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✓ XIV. The Flavopilosa Species Group of *Drosophila*

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We are establishing this new species group of *Drosophila*, subgenus *Drosophila*, for *Drosophila flavopilosa* Frey and thirteen new species (including six unnamed) from the Neotropical region. With few exceptions the species are entirely or mostly all dull yellow; they are of small to medium size, have a rather high costal index, a single strong oral bristle, an arista formula of 3/2 (the number of dorsal and ventral branches, excluding the terminal fork, expressed as a fraction), and six acrostichal rows. Females have unusually strongly spined ovipositors, and most of them have apical caps on the spermathecae. The male genitalia are of characteristic structure (see figures): lower portion of genital arch usually with two long bristles; "toe" strongly bent forward, usually elongate and narrow, not covering clasper; anal plate oblong and fused with genital arch; primary clasper broad, its under margin basally convex. Penis slender and long, curved ventrad and with a pair of apical lobes; hypandrium simple; anterior gonapophyses usually lacking or fused with hypandrium; posterior gonapophyses apparently absent; phallosomal index more than 4.0 (ratio of penis length and length of its apodeme; see Okada, 1953, Zool. Mag. [Japan] 62: 278-293).

D. flavopilosa is known to oviposit in flowers of the solanaceous plant, *Cestrum parqui*, in Chile; a similar habit for the other species of the group is suspected but is as yet not proved.

D. neochracea Wheeler (1959, Univ. Texas Publ. 5914: 183), a replacement name for *ochracea* Duda 1927, not Grimshaw 1901, is superficially much like members of this group, but it has a low costal index, convergent basal scutellars, and eight acrostichal rows. Males have recurved hairs along the inner side of the fore tarsi, and the ovipositor of the females is thin and pale, with normal dentition.

HISTORICAL PERSPECTIVE

Dr. O. Duda described *Drosophila dentata* in 1927 (Arch. f. Naturg. 91 A12 [1925]: 201-202) from eleven females from La Paz, Bolivia, one female from Los Andes, Chile, and one female from Cuzco, Peru. Through the courtesy of Dr. Rolf Hertel of the Dresden Museum, we were able to borrow one of the "cotype" females from La Paz. In 1924, however, Dr. Duda had described a different fly under this same name (Arch. f. Naturg. 90 A3: 204; 242) by including, in his new subgenus *Hirtodrosophila*, the nominal combination, *Drosophila longecrinita* var. *dentata* n. var., and later (1926, Suppl. Ent. 14: 69) elevated this *dentata* to the rank of species. Since the name *dentata* Duda 1927 was a clear homonym of *dentata* Duda 1924, Wheeler (1959, *op. cit.*: 183) proposed the new name, *tendata*, to replace the rejected homonym.

While reading the description of *Drosophila flavopilosa* Frey (1918. Finska

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Vetenskaps-Societetens Fördhandlingar 60 A14: 14) from Valparaiso, Chile, it was decided that *flavopilosa* might possibly belong to the "*dentata*" complex. With the kind assistance of Dr. Walter Hackman we were able to borrow the type female of *flavopilosa* from the Zoological Museum in Helsinki. Although the specimen was in rather poor condition, the ovipositor with its characteristic teeth was clearly visible and this, together with the other usable characters, showed clearly that it represented the same species as *dentata* Duda 1927, and hence, *tendata* Wheeler 1959.

Malloch (1934. Dipt. Patagonia and S. Chile, Pt. VI, Fasc. 5: 444) reported additional specimens of *dentata* from Chile and Argentina. But he was clearly misled by the remarkably spined ovipositor of the female, writing "I strongly suspect that Duda had two species mixed here and that the supposed female was a male belonging to the next species [*dudai* Malloch]. I have thus selected the form he described as his *dentata*, and the one he figured as a new species." For this new species, *dudai*, from Angol, Chile, he mentioned only a holotype male and an allotype. We found, however, in the U. S. National Museum collection, the holotype and two paratype females (dated 1927 and 1928; one labelled "on decayed squash"). The abdomen of the male has been lost. Through the assistance of Dr. Willis Wirth we borrowed the two paratype females for study; both appeared to belong to *funnebris* Fabricius. Dissection and study of the ovipositor and spermathecae of one of the paratypes confirmed this synonymy. The male genitalia of the *dudai* holotype no longer being available, a positive identification is not possible, but the rather rough drawing of the visible external genitalia of this holotype (Malloch, *op. cit.*, p. 441, Fig. 75, d) can quite readily be interpreted as being that of *funnebris*. Thus we have no hesitation in assigning *dudai* as a junior synonym of *funnebris*.

We have also re-examined two Chilean specimens determined by Malloch as *dentata*; both are *flavopilosa*. One is a female, labelled "Casa Pangué, Llanquihue, Chile; Dec. 1926; R. and E. Shannon," and the other is a male labelled "Angol, Chile, 17 Dec. 1926."

The absence of further records of *flavopilosa* in the more recent, modern studies on South American *Drosophila* is probably explained by the fact that it is a flower-breeder. Heed, Carson and Carson (1960. *Drosophila Information Service* 34: 84) have shown very forcefully the advantages of flower-collecting. In his monograph on Chilean species of *Drosophila*, Brncic (1957. Las especies Chilenas de Drosophilidae; Monograf. Biol. de la Univ. de Chile) failed to include "*dentata*," but it was later discovered to be present by the thousands all over central Chile, living in the flowers of *Cestrum parqui* of the Solanaceae. It is the only species of the group which has been studied while alive. Meanwhile additional specimens of *flavopilosa* and of some of the new species were located in the U.S. National Museum collection and in South American material from the collection of the California Academy of Sciences, San Francisco, sent to us by Dr. Paul Arnaud. In addition collectors from the University of Texas laboratory, working under a National Science Foundation grant (NSF G-4999, to M. R. Wheeler) have found several new species at a number of Neotropical localities.

In the present report we are describing seven of these new species and are summarizing the known distributions. None of the species has as yet been satisfac-

torily raised in the laboratory on the usual media, but details of the internal anatomy and cytology of Chilean *flavopilosa* have been secured by one of us (D. B.) since this species is readily available in the gardens of the University in Santiago.

Types of the new species are located in the following collections: U. S. National Museum, Washington, D. C. (USNM), California Academy of Sciences, San Francisco (CAS), and *Drosophila* Type and Reference Collection of the Genetics Foundation, University of Texas (UT). Careful study of the male and female genitalia has required the use of microscope slide preparations; many of these were made permanent and are numbered to correspond to the specimen from which they came. Such slide preparations are indicated in the text as "prep. 245," etc.; the slides are in the University of Texas collection.

THE SPECIES OF THE FLAVOPILOSA GROUP

The species of this group, and their known distributions (the first named locality is that of the holotype), are as follows:

flavopilosa Frey—Chile; Bolivia; Peru; Argentina; Uruguay.

incompta n. sp.—Panama; Dominica, B. W. I.; Mexico; Colombia.

nesiota n. sp.—Haiti.

acroria n. sp.—Colombia.

lauta n. sp.—Haiti.

crossoptera n. sp.—Panama; Colombia.

gentica n. sp.—El Salvador. Jamaica?

gilva n. sp.—St. Lucia, B. W. I.; Panama; Colombia.

unnamed species 1—El Salvador.

unnamed species 2—El Salvador.

unnamed species 3—Colombia.

unnamed species 4—Ecuador.

unnamed species 5—Haiti.

unnamed species 6—Colombia.

Although several of these species, at least in one sex, are recognizable on external characters alone, this is not generally true. Careful study of the male genitalia seems to be the most satisfactory way to separate the similar species since very little variation within a species has been seen. Female ovipositor structure shows some variability, and will not always separate females with certainty. We cannot be sure that the differences seen in the spermathecal shape are entirely real; the method of preparation (hydrating pinned specimens in steam, boiling the abdomen in 10% sodium hydroxide, clearing in phenol, examination in oil of creosote) often results in rupture of the inner sclerotized capsule, and this could easily result in alterations of overall shape. In general, however, we believe that the figures represent fairly typical and repeatable appearances of these structures.

