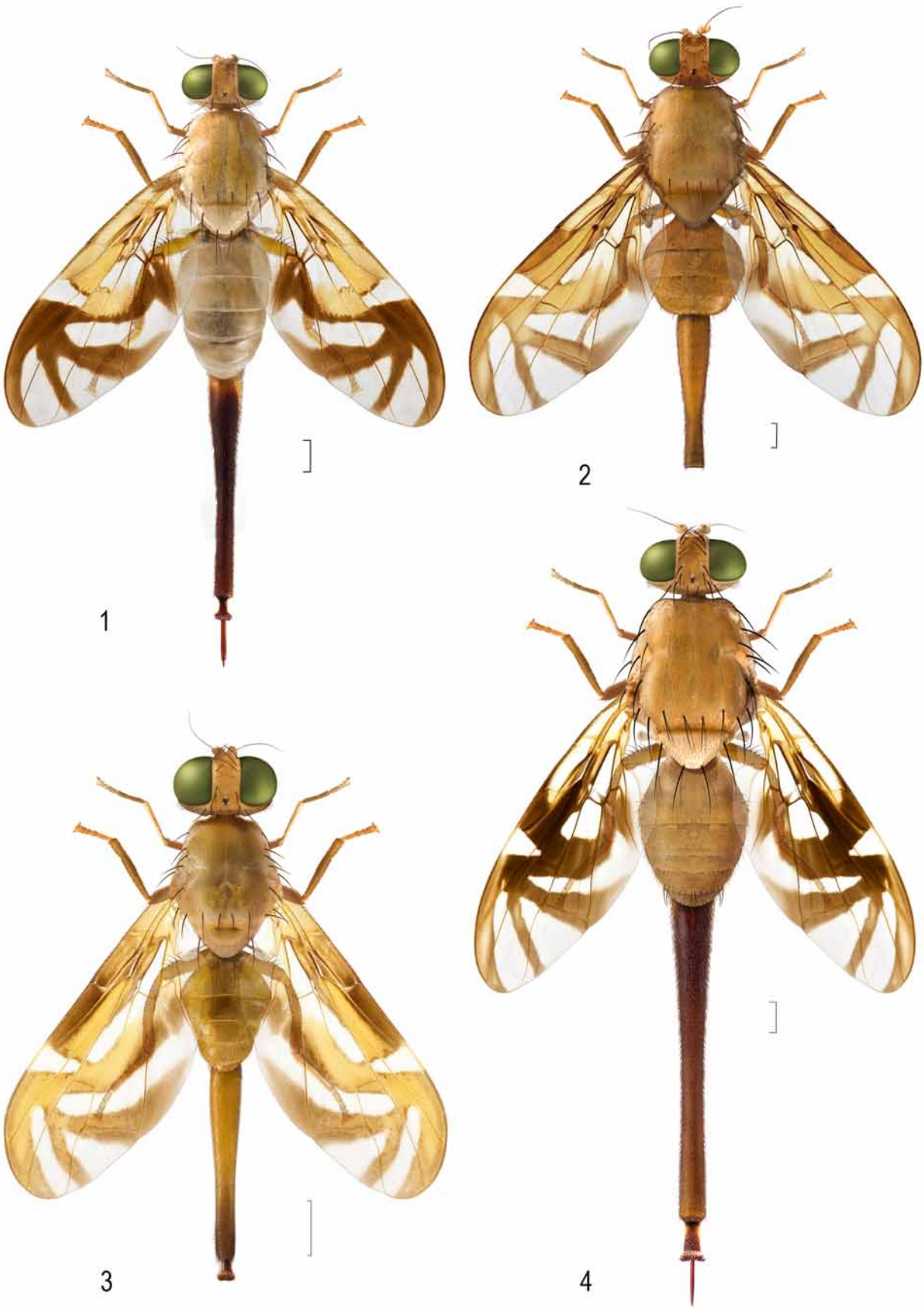
Zucchi, R. A. (1978) Taxonomia das espécies de *Anastrepha* Schiner, 1868 (Diptera, Tephritidae) assinaladas no Brasil. Dissertation, Universidade de São Paulo, Piracicaba. vi + 105 p.

Zucchi, R. A. (1979) Novas espécies de *Anastrepha* Schiner 1868 (Diptera, Tephritidae). *Revista Brasileira de Entomología* 23, 35–41.

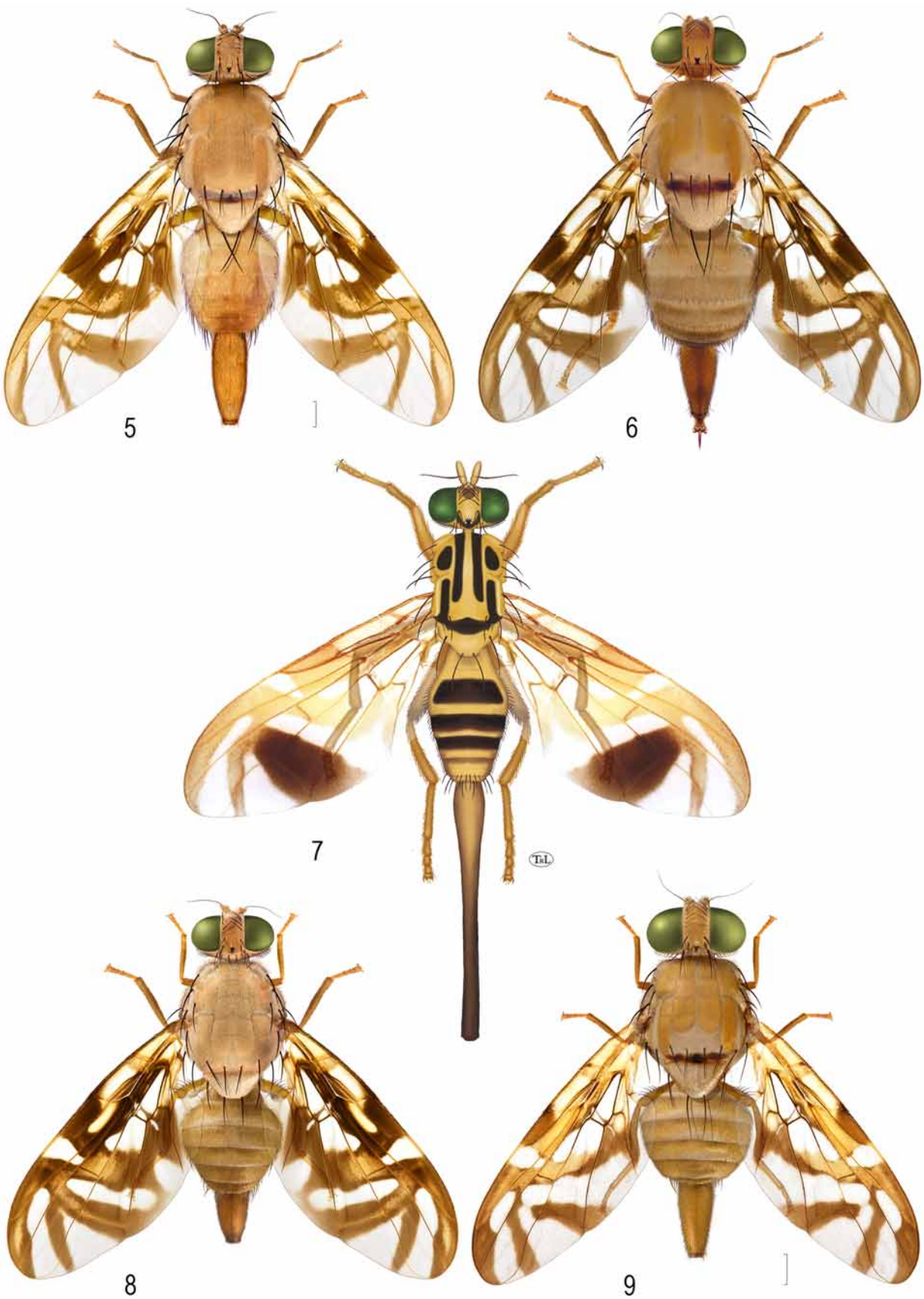
Zucchi, R. A. (2000a). Taxonomia. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado.*Holos, Riberão Preto, pp. 13–24.

Zucchi, R. A. (2000b). Espécies de *Anastrepha*, sinonímias, plantas hospedeiras e parasitóides. *In*: Malavasi, A. & Zucchi, R. A. (Eds.), *Moscas-das-frutas de importância econômica no Brasil. Conhecimento básico e aplicado*. Holos, Riberão Preto, pp. 41–48.

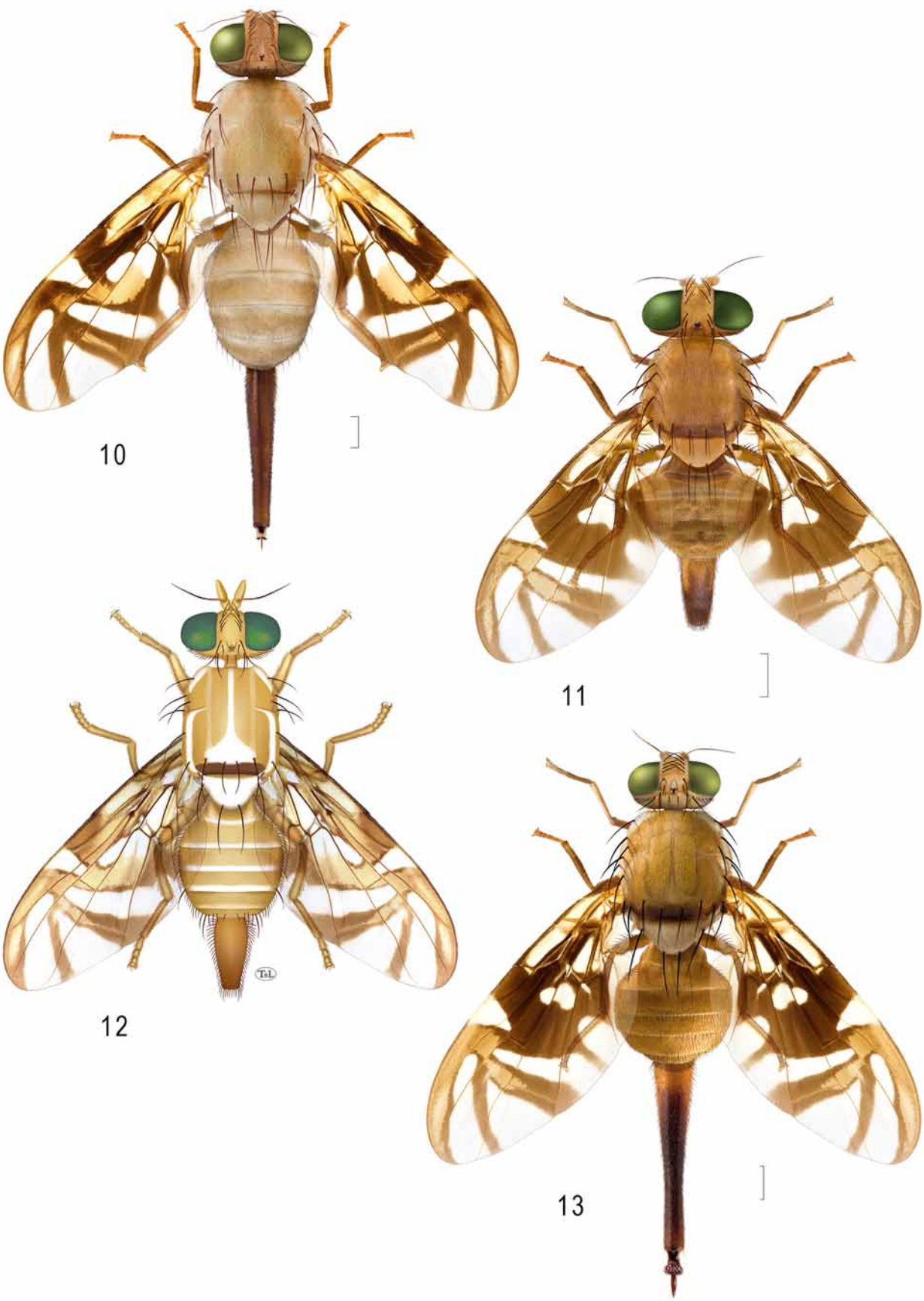
Zucchi, R. A., Silva, N. M. da & Silveira Neto, S. (1996) *Anastrepha* species from the Brazilian Amazon: Distribution, hosts, and lectotype designations. *In*: McPheron, B. A. & Steck, G. J. (Eds.), *Fruit fly pests: A world assessment of their biology and management*. St. Lucie Press, Delray Beach, pp. 259–264.



