

NINE NEW MEMBERS OF THE *DROSOPHILA TRIPUNCTATA* SPECIES GROUP (Diptera: Drosophilidae)¹

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Abstract: Descriptions of 9 new species of the *Drosophila tripunctata* species group are presented. Five sets of sibling species within this group are identified.

The present paper describes nine new species of *Drosophila* that belong in the tripunctata group, as originally established by Sturtevant (1942), of the subgenus *Drosophila*. The tripunctata group, one of the largest in the genus *Drosophila*, has been divided into four subgroups by Frota-Pessoa (1954). We follow his authority in the placement of the species. The new species are as follows: *D. roehrae*, subgroup II; *D. bodemanae*, *D. fairchildi*, *D. johnstonae*, and *D. blumelae*, subgroup III; *D. whartoniae*, *D. greerae*, *D. sucheae* and *D. pellewae*, subgroup IV.

Heed and Wheeler (1957) described 10 new members in the tripunctata group and made a count of 45 species. The present addition of nine forms raises the total to 54 species. A key to the species of the tripunctata group with descriptions of additional species will be published at a later date.

The most extensive work on hybridization studies in the tripunctata group was conducted by Patterson (1957). He mated 11 species in all combinations with one another and found that 88 percent of the 110 matings did not produce progeny because of sexual isolation. Of particular interest, however, he found almost as many matings that produced hybrids between subgroups (3) as within subgroups (4). The former three hybrids include subgroup II crossed with subgroup III and subgroup II crossed with subgroup IV. At that time there were no species of subgroup I available for analysis.

The results of four recent hybridization tests are described below. In contrast with Patterson's work, the crosses were made between cultures collected in Panama which were so similar in internal and external morphology that their distinctness on the species level was in doubt. The results are unambiguous and favorable for describing the doubtful strains as new species. This indicates that Panama may harbor a relatively high frequency of sibling species in the tripunctata group. When reciprocal crosses are made between *D. pellewae* n. sp. and *D. metzii* Sturtevant, sexual isolation is strong, but a few hybrids are produced. They are sterile *inter se* but weakly fertile in back crosses with each parental species. This case appears to be favorable material for studies in introgressive hybridization.

1. This work was supported by National Science Foundation Grant 16028 and Grant GB-1607 (Washington, D. C.) and by Public Health Service Research Grant 06813, Division of General Medical Sciences, National Institutes of Health, Bethesda, Md.
2. The Gorgas Memorial Laboratory, Panama, R. of P.
3. The University of Arizona, Tucson, Arizona.

When crosses are made between *D. blumelae* n. sp., *D. johnstonae* n. sp. and *D. fairchildi* n. sp., in all combinations, a few hybrids are produced, but they usually die in the larval or pupal stage. *D. blumelae* is sympatric with both *D. johnstonae* and *D. fairchildi*, but the latter two siblings are not known to exist in the same locality. *D. roehrae* n. sp. and *D. unipunctata* Patterson and Mainland are sibling species and are sympatric in Panama. Reciprocal mass matings are sterile. *D. mediopicta* Frota-Pessoa and *D. mediopictoides* Heed and Wheeler feed over the same fallen fruit at Cerro Campana, Panama, and may be distinguished by the presence of a thin median stripe on the sixth tergite of both sexes in *mediopicta* and the absence of this mark in *mediopictoides*. Mass reciprocal matings between the two taxa from Cerro Campana are sterile. Another set of sibling species, also from Cerro Campana, has yet to be hybridized: *D. medioparva* Heed & Wheeler, and an undescribed form.

Sixty percent of the number of ground feeding Drosophilidae of forests near Panama City, caught chiefly by net sweeping over fallen fruits and fallen blossoms, are members of the *tripunctata* group. Not only do a variety of members of this species group, but also members of the same sibling sets, feed together over the same fallen plant parts. The fallen plant parts supporting the growth of yeasts and other microorganisms, which are taken as food by the adult flies, serve also as sites for larval and pupal development. In addition, larval development may take place in blossoms of living plants; i. e., blossoms attached to the plant. Ecological studies are being reported in detail elsewhere.

The male genitalia slides were prepared according to the method of Fairchild & Hertig (1948). The larval brain chromosomes were prepared following Lewis & Riles (1960). Colors and measurements of the new species were determined from living specimens. Owing to abdominal tergite color polymorphism of various members as well as the presence of sets of sibling species, a study of living specimens is almost a necessity in order to distinguish the species from one another. Such characters as belong to the entire group, listed by Frota-Pessoa (1954), page 259, have been omitted from the descriptions.