Drosophila flavopilosa Frey

1918. Mitteilungen über südamerikanische Dipteren. Finska Vetenskaps-Societetens Fördhandlingar. Bd. LX, Afd. A, No. 14:14. Type, from Valparaiso,

Chile, in Zoological Museum, Helsinki, Finland.

=*dentata* Duda 1927. Arch. f. Naturg. 91 A12 [1925]: 201; not *dentata* Duda 1924. Arch. f. Naturg. 90 A3:204; 242.

=*tendata* Wheeler 1959. Univ. Texas Publ. 5914: 183.

=*dentata* Duda, Malloch 1934. Dipt. Patag. S. Chile, VI (5): 441; 444.

Frey's description, not being generally available, is here quoted in its entirety:

"Eine einfarbig gelbe Art, die durch die intensiv gelbe Farbe der Beborstung und Behaarung des ganzen Körpers wohl ziemlich leicht wieder zuerkennen sein wird.

"♀. Kopf und Thorax matt strohgelb, ohne Glanz. Stirn querrrektangular, auffallend stark lotrecht auffallend, etwas 1½-mal so breit wie ein Auge; die gelbe Stirnbeborstung normal. Fühler klein, einfarbig strohgelb; das dritte Glied etwa zweimal so lang wie breit; Arista gelbbraunlich, oberseits mit etwa fünf, unten mit etwa drei langen Kammstrahlen. Eine längere, bräunlichgelbe Mundvibrisse. Maxillarpalpen gelb.

"Thoraxrücken schwach braungrünlich bestäubt; Thoraxbeborstung gelb; zwei Dorsocentralborsten, eine Praescutellare? (zerstört), etwa sechszeilige Akrostichalbörstchen, zwei längere und zwei kürzere Sternopleurale. Scutellum mit zwei basalen, divergierenden und zwei apikalen, gekreuzten, gelben Randborsten.

"Hinterleib heller strohgelb als der Thoraxrücken, ohne Bestäubung und mit schwachem Glanze, fein gelbhaarig.

"Beine einfarbig blassgelb, braungelb haarig.

"Flügel deutlich, gleichmässig gelblich tingiert. Die zweite, dritte und vierte Längsader alle drei annähernd parallel; die dritte fast genau an der Flügelspitze mündend. Die kleine Querader vor der Mitte der Diskoidalzelle. Abstand der beiden Queradern von einander wenigstens zweimal grösser als derjenige der hinteren Querader vom Flügelrande. Die hintere Querader beinahe so lang wie ihr Abstand vom Flügelrande. Schwinger gelb.

"Körperlänge circa 2.75 mm.

"Flügelänge circa 2.75 mm.

"Breite der Flügel circa 1.1 mm.

"Chili: Valparaiso, 18.-28. Februar 1840, 1 Ex. (F. Sahlberg).

"Type No. 4506 in Mus. Zool. Helsingfors."

Redescription, based upon living material from "El Canelo," Santiago, Chile:

♂, ♀. Arista usually with three dorsal and two ventral branches, in addition to the terminal fork. Antennae entirely yellow; third joint clothed with fine pale hairs. Front pale yellow to yellowish tan, slightly pollinose; base of the orbital and vertical bristles and space between ocelli, same color as front. Anterior orbital (proclinate) a little shorter than the posterior reclinate; middle orbital about 1/3-2/5 as long as proclinate. One prominent oral bristle, the second being only as long as the other hairs. Face yellowish, slightly pollinose; carina prominent, narrow above but more flattened below; in a few individuals it appears very slightly sulcate. Cheeks pale yellow with dark pollinosity, their greatest width about 1/4 the greatest diameter of the eyes. Eyes bright red to scarlet, clothed with thick whitish pile. Palpi pale, haired.

Acrostichal hairs in six irregular rows; prescutellars sometimes faintly indicated. In front of anterior dorsocentrals there is usually a third less prominent dorsocentral. Basal scutellars divergent. Mesonotum, scutellum and pleura tannish yellow, unmarked. Sterno-index about 0.5. Legs pale yellow; apical bristles on first and second tibiae, preapicals on all three.

Abdomen pale yellow, without any definite darkening on the posterior margins of the tergites.

TABLE 1

Comparison of wing vein indices in species of the flavopilosa group

Species	Costal index	4th vein index	4C index	5X index	C3 bristles
flavopilosa	5.0	1.5	0.5	1.0	1/3
acroria	5.5	1.9	0.6	1.0	1/4
crossoptera	4.6	1.6	0.6	1.1	1/5
lauta	4.4	2.0	0.7	1.5	1/2
nesiota	3.3	1.7	0.8	2.0	1/3
incompta	4.4	2.3	0.8	1.3	1/3
gentica	4.0	1.8	0.7	1.7	1/6
gilva ¹	4.1	1.5	0.6	1.3	1/4
gilva ²	4.5	1.6	0.6	1.7	1/4
gilva ³	4.3	1.9	0.7	1.7	1/4
species 1	5.0	1.7	0.5	1.2	1/3
species 2	5.0	1.8	0.6	1.4	1/3
species 3	5.0	1.8	0.6	1.4	1/3
species 4	5.0	1.8	0.6 <td>1.3</td> <td>1/6</td>	1.3	1/6
species 5	4.7	1.8	0.7	1.1	1/4
species 6	5.5	1.6	0.6	1.0	1/4

¹ Allotype female, St. Lucia.² Male, St. Lucia.³ Male, Almirante, Panama.

Wings clear; veins brownish yellow. Apex of first costal section with two prominent bristles of equal length; wing vein indices are shown on Table 1.

Body length about 2.5–3.0 mm.; wings about 3.0 mm.

Internal characters and immature stages.

Anterior Malpighian tubules free, the posterior ones fused and apparently with a continuous lumen. Testes pale yellow with about 2 inner and 2½ outer coils. Sperm pump with two posterior diverticula. Ventral receptacle with about 10–12 loose and irregular loops, the proximal ones more constricted. Spermatheca (Fig. 3a) dark, spherical, with an irregular apical cap which frequently becomes collapsed into the interior after dissection.

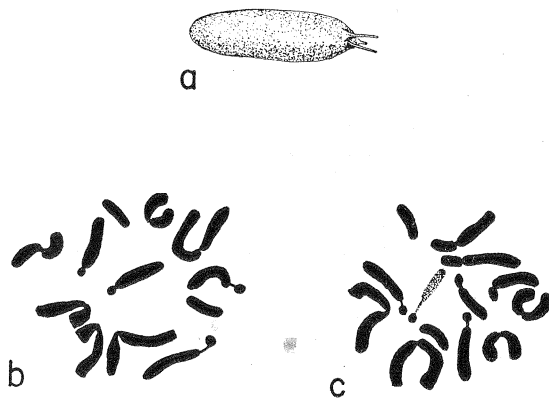


FIG. 1. *Drosophila flavopilosa*; a, egg; b, c, chromosomes.