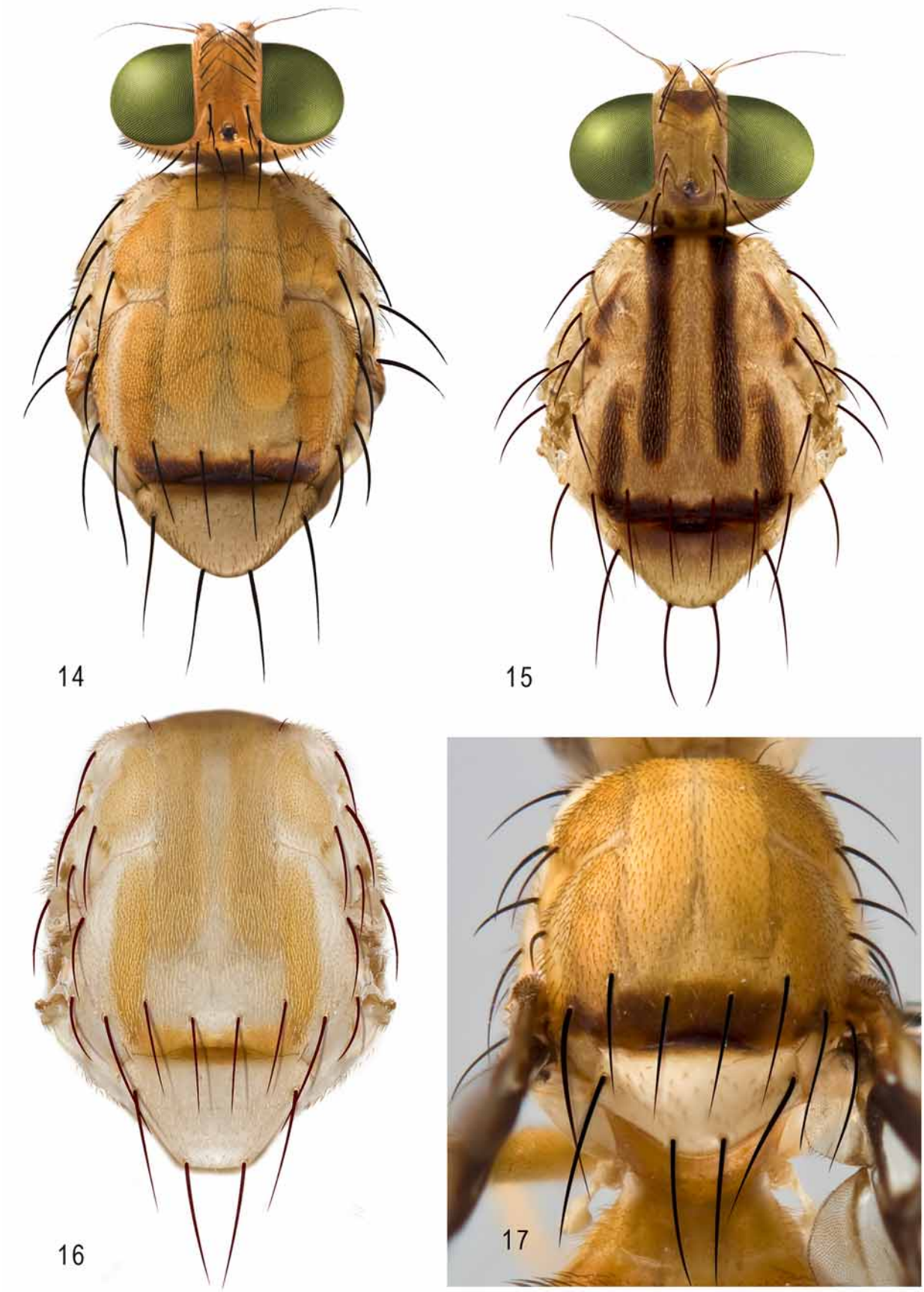
FIGURES 1–4. Habitus female, dorsal: 1, *A. bella* (composite Panama: Migdalia Fuentes, USNMENT00215485 & holotype); 2, *A. binodosa* (Brazil: Santarém, USNMENT00671150); 3, *A. disticrux* (holotype); 4, *A. concava* (composite); bar = 1.0 mm.



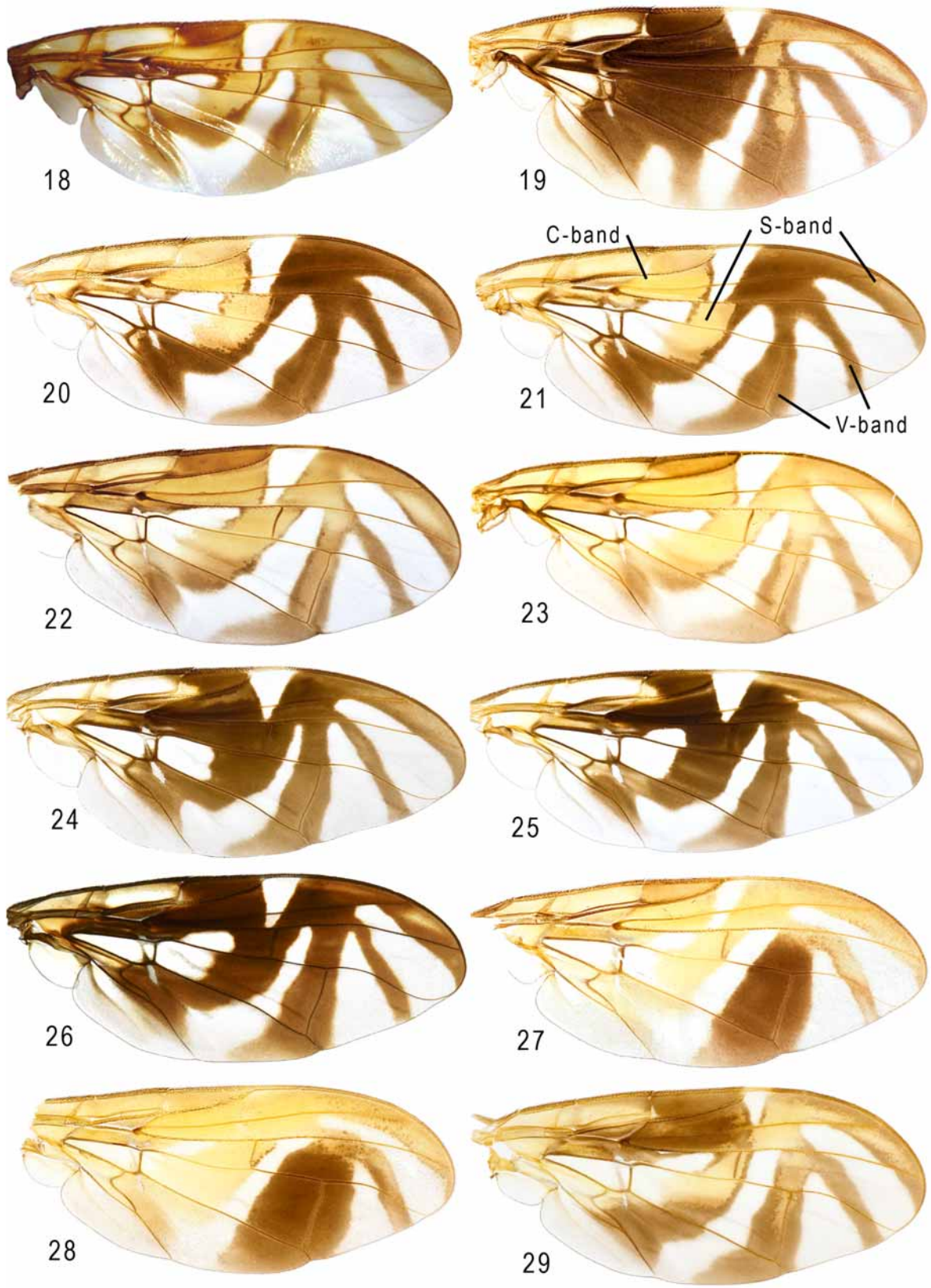
FIGURES 5–9. Habitus female, dorsal: 5, *A. furcata* (Panama); 6, *A. fuscata* (holotype); 7, *A. cordata* (Costa Rica: Estación Magsasay, INBioCRI001111264); 8, *A. isolata* (holotype); 9, *A. nigrifascia* (USA: Big Pine Key, USNMENT00216755); bar = 1.0 mm .



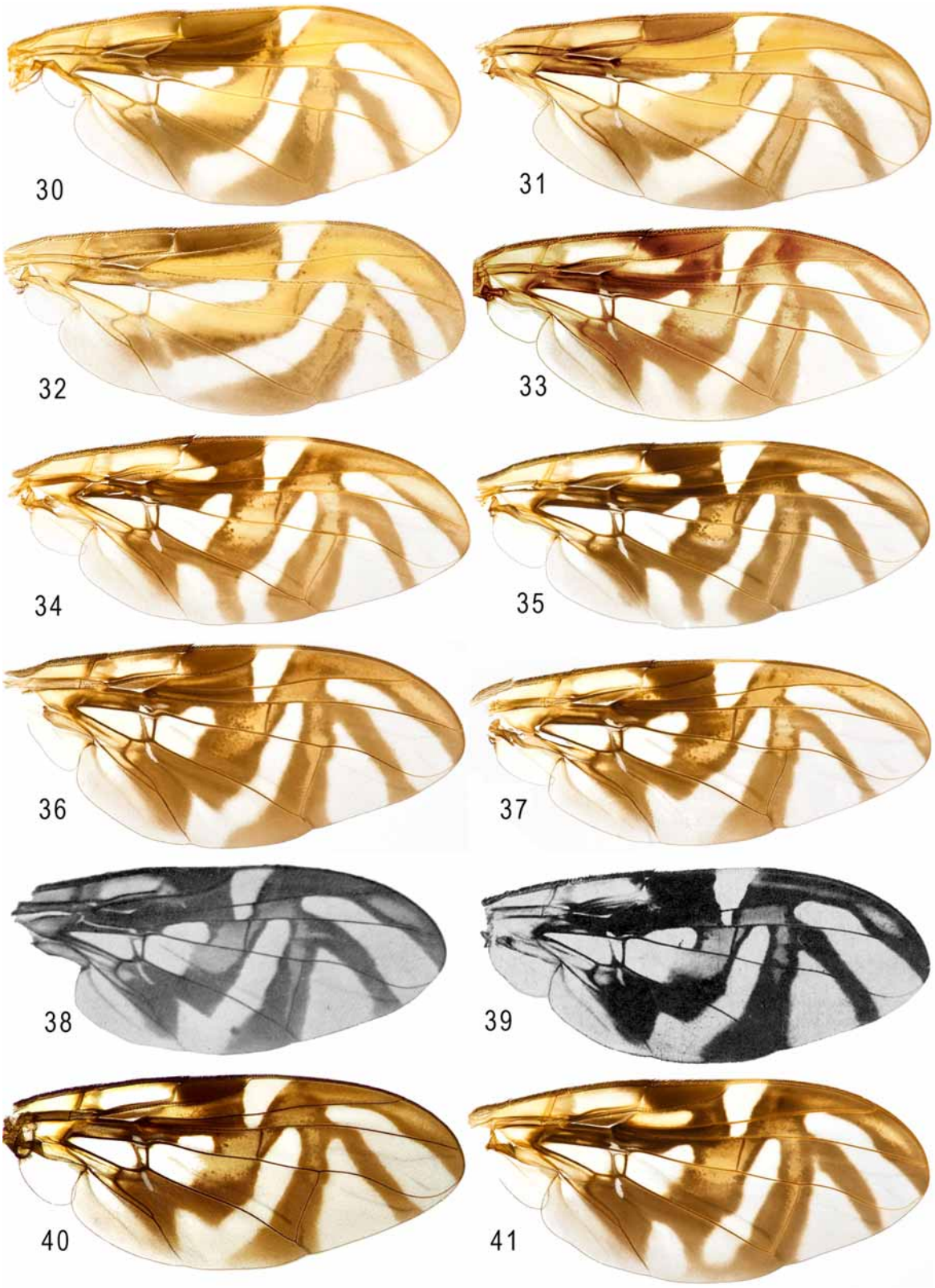
FIGURES 10–13. Habitus female, dorsal: 10, *A. nigra* (Panama: Altos de Pacora, USNMENT00215492); 11, *A. rafaeli* (Brazil: Ilha de Maraca); 12, *A. robusta* (Costa Rica: Est. Maritza, INBio000763683); 13, *A. speciosa* (Panama: Migdalia Fuentes, USNMENT00213669); bar = 1.0 mm.