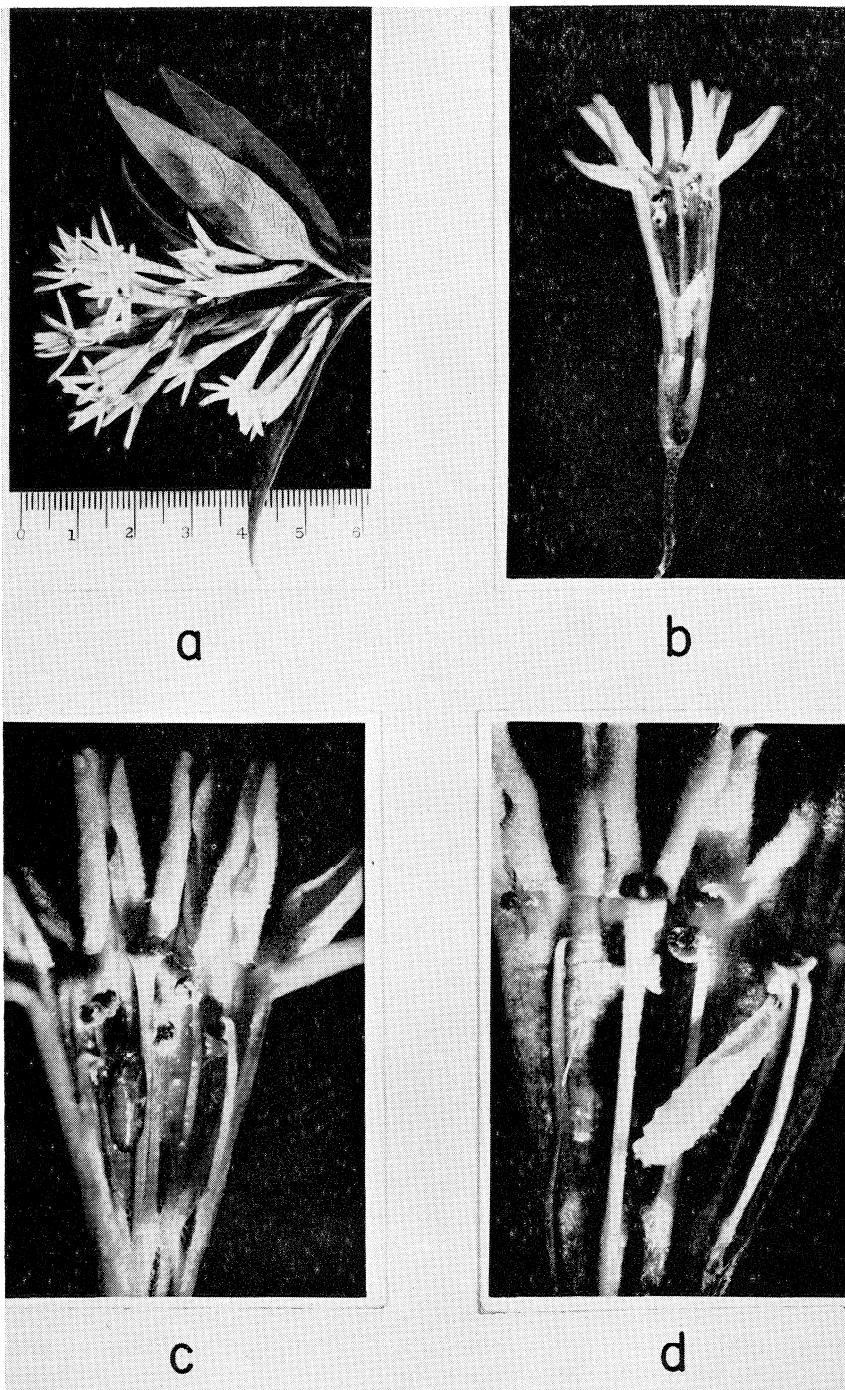


FIG. 2. Habitat of *D. flavopilosa*; a, flowers of *Cestrum parqui*; b, d, opened flowers containing larvae; c, opened flower containing pupa.

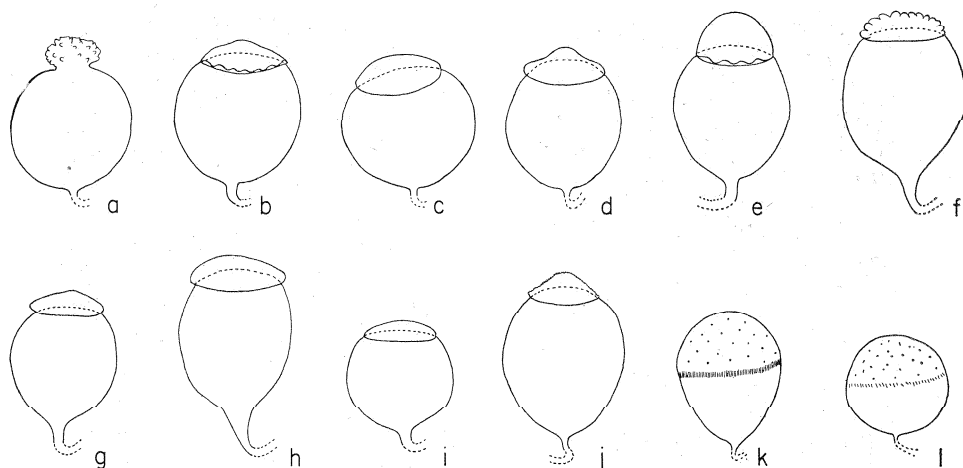


FIG. 3. Inner spermathecal capsule of: a, *flavopilosa*; b, *crossoptera*; c, *acroria*; d, *lauta*; e, *species 4*; f, *species 3*; g, *species 1*; h, *species 2*; i, *species 5*; j, *species 6*; k, *nesiota*; l, *incompta*, *gentica* and *gilva* (circumferential striae not seen on all specimens of any of these three spp.).

Eggs (Fig. 1a) about 0.7 mm. long, with two very short and slender filaments. Puparia reddish orange; anterior spiracle with 6–7 branches.

Chromosomes (Fig. 1b, c): metaphase plates normally show six pairs of chromosomes; one pair of large V-shaped chromosomes, one pair of small V's, one pair of J-shaped chromosomes, one pair of large rods with satellites, another pair of large rods, and a pair of small rods. In some plates there is in addition an extra dot-shaped chromosome that in a few individuals appears to be united to a pale element by a fine thread (Fig. 1c).

Male genitalia (Figs. 1–3, 6 of Pl. I). Genital arch longer than broad, with bristles along posterior margin and toe; upper portion with about 9, and lower portion with about 5, including two long ones. Heel absent; toe strongly bent forwards, not covering clasper, with about 9 short bristles. Anal plate oblong, with about 10 bristles, fused to the arch; no rear angle; tip connected to the tip of the opposite anal plate by a weak sclerotized structure. Primary clasper broad, with about 9 teeth arranged in a straight row; about 6 marginal bristles. Penis slender and long, with a pair of apical lobes, each lobe being bifid apically, the subapical portion being broad in the lateral aspect. Hypandrium triangular, with a deep median notch, and with numerous paramedian spines. Anterior gonapophyses slender, fused with hypandrium, and bearing about five bristles. Posterior gonapophyses apparently absent. Phallosomal index about 5.0.

Female ovipositor (Figs. 4–5 of Pl. I): lobe yellow and banana-shaped, apically quadrate, and with about 6 heavy black spines on the posterior margin and a discal spine subapically. Three bristles located at middle of anterior margin; posterior apex of lobe with three sensilla; basal isthmus broad and triangular. Eighth tergite sometimes with a short hair at the posterior margin.

Ecology: The species has been found at Santiago, Chile, always on flowers of

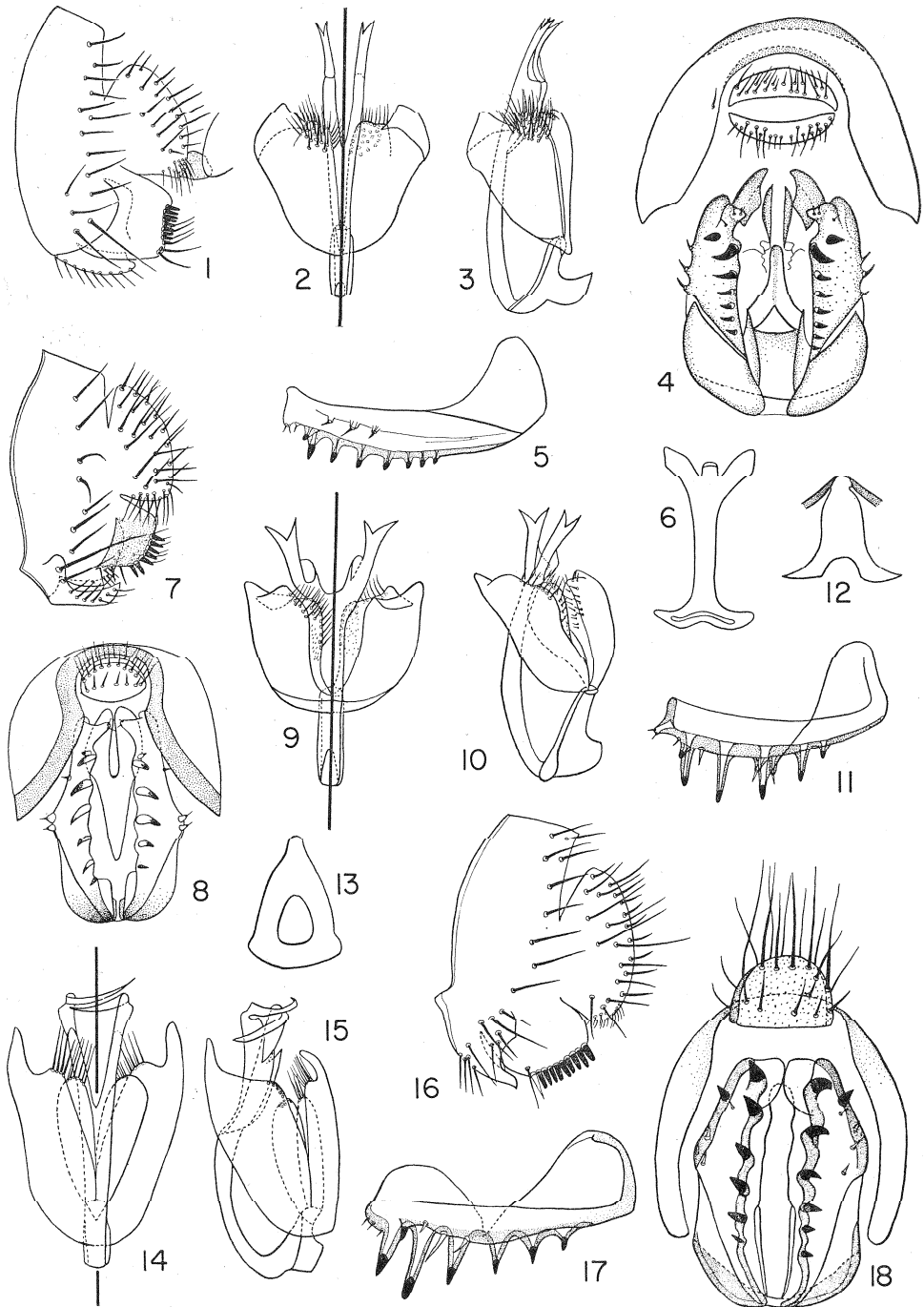


PLATE I. *D. flavopilosa* (Chile): Figs. 1-6; *lauta* (Haiti): Figs. 7-12; *acroria* (Colombia): Figs. 13-18. In Figs. 2, 8, 14, the dorsal aspect of the male copulatory apparatus is shown on the right half, the ventral aspect on the left half. Figs. 6, 12, 13, bridge connecting claspers.

Cestrum parqui L'Her. of the Solanaceae.* In spring and summer many flowers contain eggs, one larva or one pupa (Fig. 2). Apparently the larva is a pollen feeder. So far it has not been possible to breed *flavopilosa* on normal *Drosophila* medium, but larvae develop well on flowers of *C. parqui* taken into the laboratory. In the dissection of a pinned female of this species, and also in one female each of *nesiota* and *crossoptera*, a well-developed first instar larva was found in the reproductive tract, indicating that some degree of viviparity may be present in these species.

Distribution: CHILE.—numerous in central portion of country (Brncic); Valparaiso—holotype female, taken by F. Sahlberg, Feb. 1840; Los Andes—reported by Duda (1927, *op. cit.*); Los Andes, Casa Pangué, Angol—reported by Malloch (1934, *op. cit.*). ARGENTINA.—Buenos Aires, reported by Malloch (1934, *op. cit.*). PERU.—(no locality, no date), coll. J. M. Aldrich (USNM); Cuzco—one ♀, reported by Duda (1927, *op. cit.*). BOLIVIA.—La Paz, 11 ♀♀ reported by Duda (1927, *op. cit.*). URUGUAY.—Montevideo, six, labelled "So. Amer. Paras. Lab., Xii-24-42; Host *Sestrium* [sic] sp.; Silveira" (USNM).

Drosophila lauta Wheeler and Takada, new species

Front tan, semishining; face tan, dull; carina large, rounded; cheeks broad, shiny tan. Mesonotum dark tan, semishining; extra dorsocentral poorly developed. Pleura tan, somewhat shiny. Female abdomen shiny black except for a paler triangular region basally; anal plates pale. Male abdomen with poorly defined pattern; yellowish, with five paramedian light brown bands, the first smaller than the rest; lateral margins, median interruption and genital arch pale yellowish. Wings hyaline; vein indices as given in Table 1. Body length, ♀, up to 2.5 mm.; ♂, 2.0 mm.

Male and female genitalia. Male genitalia are shown in Plate I, Figs. 7, 9, 10, 12. Genital arch longer than broad, slightly convex at anterior margin; upper portion with about 4 bristles; lower portion with 5 bristles, including two longer ones, arranged in a straight row; toe strongly bent forward, with about 7 bristles. Primary clasper trapezoidal, convex on basal undermargin; about 7 primary teeth, situated on the lower 2/3 of posterior margin; about 6 marginal bristles and about 3 fine bristles on undermargin. Anterior surface of clasper with about 9 bristles. Anal plate fused to genital arch at its lower 2/3, with about 20 bristles, and the undermargin with about 11 rather short bristles.

Penis long and with a pair of apical lobes, each lobe bifid at tip; subapically with a triangular process on ventral surface. Hypandrium semicircular, with a deep median notch, and about 6 paramedian spines. Anterior gonapophyses long, apically broadened and with numerous bristles, fused with hypandrium. Posterior gonapophyses absent. Phallosomal index about 4.6.

Spermatheca as shown in Figure 3d. Ovipositor as shown in Plate I, Figs. 8, 11. Lobe yellow, banana-shaped, apically concave, with about 6 long black-tipped spines on the posterior margin, the ultimate one shorter than the penultimate. Two bristles at middle of anterior margin and a short hair subapically on an-

* The genus *Cestrum* L. (= *Habrothamnus* Endlicher) contains an estimated 150 species of shrubs and trees in Neotropical America, including the islands of the West Indies.

terior margin. Posterior apex of lobe with 2 sensilla. Basal isthmus broad and triangular.

Distribution and Types. Holotype male (UT), allotype female (UT), and 38 paratypes, (UT, USNM, CAS), from Kenscoff Pines, HAITI, ca. 5500–6000 ft., July 29, 1959, W. B. Heed and H. L. Carson. The field notes record that these collectors observed a "swarm" of this species, of at least 1000 individuals, sitting on the undersides of leaves of a vine overhead. At least 500 specimens were collected, and a number of these were returned to the laboratory alive but a culture could not be established.

***Drosophila acroria* Wheeler and Takada, new species**

Mesonotum, pleura, front, face, legs and abdomen all dull pale tannish yellow; extra dorsocentral rather well developed. Cheeks broad. Wings pale, becoming dusky toward apex and distinctly, though diffusely, browned at apices of 2nd and 3rd veins and along apical wing margin. Wing vein indices are given in Table 1; the extremely high costal index (5.5) is present elsewhere only in unnamed species 6. Body length estimated to be 3.0 or a bit more.

Male and female genitalia. The male genitalia are shown in Plate I, Figs. 13–16. Genital arch broad; heel pronounced; upper portion with about 9 bristles, lower portion with 6 bristles, including two long ones; toe strongly bent forward, with about 6 bristles. Primary clasper broad and semicircular, the primary teeth consisting of about 9 black ones and one pale terminal one; one marginal bristle. Anal plate oblong, fused with arch on the lower $\frac{2}{3}$, with about 20 bristles, the undermargin with about 10 short hairs.