FIGURES 14–17. Head and thorax, dorsal: 14, *A. fenestrella* (Costa Rica: Zurquí, USNMENT00048495); 15, *A. nigrivittata* (holotype); thorax, dorsal: 16, *A. pseudorobusta* (holotype); thorax, posterodorsal: 17, *A. speciosa* (Panamá: Migdalia Fuentes, USNMENT00213669).

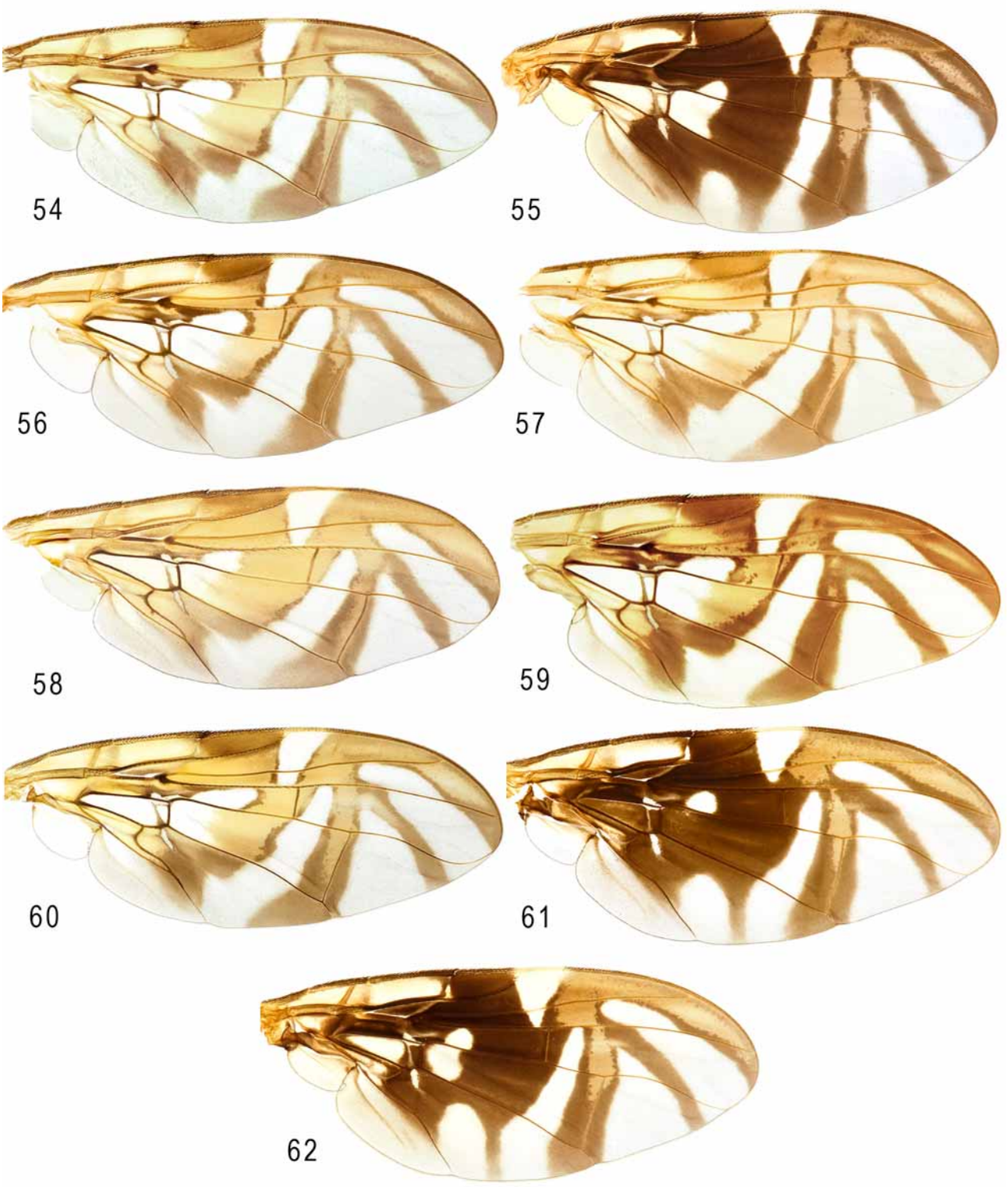


FIGURES 18–29. Wings: 18, *A. amaryllis* (holotype); 19, *A. amazonensis* (holotype); 20–21, *A. bella* (Panamá: Cerrro Jefe, USNMENT00215485; Migdalia Fuentes, USNMENT00671176); 22–23, *A. binodosa* (Brazil: Santarem, USNMENT00216097, USNMENT00671150); 24–26, *A. concava* (male, Panamá: Arraijan, USNMENT00214860; female, Panamá: Arraijan, USNMENT00214911; female, Bolivia: Agrigento A, USNMENT00212059); 27–28, *A. cordata* (holotype; Panamá: El Cermeño, USNMENT00104299); 29, *A. cryptostrepha* (Surinam: Paramaribo, USNMENT00216571).



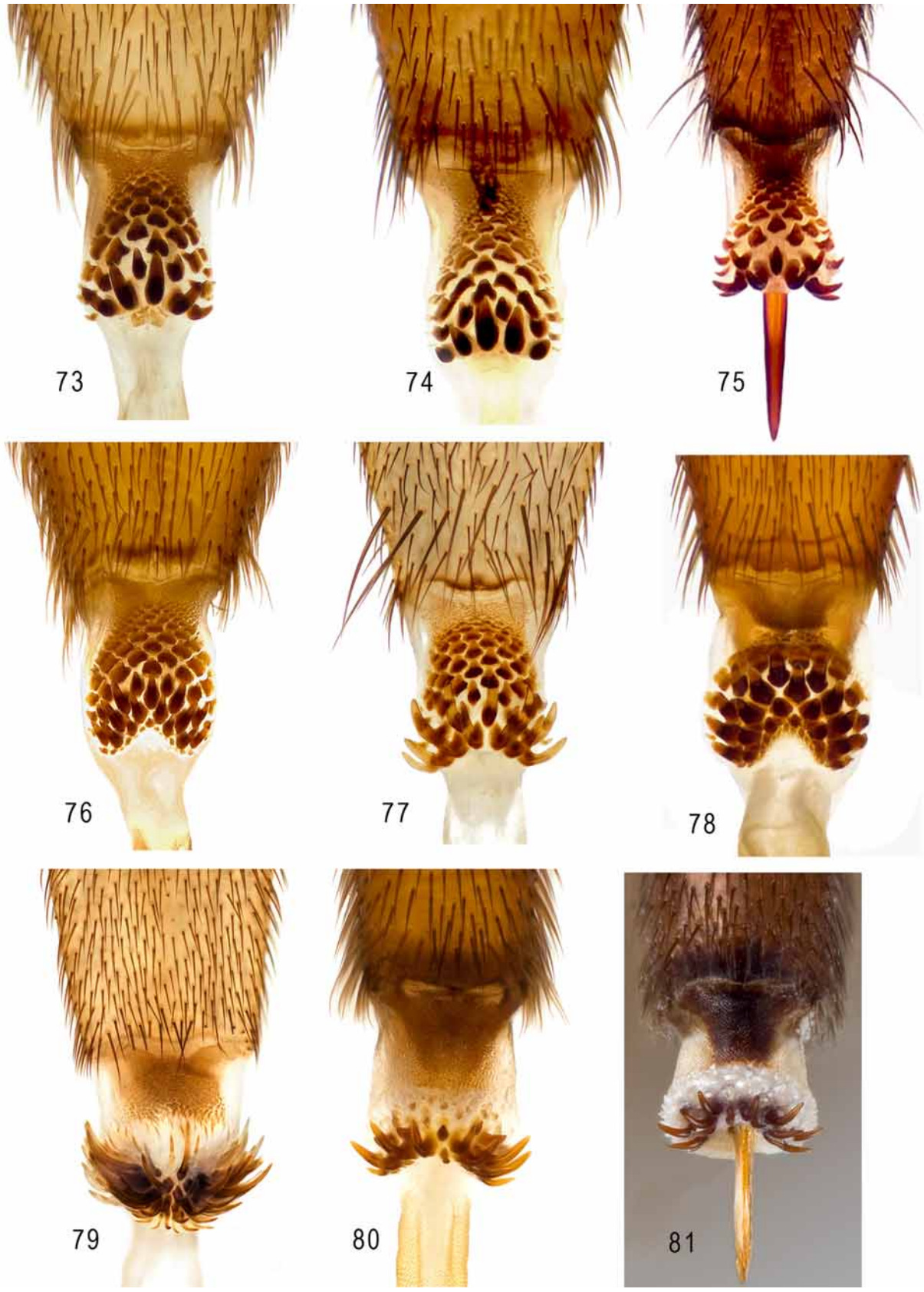
FIGURES 30–41. Wings: 30, *A. cryptostrepha* (Peru: Meshagua, USNMENT00104288); 31, *A. cryptostrephoides* (holotype); 32, *A. disticrux* (holotype); 33, *A. fenestrata* (Brazil: Rio Trombetas, USNMENT00052104); 34–35, *A. fenestrella* (Panamá: Arraijan, USNMENT0052103; Altos de Pacora, USNMENT00671180); 36–39, *A. furcata* (Brazil: Cruz das Almas, USNMENT00052097; Panamá: El Cermeño, USNMENT00052100; holotype, copied from Lima 1934, estampa LXVIII, fig. 28; female, Brazil: Cachoeira Paciencia, copied from Lima 1937, estampa 3, fig. 4); 40, *A. fuscata* (holotype); 41, *A. isolata* (Ecuador: Onkone Gare Camp, USNMENT00054603).

FIGURES 42–53. Wings: 42, *A. jamaicensis* (holotype); 43, *A. lambda* (holotype); 44, *A. miza* (Venezuela: Cuchime, USNMENT00214907); 45–46, *A. nigra* (Panamá: Altos de Pacora, USNMENT00215489; Chayotera, USNMENT00671160); 47–49, *A. nigrifascia* (USA: Key West, USNMENT00056328; Big Pine Key, USNMENT00216419; USNMENT00216755); 50, *A. nigrivittata* (holotype); 51, *A. partita* (holotype); 52, *A. phaeoptera* (holotype, copied from Lima 1937, estampa 1, fig. 3); 53, *A. pittieri* (Venezuela: Rancho Grande, USNMENT0052102).

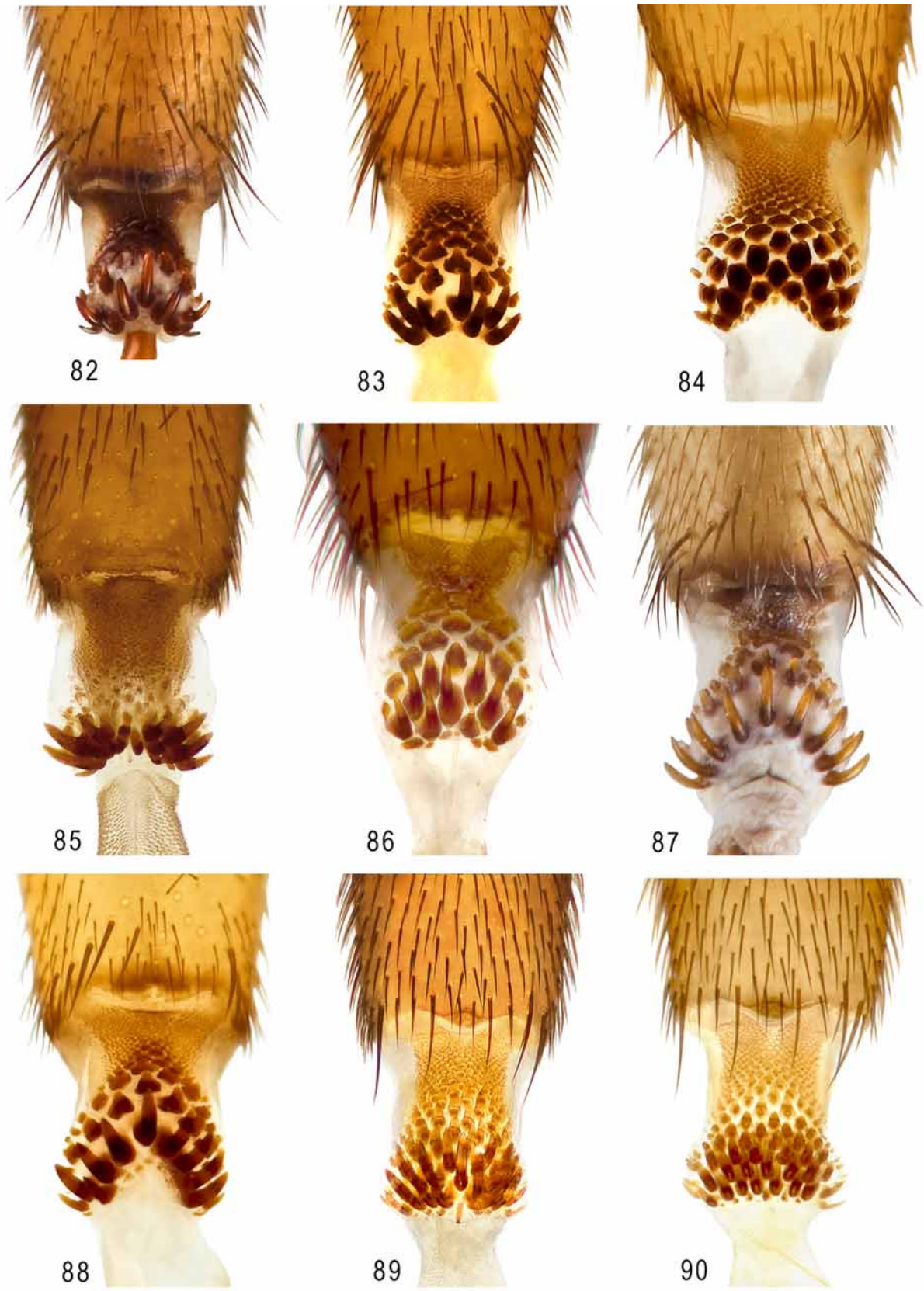


FIGURES 54–62. Wings: 54, *A. pseudorobusta* (Venezuela: C. Bolívar, USNMENT00216401); 55, *A. rafaeli* (Brazil: Ilha de Maraca, USNMENT0052106); 56–57, *A. robusta* (Panamá: Villa Myrtha, USNMENT00671154; Arraijan, USNMENT00052109); 58, *A. rojasi* (Panamá: Barro Colorado Is., USNMENT00216154); 59–60, *A. simulans* (Brazil: Tijuca, USNMENT00216398; Peruibe, USNMENT00216170); 61–62, *A. speciosa* (male, Panamá: Altos de Pacora, USNMENT00216166; female, Arraijan, USNMENT00052105).

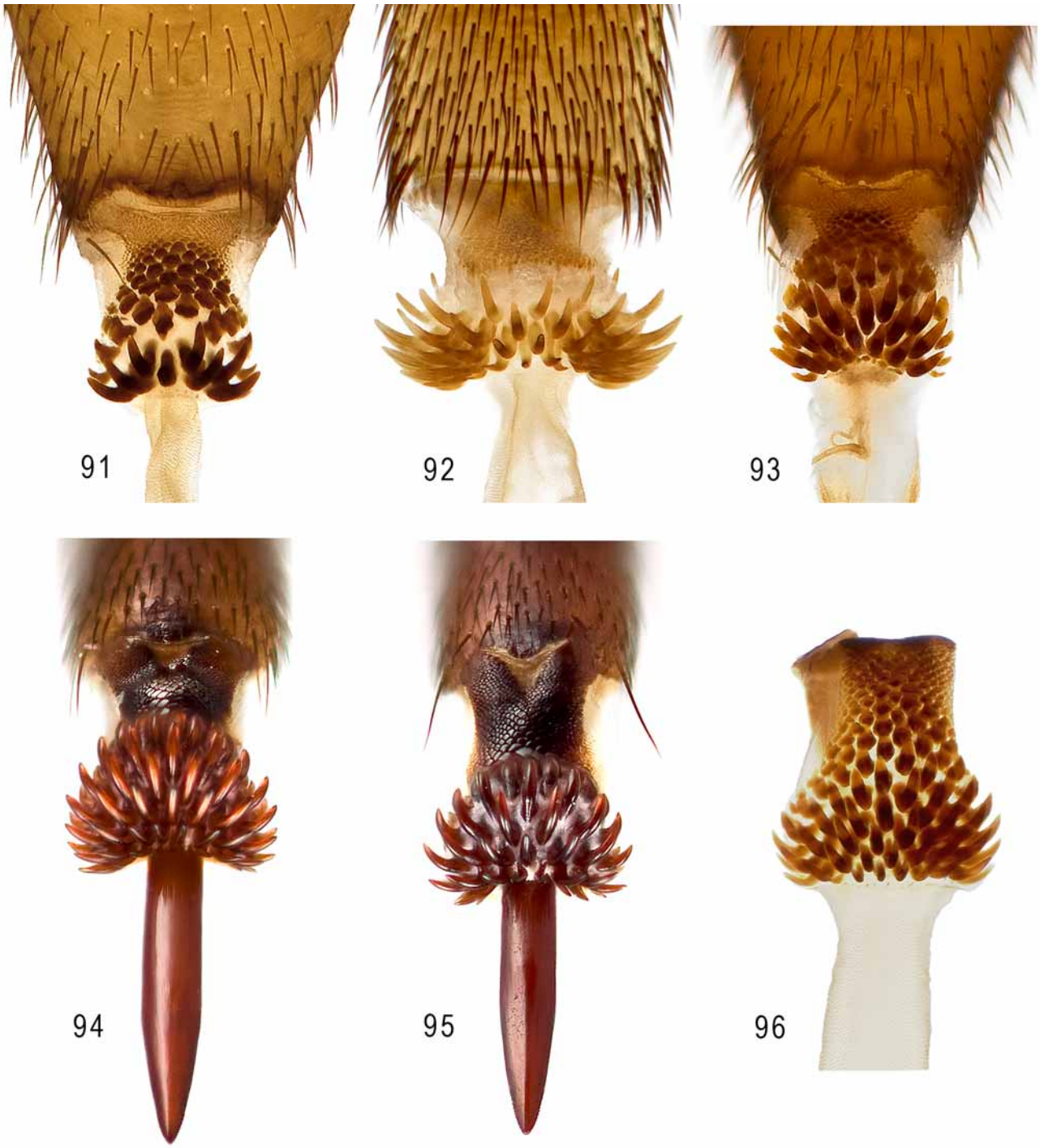
FIGURES 63–72. Eversible membranes: 63, *A. amazonensis* (holotype); 64–65, *A. bella* (Panamá: Migdalia Fuentes, USNMENT 00671175; Altos de Pacora, USNMENT00216156); 66, *A. binodosa* (Brazil: Santarem, USNMENT00216097); 67, *A. concava* (Panamá: El Cermeño, USNMENT00104251); 68, *A. cordata* (Panamá: El Cermeño, USNMENT00104297); 69, *A. cryptostrepha* (Surinam: Paramaribo, USNMENT00216571); 70, *A. disticrux* (holotype); 71, *A. fenestrata* (Brazil: Rio Trombetas, USNMENT00052104); 72, *A. fenestrella* (Costa Rica: La Selva, USNMENT00104276).



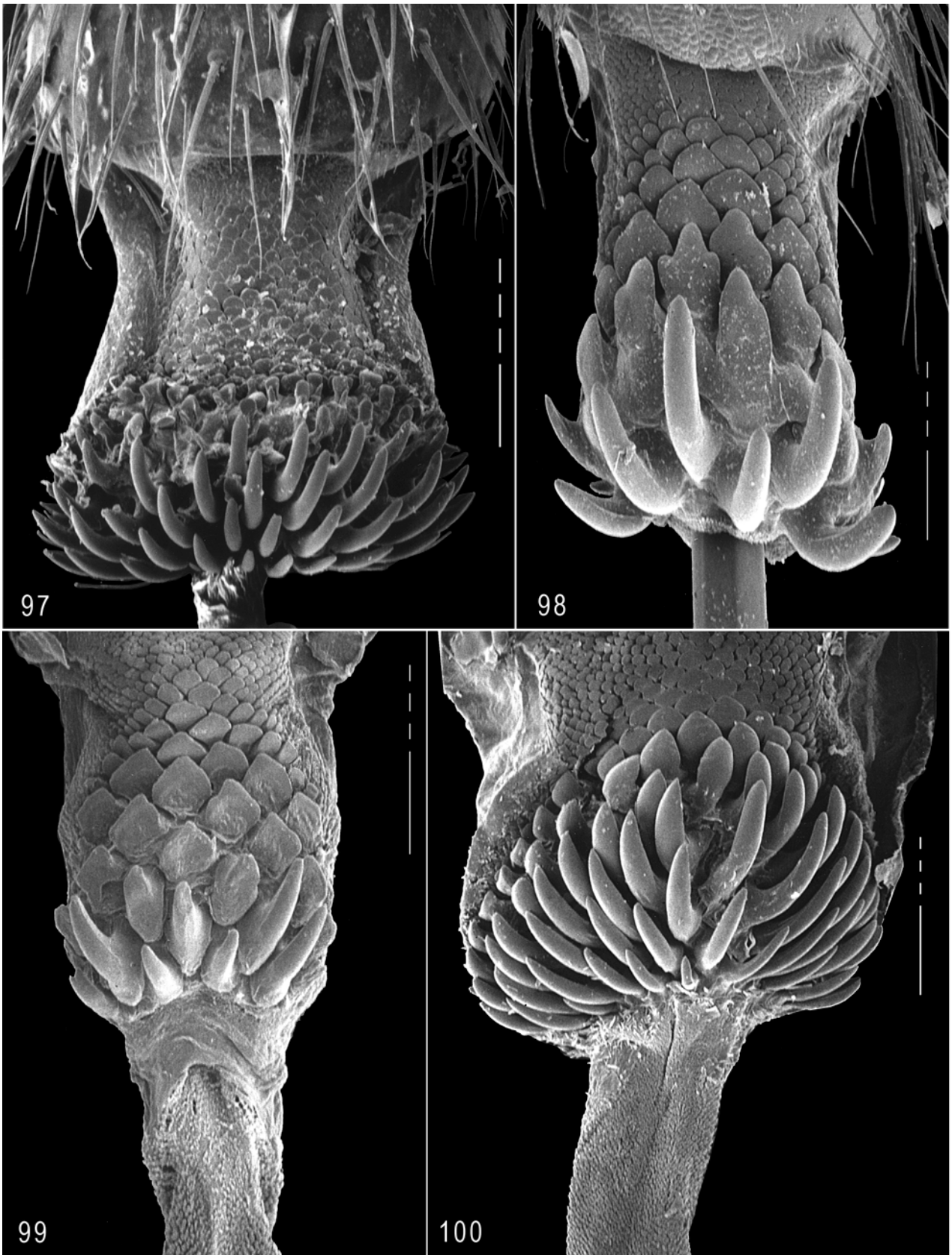
FIGURES 73–81. Eversible membranes: 73–74, *A. furcata* (Brazil: Manaus, USNMENT00216209; Panamá: La Fortuna, USNMENT00216175); 75, *A. fuscata* (holotype); 76, *A. isolata* (Ecuador: Onkone Gare Camp, USNMENT00054600); 77, *A. jamaicensis* (holotype); 78, *A. lambda* (holotype); 79, *A. miza* (Venezuela: Cuchime, USNMENT00214907); 80–81, *A. nigra* (Panamá: Altos de Pacora, USNMENT00215490, USNMENT00215491).