Penis long, with a pair of apical lobes, each lobe with a long dash-like process at apex; a triangular process on subapical portion of ventral surface. Hypandrium quadrate, with deep median notch and about 5 paramedian spines. Anterior gonapophyses oblong, fused with hypandrium on the lower $\frac{2}{3}$, and with about 5 apical bristles. Posterior gonapophyses absent. Phallosomal index about 8.0. (prep. 237).

Spermatheca as shown in Fig. 3c. Ovipositor (prep. 257) as shown in Plate I, Figs. 17–18; lobe yellow, banana-shaped, apically rounded. About 6 long black-tipped spines on posterior margin and a shorter discal spine anteriorly and subapically. Four bristles near middle of anterior margin. Posterior apex of lobe with 3 sensilla. Basal isthmus broad, triangular.

Distribution and Types. Holotype male (UT), taken by sweeping along the Tequendama Falls road near Bogota, COLOMBIA, ca. 8700 ft., Feb. 1958, M. R. Wheeler; allotype female (UT), from 50 kilo. west of Bogota, Colombia, July 1960, W. B. Heed and H. L. Carson.

***Drosophila crossoptera* Wheeler and Takada, new species**

Small, wholly pale yellowish tan species. Body length up to 2.0 mm. (♀); males smaller. Cheeks moderately broad. An extra dorsocentral sometimes evident. Costal margin of male wing with a series of long, thin recurved hairs on ventral side (Fig. 17, Plate III); the greatest number seen was about 10, lesser numbers probably being due to fragility. Wing indices as shown in Table 1.

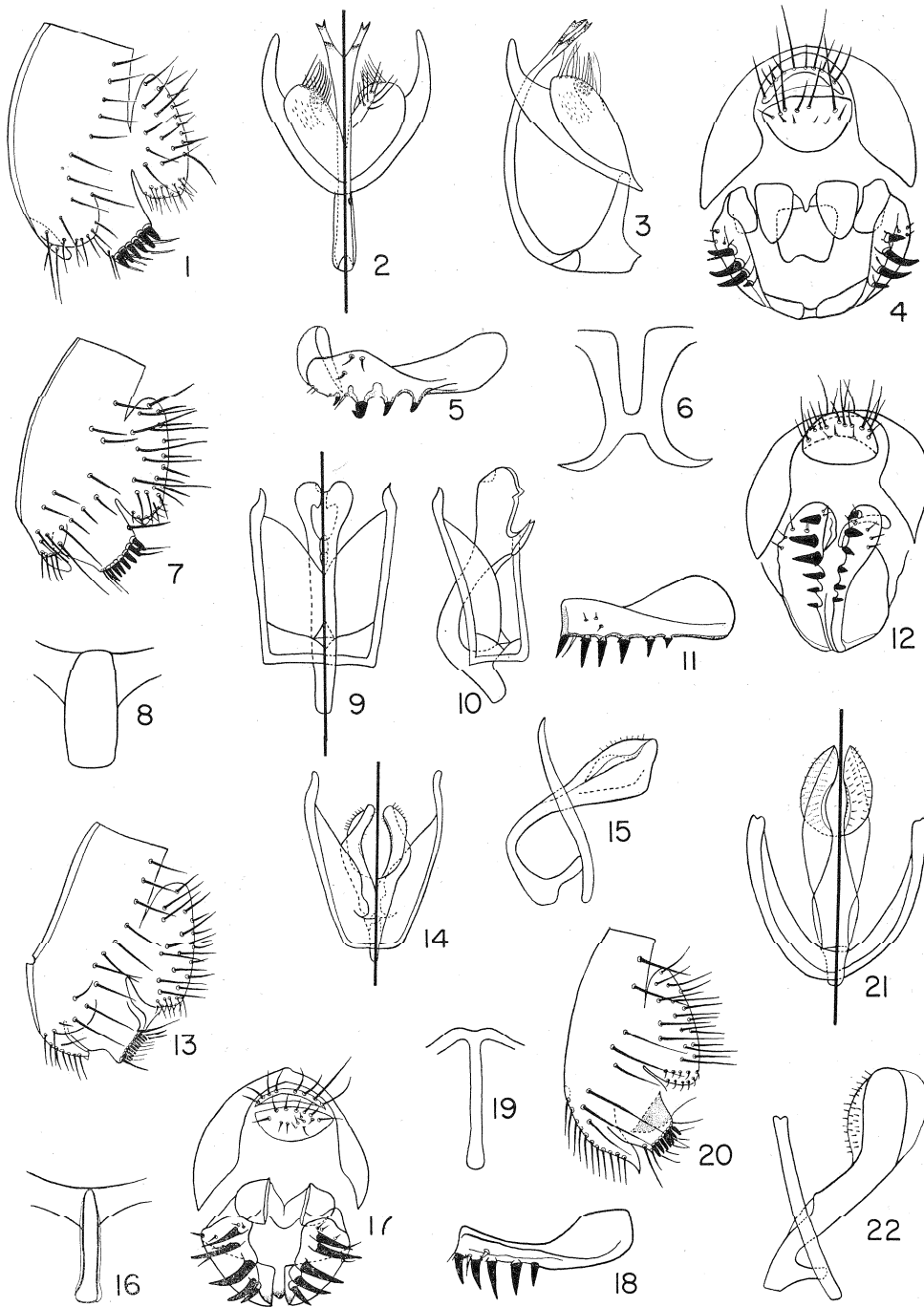


PLATE II. *D. crossoptera* (Panama): Figs. 1-6; *gentica* (El Salvador): Figs. 7-12; *gilva* (♂, Colombia): Figs. 13-16; *gilva* (St. Lucia): Figs. 17-22. In Figs. 2, 9, 14, 21, the dorsal aspect of the male copulatory apparatus is shown on the right half, the ventral aspect on the left half.

Male and female genitalia. The male genitalia are shown in Plate II, Figs. 1-3, 6. Genital arch broad; upper portion with about 5 bristles; lower portion with about 11 bristles; toe bent forward, with about 4 bristles. Primary clasper quadrate, with about 6 primary teeth and about 7 marginal bristles, including two long ones. Anal plate fused with genital arch on lower 1/3, oblong, and with about 18 bristles; rear angle present; undermargin with about 17 short hairs.

Penis long, slender, curved ventrad and with a pair of apical lobes each of which is bifid at the tip; subapical portion transparent. Hypandrium triangular, with numerous paramedian spines. Anterior gonapophyses knob-like, fused with hypandrium at base, and with about 10 bristles. Posterior gonapophyses absent. Phallosomal index about 5.0.

Spermatheca as shown in Fig. 3b. Ovipositor as shown in Plate II, Figs. 4-5; lobe yellow, longer than broad, apically trapezoidal; with about 4 long black spines on posterior margin, strongly bent outward. Three bristles situated at middle of anterior margin; a fine bristle located between the ultimate and penultimate spines. Posterior apex of lobe with 2 sensilla. Basal isthmus broad and oblong.

Distribution and Types. Holotype male, allotype female, and 11 paratypes (prep. 234, 244), from Almirante, Bocas del Toro Pr., PANAMA, March 1953, F. S. Blanton (USNM); all specimens appear to have been taken in light traps. One paratype male, from 3 miles west of Villavicencio, Meta, COLOMBIA, 920 meters, March 1953, E. I. Schlinger and E. S. Ross (CAS).

***Drosophila gentica* Wheeler and Takada, new species**

Small, wholly pale yellowish tan species. Body length up to 2.0 mm. Cheeks narrow. No extra dorsocentrals. Wing vein indices as given in Table 1.

Male and female genitalia. The male genitalia are shown in Plate II, Figs. 7-10. Genital arch longer than broad, simple; upper portion with about 4 bristles; lower portion with about 7 bristles, including two long ones; heel absent; toe strongly bent forward, with 7 short bristles. Primary clasper broadly trapezoidal, convex basally below; about 7 primary teeth; about 5 marginal bristles, separated into an upper 3 and a lower 2. Anal plate oblong, fused with genital arch on lower 2/3, with about 20 bristles; undermargin with about 9 hairs; tip pointed downward, transparent.

Penis long, heart-shaped at apex and bifid apically and with a small horn-like process subbasally on ventral surface, curved ventrad. Hypandrium simple, quadrate. Anterior and posterior gonapophyses absent. Phallosomal index about 4.0.

Spermatheca as shown in Fig. 3l. Ovipositor as in Figs. 11-12 of Plate II: lobe yellow, slender, apically quadrate, and with about 6 heavy black spines on posterior margin. Three bristles subapically on anterior margin; a bristle between ultimate and penultimate spine of posterior margin. Posterior apex of lobe with 2 sensilla. Basal isthmus broad and triangular.

Distribution and Types. Holotype male (UT), with genitalia attached in microvial, allotype female (UT) (prep. 246) and six paratypes (UT), San Salvador, EL SALVADOR, Jan. 1954, W. B. Heed.

Not certainly identical with *gentica* are two males and two females from Hot Mineral Springs near Bath, Jamaica, B.W.I., Feb. 1956, W. B. Heed (UT). The male genitalia of these males is shown on Plate III, Figs. 7–10. There seem to be differences in the copulatory apparatus but there have been too few males to settle this point.

***Drosophila gilva* Wheeler and Takada, new species**

Small, wholly pale tannish yellow species. Body length usually less than 2.0 mm. Cheeks narrow. No extra dorsocentrals. Not separable from *gentica*, *incompta* and *nesiota* except by the use of genitalia. Judging from the male genitalia, there appear to be two "varieties" of *gilva*—the "typical form" from St. Lucia, B.W.I. and Panama, and a variant, known at present only from Popayan and Villavicencio, Colombia.

Male and female genitalia. The male genitalia of the "typical form," from St. Lucia, are shown in Plate II, Figs. 19–22. Genital arch longer than broad; heel absent; toe strongly bent forward, its posterior apex triangular; upper portion with about 5 bristles, the lower portion with about 3 bristles, including two long ones; toe with about 10 short bristles on the undermargin. Anal plate fused with arch on the lower $\frac{2}{3}$. Primary clasper trapezoidal, with about 7 primary teeth and about 8 marginal bristles.

Penis rectangularly curved dorsad at middle, bifid and with numerous hair-like structures on the dorsal surface. Hypandrium simple. Both anterior and posterior gonapophyses absent. Phallosomal index about 6.0.

The male genitalia of the Colombia type are shown in Plate II, Figs. 13–16. Upper portion of genital arch with about 7 bristles, the lower portion also with about 7, including two long ones; heel slightly developed; toe strongly bent forward, its posterior end truncate, bearing about 7 short bristles. Primary clasper broad, the basal under portion convex, with about 10 primary teeth, and more than 8 marginal bristles. Anal plate fused with arch on lower half; oblong, with about 18 bristles, the undermargin with about 10 short bristles. Penis broad, bifid on upper half, ventrally curved on distal half, and with a few hairs on the dorsal margin of the subapical portion. Phallosomal index about 5.0.

The spermatheca is shown in Fig. 31 and the ovipositor is shown in Plate II, Figs. 17–18. Loge yellowish orange, slender and banana-shaped, apically quadrate; posterior margin with about 5 long black spines, strongly bent outward. Three bristles on subapical anterior margin and a bristle between ultimate and penultimate spine. Posterior apex of lobe with 2 sensilla. Basal isthmus broad, trapezoidal.

Distribution and Types. Holotype male, allotype female, and 38 paratypes (prep. 241, 242), ST. LUCIA, B.W.I., Jan. 1956, W. B. Heed (UT); one male paratype, Almirante, Bocas del Toro Pr., PANAMA, Oct. 1952, F. S. Blanton (USNM) (prep. 248); one male paratype, from 30 kilo. north of Popayan, COLOMBIA, March 1958, M. R. Wheeler (UT) (prep. 236); 19 male and 2 female paratypes, from 3 miles west of Villavicencio, Meta, Colombia, 920 meters, March 1955, E. I. Schlinger and E. S. Ross (CAS).

***Drosophila incompta* Wheeler and Takada, new species**

Wholly pale tannish yellow species. Body length up to 2.0 mm. Cheeks moderately narrow. No extra dorsocentral bristles. Wing vein indices as shown in Table 1. Not separable from *gentica*, *gilva* and *nesiota* except by the use of genitalia.

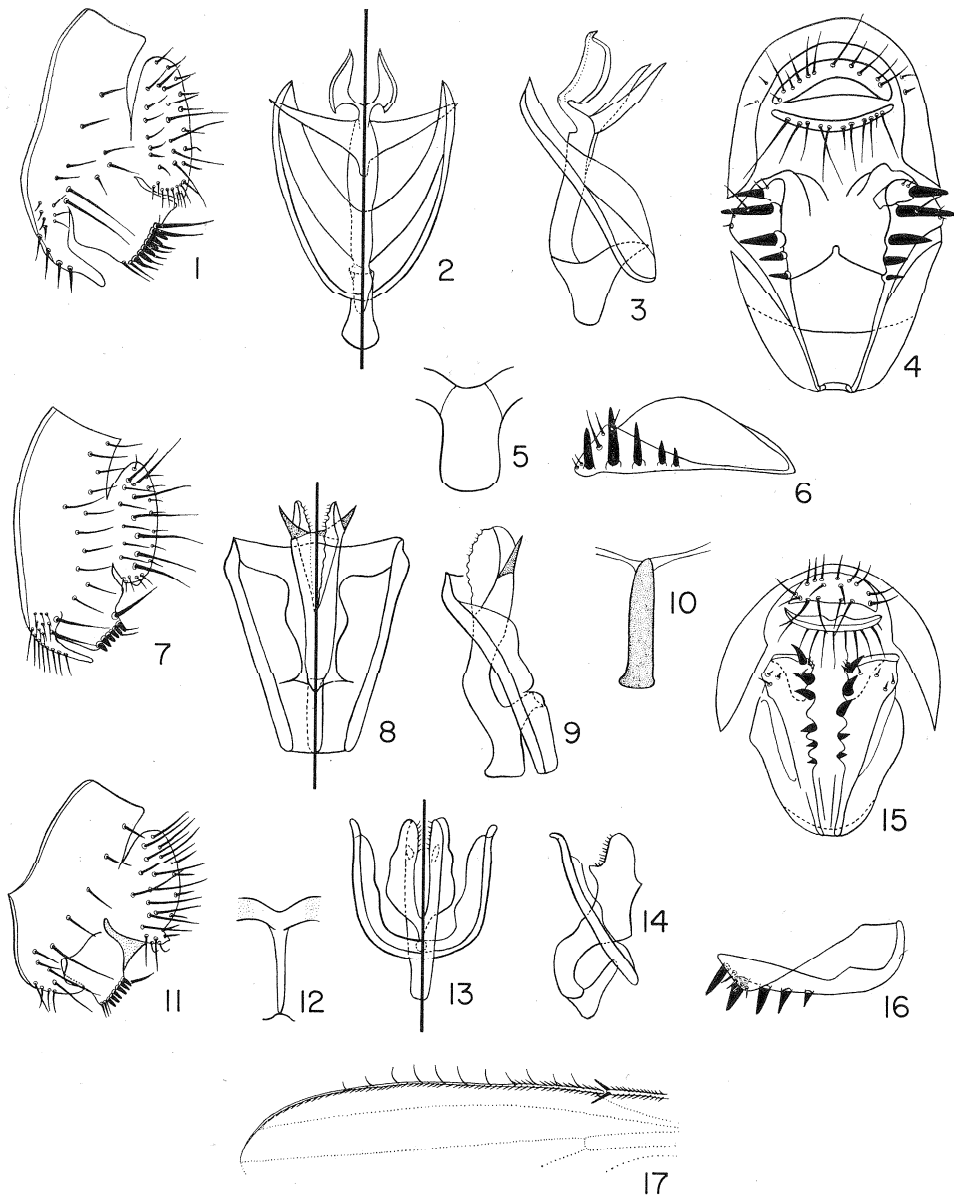


PLATE III. *D. nesiota* (Haiti): Figs. 1-6; *gentica*-like (δ , Jamaica): Figs. 7-10; *incompta* (δ , Panama; δ , Dominica, B.W.I.): Figs. 11-16; *crossoptera*, δ , anterior wing margin viewed from below: Fig. 17. In Figs. 2, 8, 13, the dorsal aspect of the male copulatory apparatus is shown on the right half, the ventral aspect on the left half.