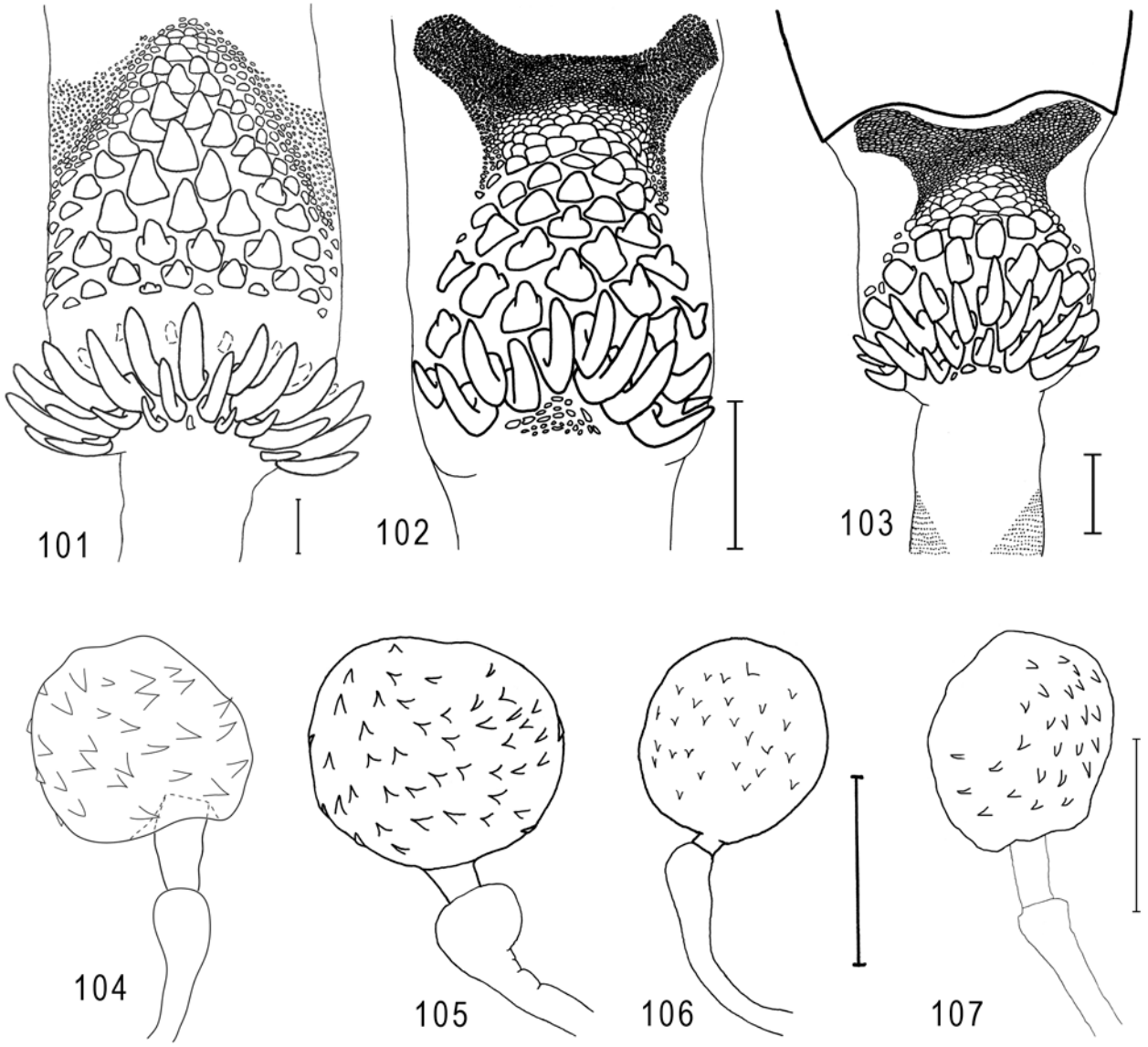
FIGURES 82–90. Eversible membranes: 82–83, *A. nigrifascia* (USA: Big Pine Key, USNMENT00216472; Key West, USNMENT00216381); 84, *A. nigrivittata* (holotype); 85, *A. partita* (holotype); 86, *A. pittieri* (Venezuela: Rancho Grande, USNMENT0052102); 87–88, *A. pseudorobusta* (holotype; Venezuela: C. Bolívar, USNMENT00216401); 89–90, *A. rafaeli* (Brazil: Ilha de Maraca, USNMENT0052106).



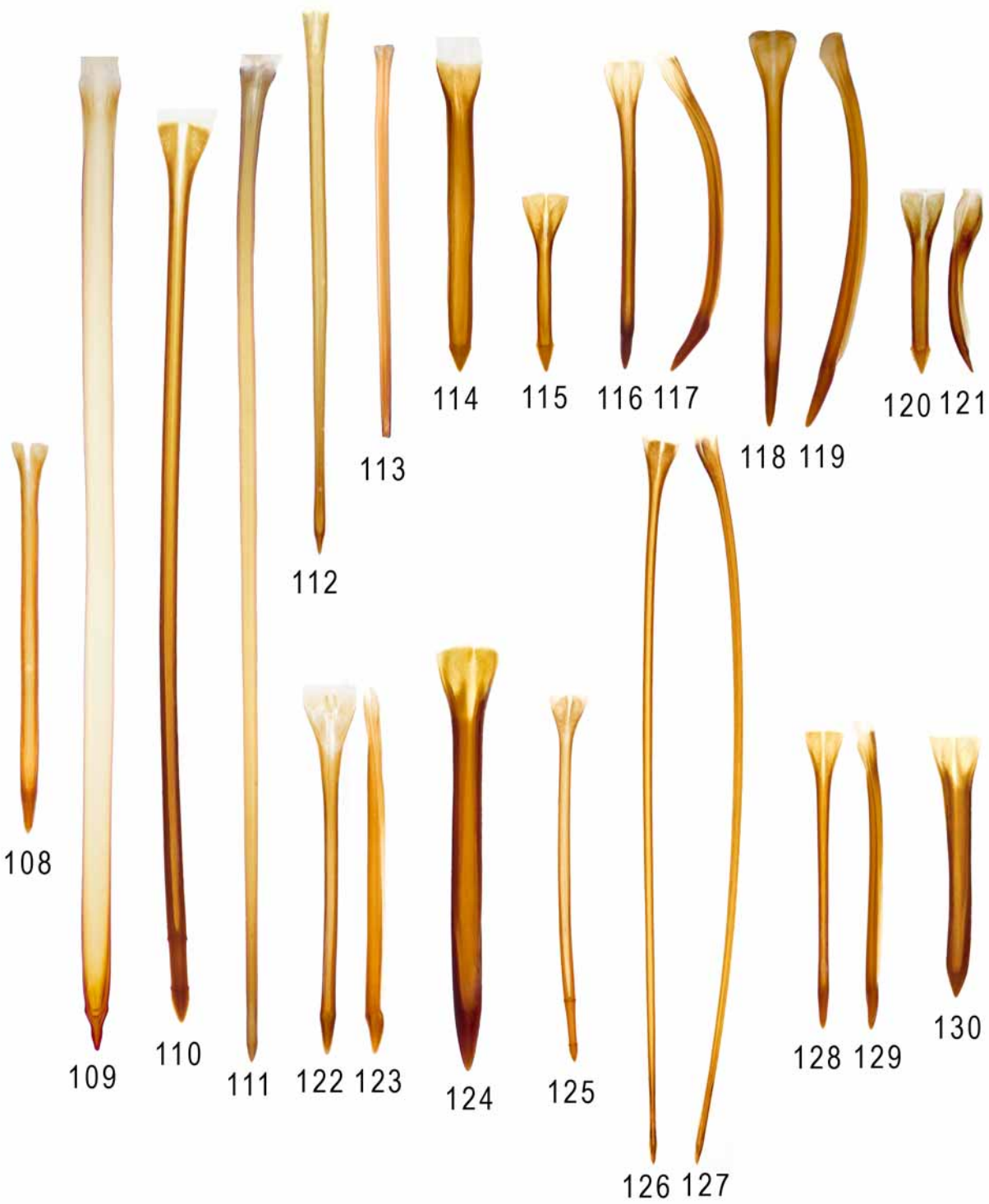
FIGURES 91–96. Eversible membranes: 91, *A. robusta* (Panamá: El Cermeño, USNMENT00216357); 92, *A. rojasi* (Costa Rica: Hitoy Cerere, INBio0003033725); 93, *A. simulans* (Brazil: S. José Pinhais, USNMENT00216238); 94–96, *A. speciosa* (Panama: Arraijan, USNMENT00216303; Migdalia Fuentes, USNMENT00213669; Altos de Pacora).



FIGURES 97–100. Eversible membranes (scanning electron micrographs): 97, *A. cordata* (Panama: El Cermeño, USNMENT00104296); 98, *A. nigrifascia* (USA: No Name Key, USNMENT00216382); 99, *A. pittieri* (Venezuela: Rancho Grande); 100, *A. speciosa* (Panamá: Arraijan, USNMENT00052105).



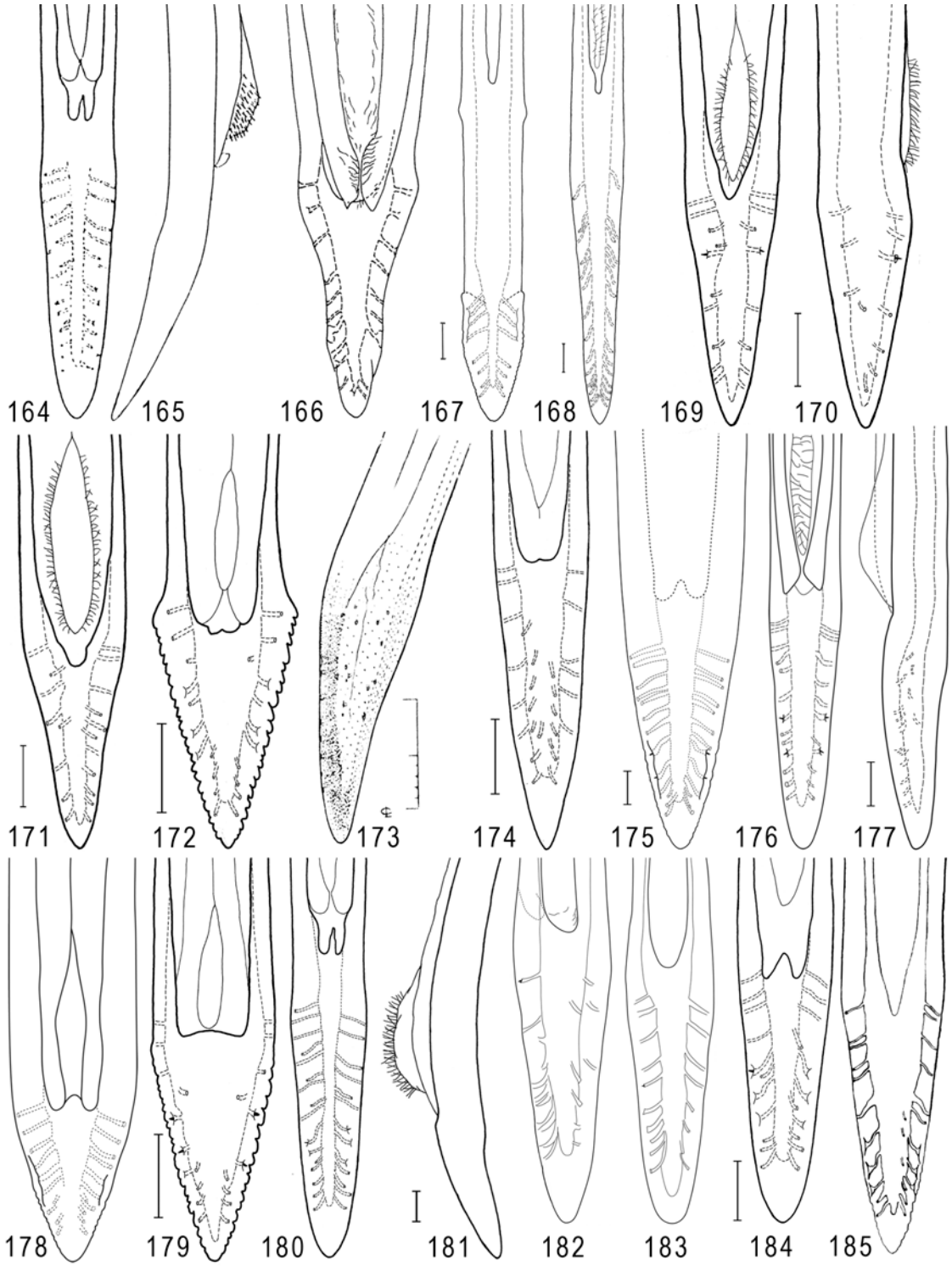
FIGURES 101–107. Eversible membranes: 101, *A. concava* (Ecuador: Rio Palenque, USNMENT00671171); 102, *A. robusta* (Panamá); 103, *A. simulans* (Brazil: Tijuca, USNMENT00216398). Spermathecae: 104, *A. fenestrella* (Panamá: Arraijan, USNMENT00216308); 105, *A. robusta* (Panamá: El Cermeño, USNMENT00216356); 106, *A. rojasi* (Panamá: Barro Colorado Is., USNMENT00216155); 107 *A. speciosa* (Panamá: Balboa, USNMENT00216302); bar = 0.1 mm.



FIGURES 108–130. Aculei (ventral or lateral): 108, *A. amazonensis* (holotype); 109, *A. bella* (Panamá: Migdalia Fuentes, USNMENT00671175); 110, *A. binodosa* (Brazil: Santarem, USNMENT00216097); 111, *A. cordata* (Guatemala: Poptún, USNMENT00050350); 112, *A. cryptostrepha* (Surinam: Paramaribo, USNMENT00216571); 113, *A. disticrux* (holotype); 114, *A. fenestrata* (Brazil: Rio Trombetas, USNMENT00052104); 115, *A. fenestrella* (Costa Rica: La Selva, USNMENT00104276); 116–117, *A. furcata* (Brazil: Manaus, USNMENT00216209); 118–119, *A. fuscata* (holotype); 120–121, *A. isolata* (Ecuador: Onkone Gare Camp, USNMENT00054600); 122–123, *A. jamaicensis* (holotype); 124, *A. lambda* (holotype); 125, *A. miza* (Venezuela: Cuchime, USNMENT00214907); 126–127, *A. nigra* (Panamá: Altos de Pacora, USNMENT00215490); 128–129, *A. nigrifascia* (Key Largo, USNMENT00216379).

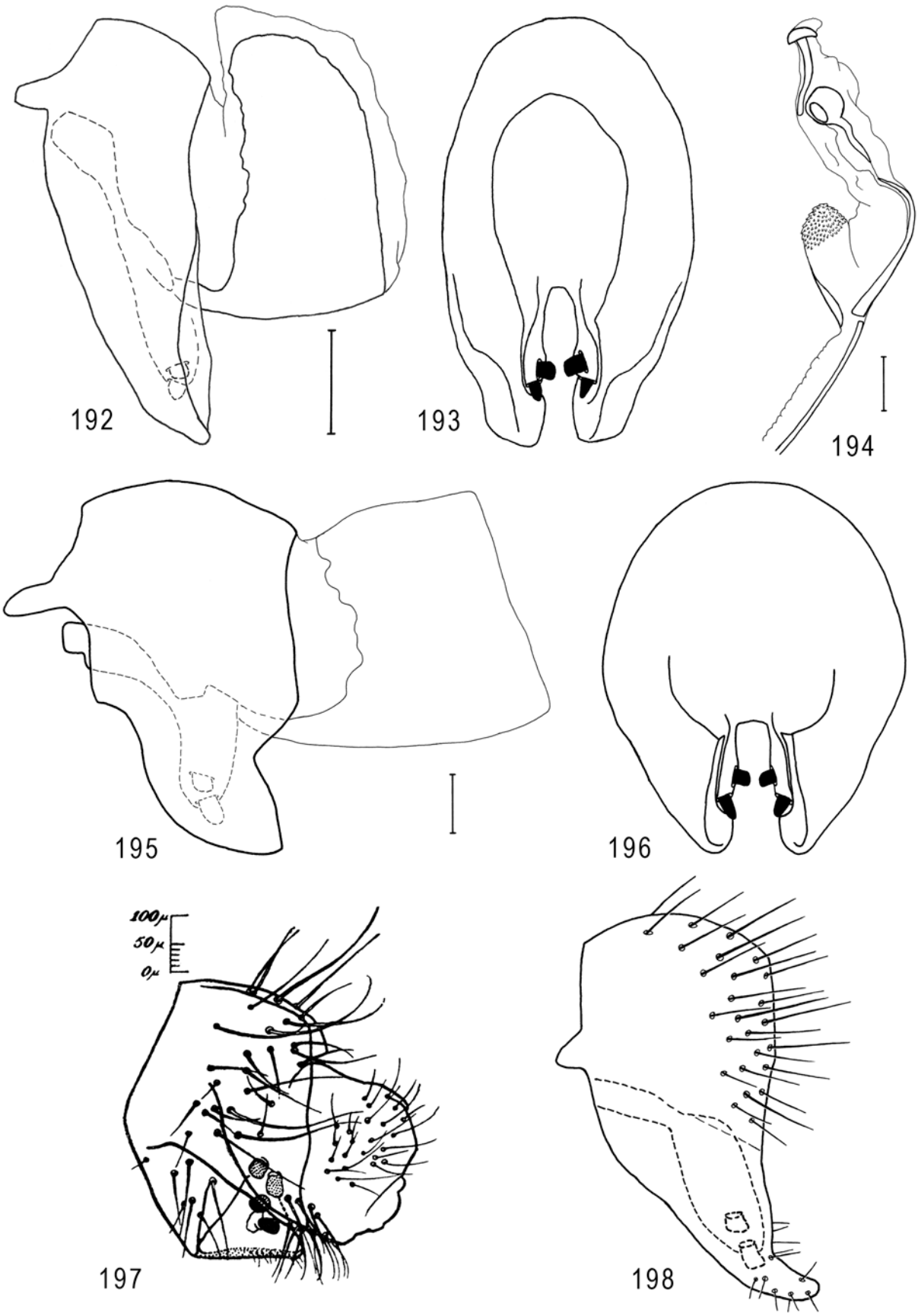
FIGURES 131–148. Aculei (ventral or lateral): 130, *A. nigrivittata* (holotype); 131, *A. partita* (holotype); 132–133, *A. pittieri* (Venezuela: Rancho Grande, USNMENT0052102); 134–136, *A. pseudorobusta* (holotype; Venezuela: C. Bolivar, USNMENT00216401); 137, *A. rafaeli* (Brazil: Ilha de Maraca, USNMENT0052106); 138–139, *A. robusta* (Panamá: El Cermeño, USNMENT00216357); 140, *A. rojasi* (Costa Rica: Hitoy Cerere, INBio0003033725); 141, *A. simulans* (Brazil: S. José Pinhais, USNMENT00216238); 142, *A. speciosa* (Panama: El Cermeño, USNMENT00216291). Aculeus tips: 143, *A. amaryllis* (lateral; image by J.O. Tigrero); 144, *A. amazonensis* (holotype); 145, *A. binodosa* (Brazil: Santarem, USNMENT00104291); 146, *A. cryptostrepha* (Surinam: Paramaribo, USNMENT00216571); 147, *A. fenestrata* (Brazil: Rio Trombetas, USNMENT00052104); 148, *A. fenestrella* (Panamá).

FIGURES 149–163. Aculeus tips (ventral or lateral): 149, *A. furcata* (Panamá: La Fortuna, USNMENT00216175); 150, *A. isolata* (Ecuador: Onkone Gare Camp, USNMENT00054600); 151–152, *A. jamaicensis* (holotype); 153, *A. miza* (Venezuela: Cuchime, USNMENT00214907); 154, *A. nigra* (Panamá: Altos de Pacora, USNMENT00215490); 155, *A. nigrifascia* (USA: Florida); 156, *A. nigrivittata* (holotype); 157–158, *A. partita* (holotype); 159, *A. pittieri* (Venezuela); 160, *A. pseudorobusta* (Venezuela: C. Bolivar, USNMENT00216401); 161, *A. rafaeli* (Brazil: Ilha de Maraca); 162, *A. rojasi* (Costa Rica: Hitoy Cerere, INBio0003033725); 163, *A. speciosa* (Panamá).