Male and female genitalia. The male genitalia are shown in Plate III, Figs. 11–14. Genital arch broad, upper portion with about 4 bristles, lower portion with about 5, including two long ones; toe slightly broad proximally and bent forward, with about 5 short bristles; heel pronounced. Primary clasper broad, both upper and under margins convex. Primary teeth about 6, and about 4 marginal bristles, the upper one long. Anal plate fused with genital arch on lower half, oval, with about 17 bristles; tip pointed and with about 6 short bristles.

Penis longer than broad, the apical half bifid, with a horn-like process on dorsal subapical portion. Hypandrium simple, U-shaped, without paramedian spines. Both gonapophyses absent. Phallosomal index about 5.0.

Spermatheca as shown in Fig. 3l. Ovipositor as shown in Plate III, Figs. 15–16; lobe yellow, slender, slightly crescentic, apically triangular. With about 5 heavy black spines on posterior margin. Three bristles subapically on anterior margin and a bristle located between ultimate and penultimate spine. Posterior apex of lobe with 3 sensilla. Basal isthmus broad and quadrate.

Distribution and Types. Holotype male (prep. 235), Almirante, Bocas del Toro Pr., PANAMA, Jan. 1953, F. S. Blanton (USNM); allotype female (prep. 249), same data as holotype except Oct. 1952 (USNM). Six paratype females: two, Antrim, DOMINICA, B.W.I., March 1956, J. F. G. Clarke (USNM); one, same data as allotype (USNM); one, Cordoba, Vera Cruz, MEXICO, sweeping in coffee finca, May 1959, M. Wasserman (UT); two, from 3 miles west of Villavicencio, Meta, COLOMBIA, March 1955, E. I. Schlinger and E. S. Ross (CAS).

The female from Cordoba, Mexico was returned to the laboratory alive, and was dissected several weeks later. Both ovaries were small and colorless; the left one had a single well-developed egg which, when dissected free, showed no sign of filaments. The ventral receptacle was very short, with 4–5 small coils. The parovaria were of about the same size and shape as the spermathecae.

Drosophila nesiota Wheeler and Takada, new species

Wholly pale tannish yellow species. Body length less than 2.0 mm. Cheeks moderately narrow; an extra dorsocentral sometimes slightly developed. Wing vein indices as shown in Table 1. Not separable from *gilva*, *gentica* or *incompta* except by the use of genitalia.

Male and female genitalia. The male genitalia are shown in Plate III, Figs. 1–3, 5. Genital arch slightly concave at posterior margin; lower portion with about 5 bristles, including two long ones; upper portion with about 5 bristles, irregularly arranged. Toe strongly bent forward, with 4–5 short bristles. Primary clasper quadrate and broad, the undermargin convex; about 6 primary teeth and about 9 marginal bristles, the upper two stouter and longer. Anal plate oblong, fused with the genital arch on the lower 1/3, with about 23 bristles, the undermargin with about 10 short bristles.

Penis long and slender, the tip bifid, the subapical portion with a pair of long sword-like processes on ventral surface. Hypandrium simple and triangular, without paramedian spines. Anterior and posterior gonapophyses absent. Phallosomal index about 4.0.

Spermatheca as in Fig. 3k; the oval shape seems to be characteristic. The ovipositor is shown in Plate III, Figs. 4, 6; lobe yellow, slender, triangular, and with about 5 heavy black spines on the upper half of the posterior margin. Three bristles subapically on anterior margin. Posterior apex of lobe with 2 sensilla. Basal isthmus broad, semicircular. Eighth tergite with a pair of short hairs on each side near the posterior margin.

Distribution and Types: Holotype male (prep. 232) and allotype female (prep. 255), both descendants of a single female from near Petionville, HAITI, July 1959, W. B. Heed and H. L. Carson (UT.)

The original female from Haiti was returned to the laboratory alive, the holotype and allotype being reared from two eggs laid in the culture vial. The eggs were smooth, without chorion pattern, and lacked filaments. They were laid on the glass sides of the vial rather than on the food surface.

Unnamed species 1

One female, San Salvador, EL SALVADOR, Jan. 1954, W. B. Heed (UT). Body length about 2.5 mm.; wholly pale yellowish tan; cheeks moderately broad; extra dorsocentrals weak. Wing indices as in Table 1. The spermatheca is shown in Fig. 3g; the ovipositor (prep. 245), shown in Plate IV, Figs. 1-2, is as follows: lobe yellow, broad, apically trapezoidal, with about six heavy black-tipped spines on posterior margin, the ultimate one being shorter than the penultimate (on the anterior side) and with an apical sensillum. Three bristles located on subapical lobe; posterior apex of lobe with a sensillum. Basal isthmus broad and triangular.

Unnamed species 2

One female, San Salvador, EL SALVADOR, Jan. 1954, W. B. Heed (UT). Body length about 2.5 mm.; wholly pale yellowish species; cheek moderately broad; extra dorsocentrals not evident. Wing indices as in Table 1. The spermatheca is shown in Fig. 3h; the ovipositor (prep. 250), shown in Plate IV, Figs. 3-4, is as follows: lobe yellow, longer than broad, apically quadrate, with about seven heavy, black-tipped spines, the ultimate one short and located anteriorly; a small bristle between ultimate and penultimate. Three bristles at middle of anterior margin. Posterior apex of lobe with 2 sensilla. Basal isthmus broad, trapezoidal.

Unnamed species 3

One female, from 50 kilo. west of Bogota, COLOMBIA, July 1960, W. B. Heed and H. L. Carson (UT). Body length about 2.5 mm.; body yellowish tan, but palpi distinctly brown, and cheeks a little darkened below eyes; cheeks moderately broad. Acrostichal rows straight and uniform; an extra dorsocentral weakly indicated. Wing indices as in Table 1. The spermatheca is shown in Fig. 3f; the ovipositor (prep. 251), shown in Figs. 5-6 of Plate IV, is as follows: lobe yellow, banana-shaped; apically oblong and with about five black spines on the posterior margin, the ultimate one shorter than the penultimate. Three bristles located near middle of anterior margin; a fine bristle between ultimate and penultimate