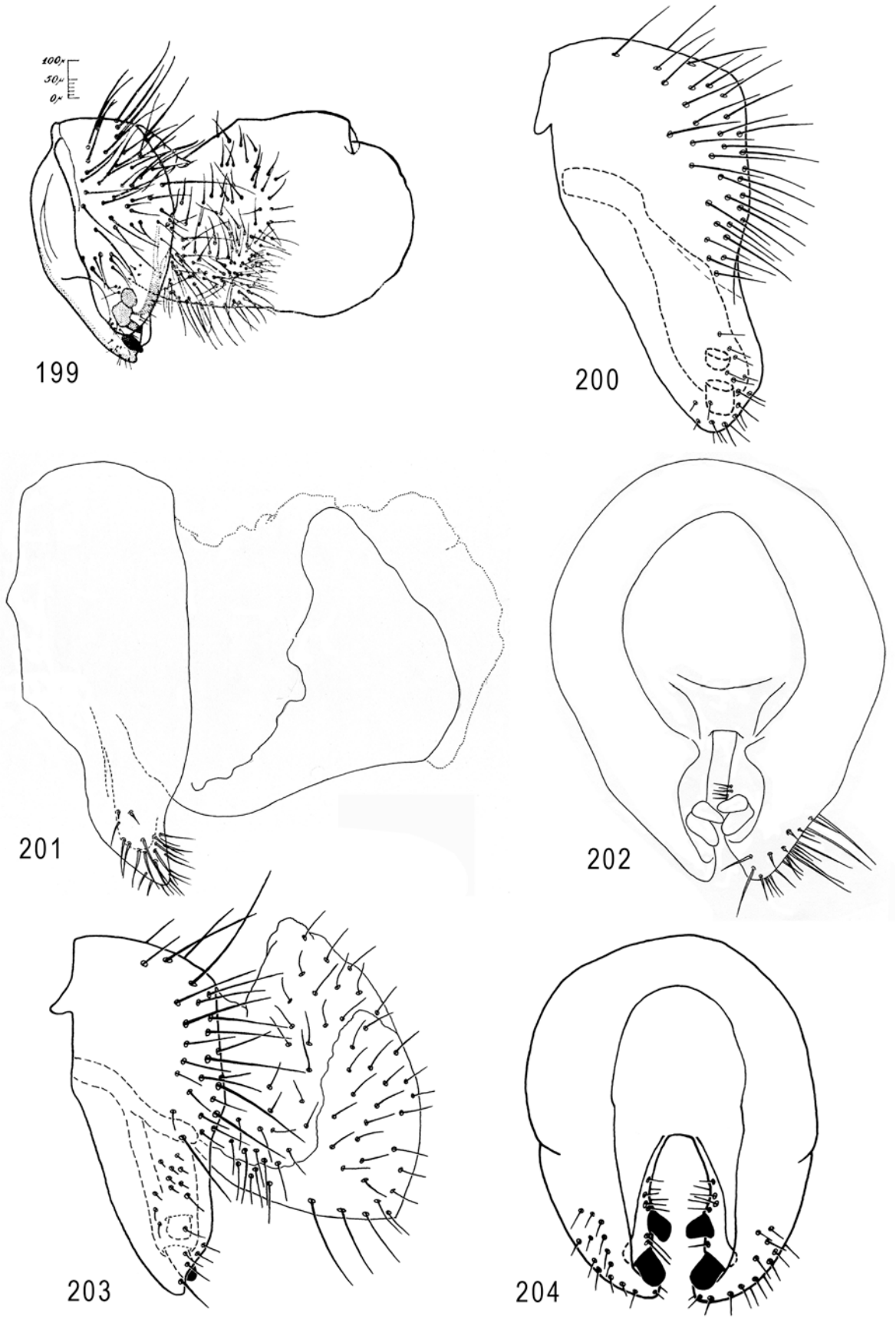


FIGURES 164–185. Aculeus tips (ventral or lateral): 164–165, *A. amaryllis* (from Tigrero 1998, figs. 82, 81); 166, *A. bella* (Panamá: Altos de Pacora); 167, *A. binodosa* (Brazil: Santarem, USNMENT00216097); 168, *A. concava* (Brazil: Santarem, USNMENT00671170); 169–170, *A. cordata* (Panama: El Cermeño, USNMENT00104297); 171, *A. cryptostrepha* (Surinam: Paramaribo, USNMENT00216571); 172, *A. fenestrella* (Panamá: Arraijan, USNMENT00216308); 173–174, *A. furcata* (ventrolateral, Brazil: Cachoeira Paciencia, from Lima 1937, fig. 17; Brazil: Muritiba, USNMENT00052098); 175, *A. lambda* (holotype); 176–177, *A. nigrifascia* (USA: Torch Key, USNMENT00216376; Big Pine Key, USNMENT00216421); 178, *A. nigrivittata* (holotype); 179, *A. pittieri* (Venezuela: Rancho Grande, USNMENT00216181); 180, *A. pseudorobusta* (Venezuela: C. Bolivar, USNMENT00216401); 181, *A. robusta* (Panamá: El Cermeño, USNMENT00216356); 182–184, *A. simulans* (holotype, paratype drawings by R.A.Zucchi; Brazil: Tijuca, USNMENT00216398); 185, *A. speciosa* (from Stone 1942a, fig. 20C); bar = 0.05 mm.

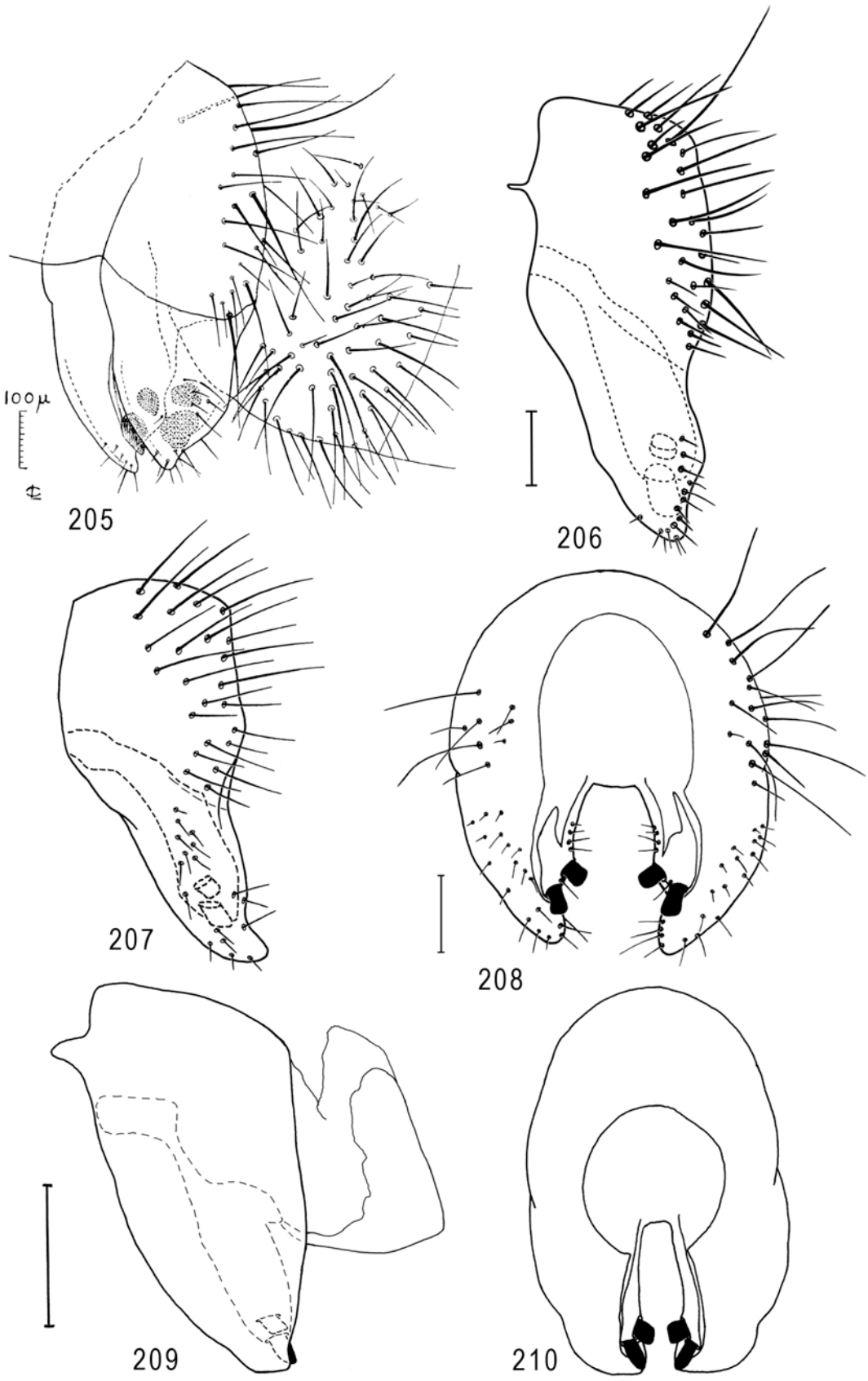
FIGURES 186–191. Aculeus tips (scanning electron micrographs): 186, *A. nigrifascia* (USA: No Name Key, USNMENT00216382); 187, *A. robusta* (Panamá: Arraijan, USNMENT00216350); 188–189, *A. speciosa* (tip and detail, (Panamá: Arraijan, USNMENT00052105). Eggs: 190, *A. pittieri* (Venezuela: Rancho Grande); 191, *A. speciosa* (Panamá).



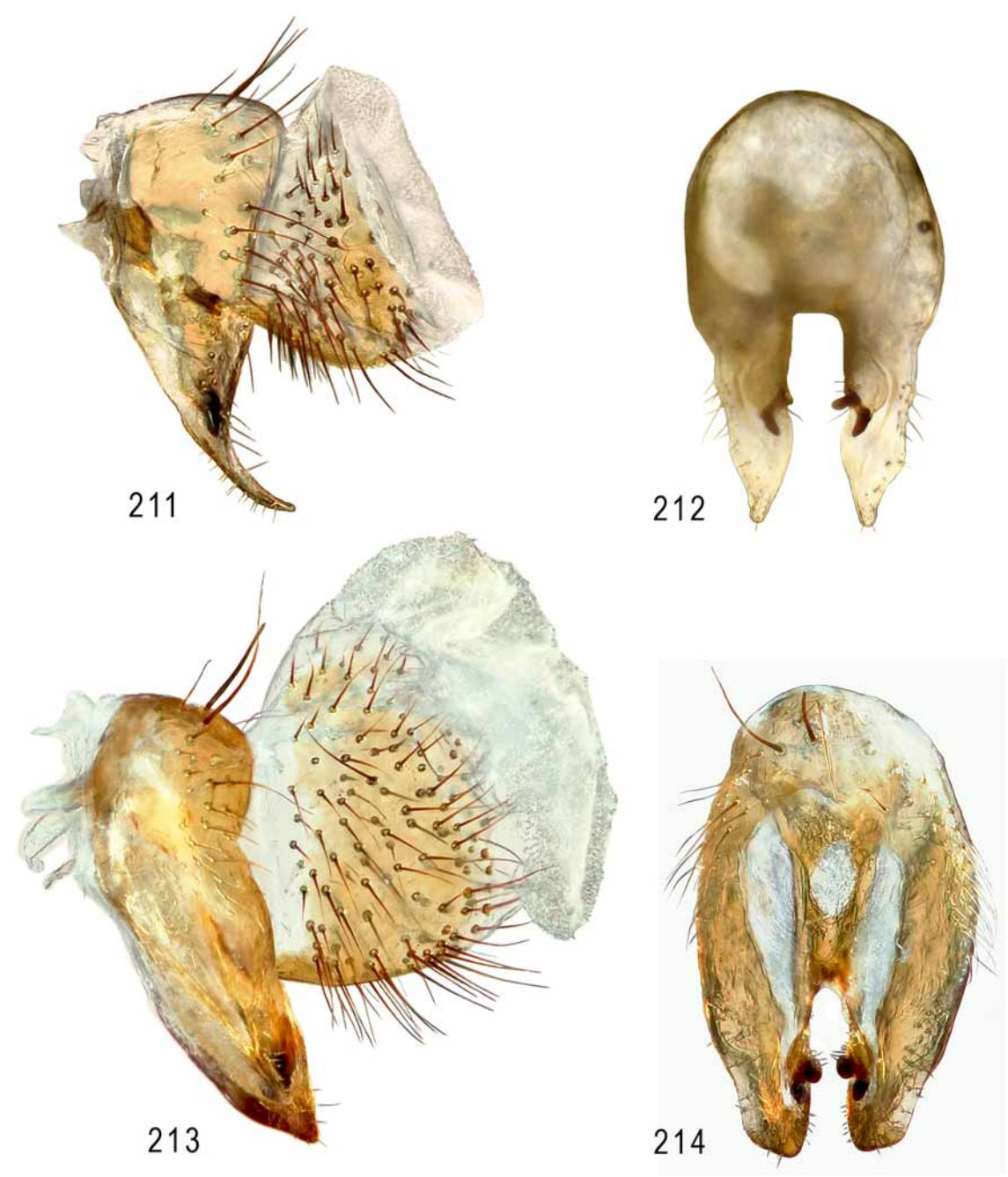
FIGURES 192–198. Male terminalia (epandria and surstyli): 192–193, *A. concava* (lateral and posterior, Panamá: Arraijan); 194–196, *A. cryptostrephoides* (glans, epandrium and surstyli, holotype); 197, *A. fenestrata* (ventrolateral, holotype, copied from Lima 1934, fig. 24); 198, *A. fenestrella* (lateral, Panamá: Arraijan, USNMENT00052103).



FIGURES 199–204. Male terminalia (epandria and surstyli): 199–200, *A. furcata* (ventrolateral, holotype, copied from Lima 1934, fig. 27; lateral, Panamá: El Cermeño, USNMENT00052100); 201–202, *A. nigra* (lateral and posterior, Panamá); 203–204, *A. nigrifascia* (lateral and posterior, USA: Big Pine Key, USNMENT00216393).



FIGURES 205–210. Male terminalia (epandria and surstyli): 205, *A. phaeoptera* (lateral, holotype, copied from Lima 1937, fig. 9); 206, *A. robusta* (lateral, Panama: Arraijan, USNMENT00216447); 207–208, *A. pittieri* (lateral and posterior, Venezuela: Rancho Grande, USNMENT00216185); 209–210, *A. rojasi* (lateral and posterior, Panamá: Barro Colorado Is., USNMENT00216154).



FIGURES 211–214. Male terminalia (epandria and surstyli): 211–212, *A. bella* (lateral and posterior, Panamá); 213–214, *A. concava* (lateral and posterior, Panamá: Arraijan, USNMENT00104277).

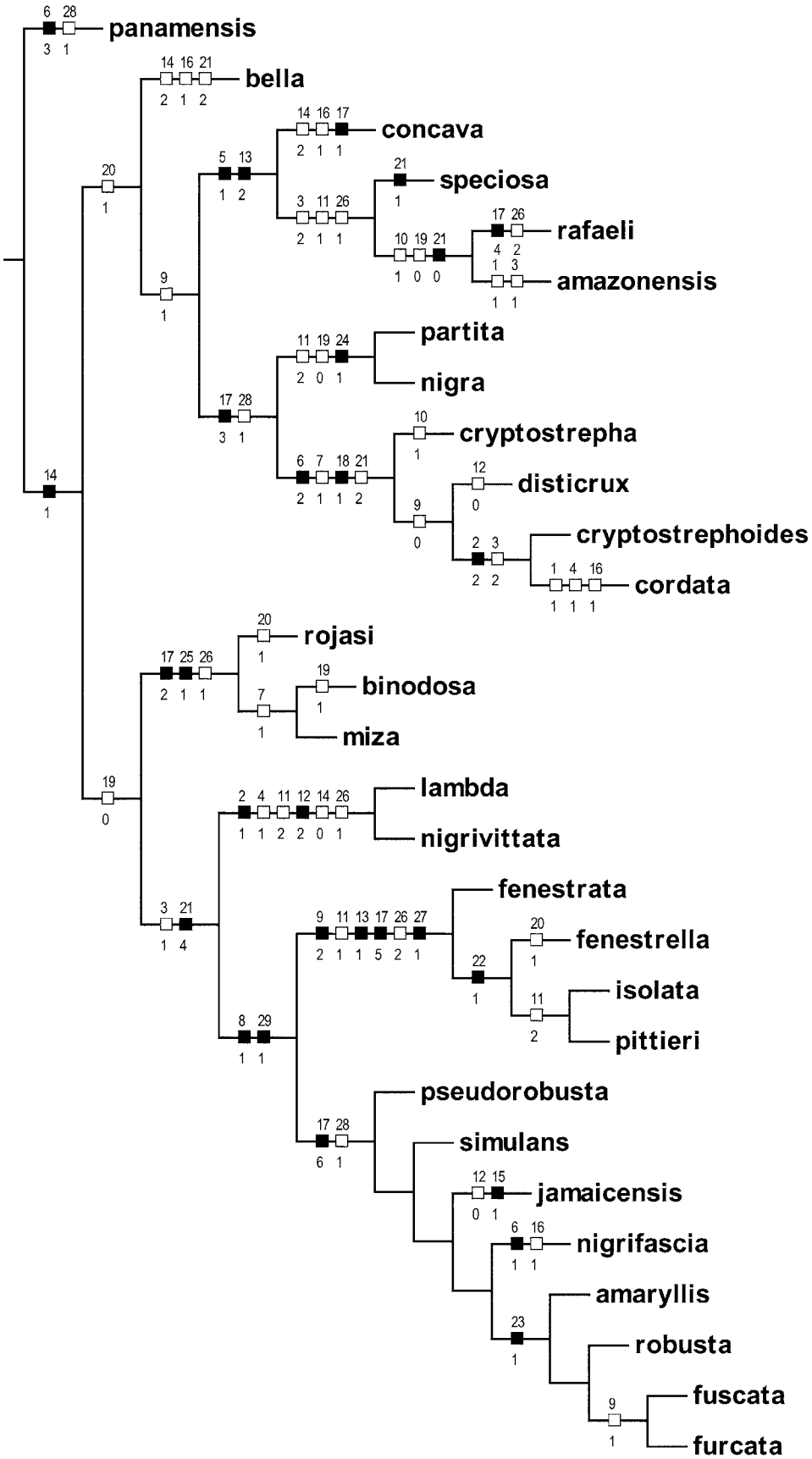


FIGURE 215. Possible phylogenetic relationships among species of the *robusta* group. Analysis with *A. panamensis* as outgroup. Character numbers and states refer to Table 1 and are plotted assuming slow optimization.

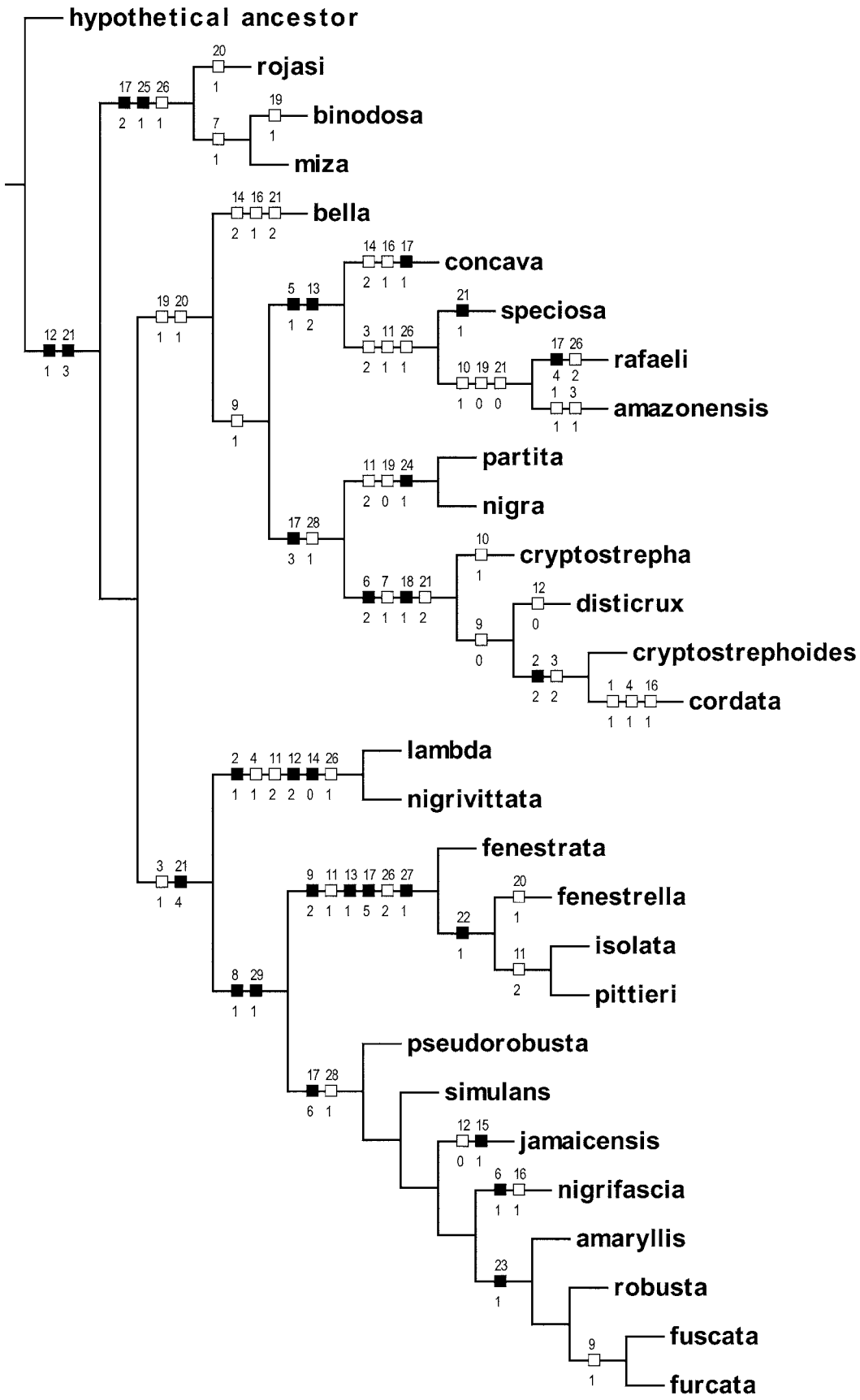


FIGURE 216. Possible phylogenetic relationships among species of the *robusta* group. Analysis with hypothetical ancestor as outgroup. Character numbers and states refer to Table 1 and are plotted assuming slow optimization.

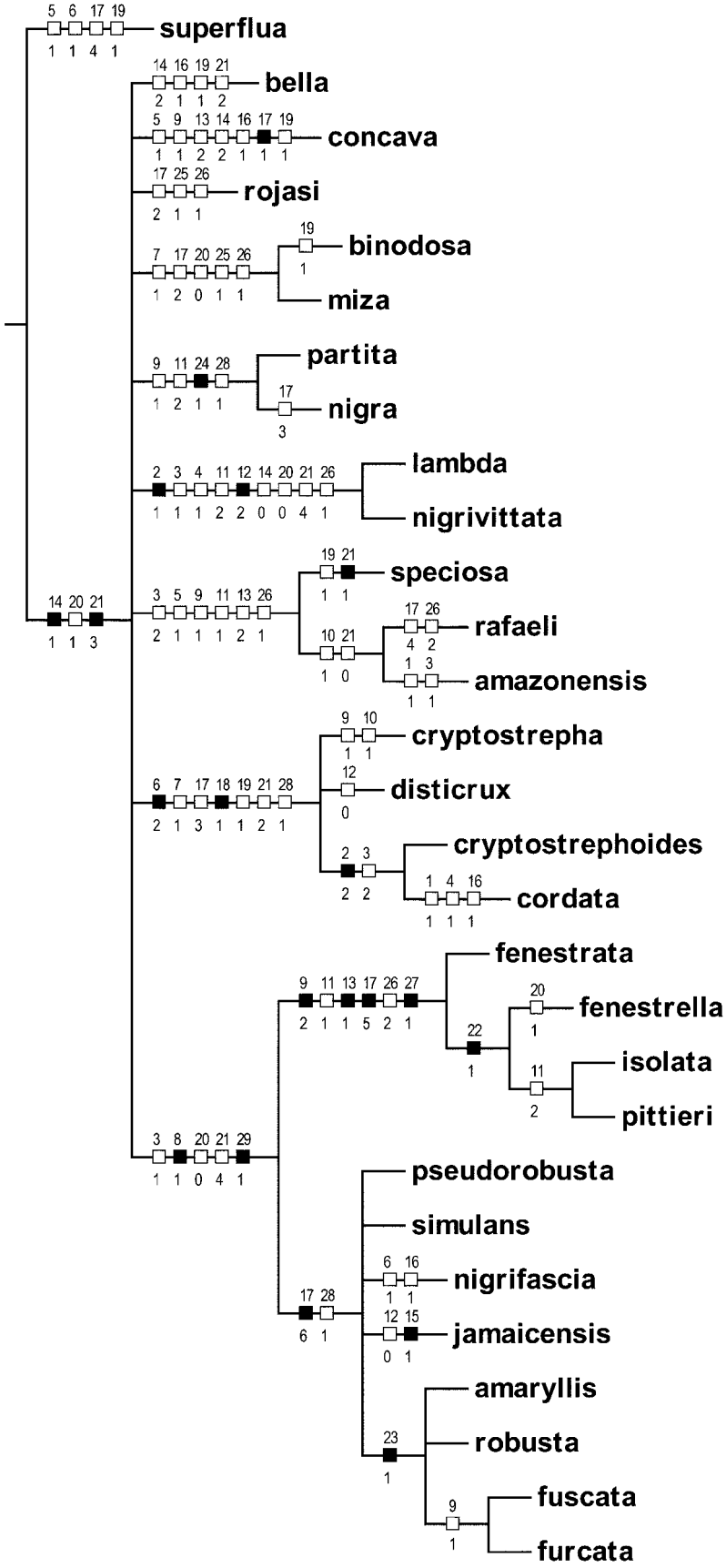


FIGURE 217. Possible phylogenetic relationships among species of the *robusta* group. Analysis with *A. superflua* as outgroup. Character numbers and states refer to Table 1 and are plotted assuming slow optimization.