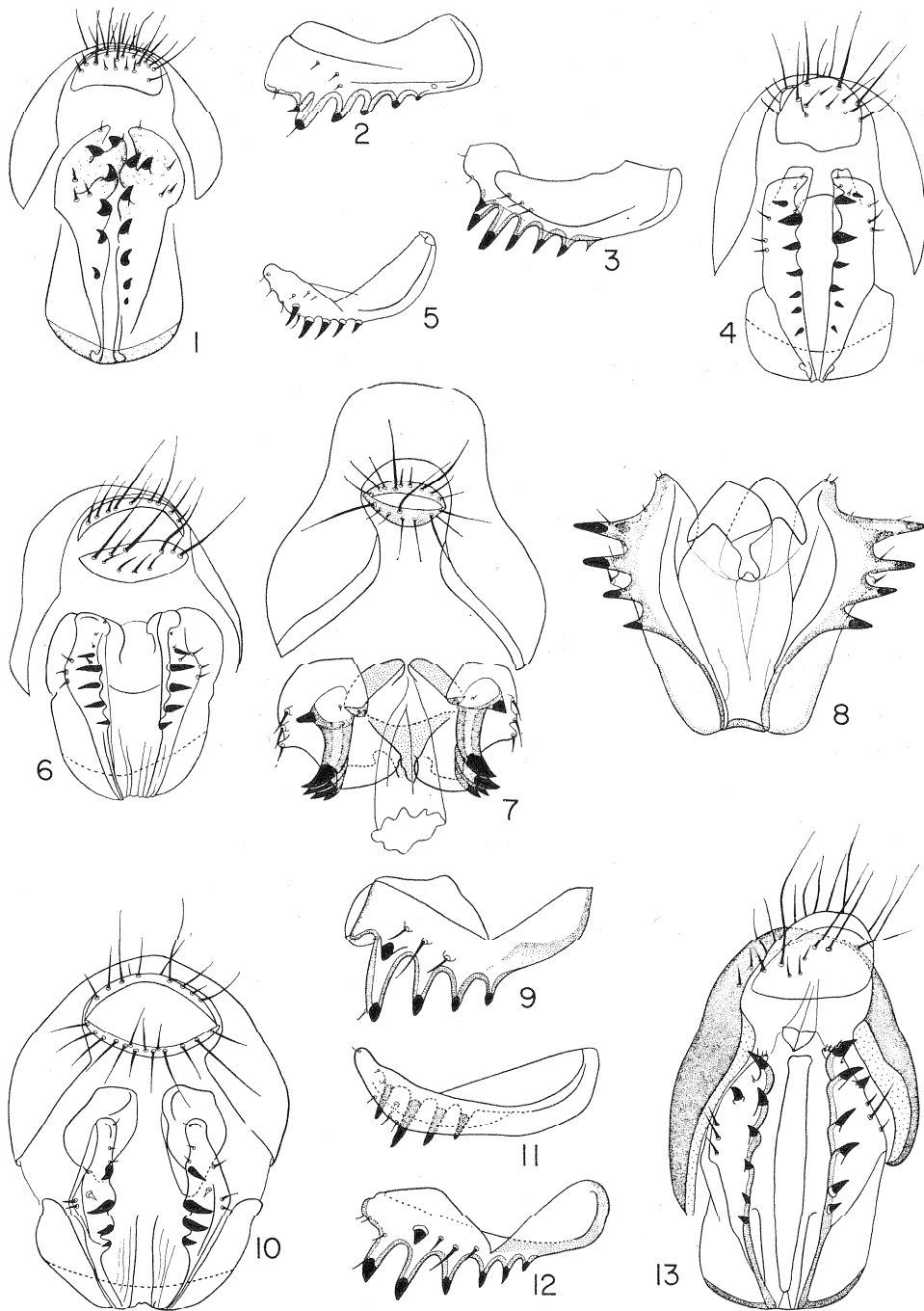


PLATE IV. Unnamed species 1 (El Salvador): Figs. 1-2; species 2 (El Salvador): Figs. 3-4; species 3 (Colombia): Figs. 5-6; species 4 (Ecuador): Figs. 7-9; species 5 (Haiti): Figs. 10-11; species 6 (Colombia): Figs. 12-13. All genitalial figures were prepared for publication by Mrs. Linda Kuich.

spines. Posterior apex of lobe with three sensilla. Basal isthmus longer than broad, curved upward.

Unnamed species 4

One female, Mt. Cotopaxi, near Quito, ECUADOR, 3583–3700 meters, March 1958, M. R. Wheeler (UT). Mesonotum light brown, overlaid with dense grayish pollen; scutellum paler tan; pleura, legs and abdomen tan. Front tan anteriorly, with a rather large, prominent dull blackish triangle extending well beyond ocellar area, and orbits also somewhat darkened. Face, cheeks and palpi tan; cheeks quite broad. Several enlarged hairs in each dorsocentral row; acrostichals irregular but more nearly 4-rowed than 6-rowed; prescutellars not developed. Body length about 2.0 mm. Wing indices as in Table 1. The spermatheca is shown in Fig. 3e; the ovipositor (prep. 254), shown in Figs. 7–9 of Plate IV, is as follows: lobe orange-yellow, massive, strongly convex at middle, apically quadrate; with about five massive, long, black tipped spines on the posterior margin, the ultimate one short and located on the anterior side of the penultimate. Three fine bristles situated at middle of anterior margin. Posterior apex of lobe with 3 sensilla, 2 at apex and one subapical. Basal isthmus longer than broad, curved upward.

Unnamed species 5

One female, Petionville, HAITI, June–July 1959, W. B. Heed and H. L. Carson (UT). Body length nearly 3 mm.; wholly pale tan; cheek moderately narrow; acrostichals in straight, uniform rows; extra dorsocentrals not evident. Wing indices as in Table 1. The spermatheca is shown in Fig. 3i; the ovipositor (prep. 253), shown in Plate IV, Figs. 10–11, is as follows: lobe yellow, banana-shaped, apically elongate, and curved upward; with about four long black spines on posterior margin. Four bristles located subapically, one nearer the spine row. Posterior apex of lobe with 3 sensilla, one apical and 2 subapical. Basal isthmus slender, curved upward.

Unnamed species 6

One female, from 17 miles SE of Bogota, Cundin Amarca, COLOMBIA, 2930 meters, March 1955, E. I. Schlinger and E. S. Ross (CAS). A brownish tan species with wholly black, semishining abdomen. Cheeks broad; legs rather long and slender; with 1–2 extra dorsocentrals rather well developed; wings brownish, veins dark; indices as in Table 1. Body length 3.0 mm. or a bit more. The spermatheca is shown in Fig. 3j; the ovipositor, mounted in a microvial, is shown in Plate IV, Figs. 12–13, and is described as follows: lobe yellow, longer than broad, apically rounded, strongly convex at middle, and with about six massive, long, black-tipped spines on posterior margin. A discal spine on subapical portion; ultimate spine with an apical sensillum and a basal sensillum. Three bristles at middle of anterior margin; posterior apex of lobe with 2 sensilla. Basal isthmus broad and triangular. Eighth tergite with a pair of short bristles on each side near posterior margin.

DISCUSSION

The most unusual feature of the group is the remarkable development of thick spines on the outer margin of the ovipositor. Comparable structures have not been observed elsewhere in the family. The usefulness of such structures is obscure. The spines on opposite sides tend to be situated alternately so that, when closed, an interlocking arrangement is produced; this could be a mechanism for scarifying the inner flower surface to induce floral bleeding. The scarified area might serve as the point of egg attachment, or the sap might be used as food. Although larvae of *flavopilosa* are clearly pollen feeders (see Fig. 2, d), it is still possible that very small larvae might utilize floral sap. Since nothing is known of adult food habits (very few adults have been taken at banana-baited traps), it is also possible that adults utilize floral sap. In this case, sap flow induced by females could be important in attracting males to the same flowers. Further field studies could undoubtedly furnish evidence on these questions.

The species of the group seem to be readily divisible into two subgroups:

flavopilosa subgroup: an apical cap on the spermatheca; posterior gonapophyses absent; anterior gonapophyses bearing bristles, fused with hypandrium; paramedian bristles present on either side of the median notch of the hypandrium; no long bristles near upper end of primary tooth row of clasper. This group would contain *flavopilosa*, *lauta*, *acroria*, *crossoptera*, and the six unnamed species.

nesiota subgroup: no apical cap on spermatheca; both anterior and posterior gonapophyses absent; no paramedian bristles on hypandrium; with 1-2 long bristles near upper end of primary tooth row of clasper. Belonging to this group are *nesiota*, *incompta*, *gentica* and *gilva*.

It is a bit surprising that several species have frequently been taken together at the same locality. This is shown by the available material from Petionville, Haiti (two species), Almirante, Panama (two species), Villavicencio, Colombia (three species), and the specimens from San Salvador. The latter represent only a part of the collections made by Dr. Heed in the "eastern barranco" near the Instituto Tropical de Investigaciones Cientificas (Heed, 1955. Dissertation, University of Texas). The total number of specimens taken by him was 17, as follows: December 10-19: one; January 15-28: thirteen; March 1-3: two; April 17: one. The only specimens available to us for this study were from his January collection and included three species, *gentica*, and species 1 and 2. At the present time there is no way of determining whether this represents a lack of specific flower constancy, or the presence in proximity of several flower species in such localities.