Acknowledgment: It is a pleasure to acknowledge the assistance of Dr. W. J. Hanson, Director of the Museum, Utah State University, Logan, Utah, in weekly collecting trips to Cerro Campana, Panama, in 1960 and 1961; and to Alan C. Pipkin, Jr., for assistance in collecting *Drosophila* in Chiriqui Province, Panama, in Darien Province, Panama, and in Rio Raposo, Colombia. We are indebted to Dr. Martin H. Moynihan, Director, The Smithsonian Institution Biological Area, Barro Colorado Island, Canal Zone, and to Dr. Carlos San Martín, Universidad del Valle, Buenaventura, Columbia for collection facilities; to Dr. Jorge León, Instituto Interamericano Ciencias Agrícolas de la Organización de los Estados Americanos, for identifying plant material; to Dr. Alan C. Pipkin, Sr., for the photograph of the wing of *D. whartoniae*. Thanks are given to Mr. O. Ortiz for preparing the genitalia and chromosome slides and to Mr. A. Powers for culturing the delicate species.

Drosophila bodemanna Pipkin and Heed, n. sp. Fig. 2 E-H.

External characters of imagines: ♂, ♀, Arista with 5 dorsal and 3 ventral branches in addition to terminal fork. Front dark grayish brown, with heavy pollinosity, shining silvery when viewed from an angle; 7 frontal hairs on each side; 5 orbital hairs. Proclinate orbital about 2/3 the posterior reclinate; anterior reclinate 1/4 the proclinate. Face yellowish tan, paler above; cheeks pale tan. Carina flattened above. Two prominent oral

bristles, about the same length. Cheek width from base of oral to eye border $1/13$ greatest diameter of eye. Eye bright red, slightly darker in upper $1/4$; pale pile. Eye index 1.2. Palpi with 1 longer subapical bristle and 5 shorter bristles on antero-lateral margin. *Acrostichal hairs* in 6 rows; mesonotum and scutellum subshining, unicolorous tan; halteres, yellowish tan; pleura, straw colored. Anterior sternopleural about $5/7$ posterior; mid-sternopleural thin, about $1/2$ anterior. Legs yellowish; 2 black hairs at base of hind metatarsus. *Wing* brownish; posterior crossvein clouded; anterior crossvein, only slightly so. Costal index about 4.6; 4th vein index, about 1.6; $5\times$ index about 1.3; 4c index about 0.59. Third costal section with heavy hairs on basal $1/2$. Two prominent bristles at apex of 1st costal section. *Abdomen* subshining brownish yellow; tergites 2 and 3 possessing black apical bands less than $1/2$ width of the tergite indented medially, apical band fading at lateral bend of tergite; tergite 4 possessing a narrow apical band with medial extension; tergite 5 without apical band but possessing median black triangular mark, rounded anteriorly; tergite 6 with median stripe directly posterior to the mark on tergite 5. Abdominal marks of ♀ similar to ♂, but fainter, sometimes bare on tergites 5 and 6. *Body length* (etherized) ♂, about 2.4 mm; ♀, 2.8 mm. *Wing length* ♂, about 2.3 mm; ♀, 2.6 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubule branched basally near gut; free at ends; posterior Malpighian tubules apposed with continuous lumen. Testes pale yellow with 1 thicker inner coil (the vas deferens) and 3 slightly thicker outer coils (the testes proper). Two short sperm pump diverticula slightly less than greater diameter of sperm pump. Anal plate of ♂ with distinctive tuft of small bristles on ventral margin. Forceps (fig. 2F) with 7 primary teeth, arranged in a curve; no secondary teeth; about 6-7 marginal bristles, 8-9 bristles on upper surface of forceps. Toe rounded with 2-3 prominent bristles. Hypandrium (fig. 2E) with a pair of smaller medial bristles and a pair of longer, more lateral bristles, widely separated. Head of phallus simple; its apodeme a slightly bent rod. Spermathecae oval (fig. 2H), rounded apically; internal duct not telescoped at base, expanded apically. Ovipositor plate with 19-22 teeth, apex of ovipositor plate rounded (fig. 2G).

Egg: Not studied.

Puparium: Golden brown; anterior spiracles with about 12 pale amber filaments of varying lengths; distal end of anterior horn black ringed. Horns, including spiracles, about $1/3$ length of puparium. Posterior spiracles yellowish with darker tips; parallel.

Chromosomes: Not studied. The species does not breed readily on laboratory medium.

Belongs in subgroup III of the tripunctata group of the subgenus *Drosophila*. *D. bodemanae* differs in body color and important details of the ♂ genitalia, as well as internal and pupal characters from *D. argenteifrons* Wheeler (1954) which likewise possesses a heavily pollinose front, shining silvery at an angle.

DISTRIBUTION: Cerro Campana, Panama Province, Panama, 850 m, in cloud forest, I, V-VI, XI, 1960; IX, XI, 1961; XI, 1963; in El Volcán, Chiriquí Province, Panama, VI, 1962.

Holotype ♂, (62 C 4), Cerro Campana, Panama Province, Panama, and 1 ♂ and 2 ♀ paratypes (6 P S 2), El Volcán, Chiriquí Province, Panama (USNM). Four ♂ and 5 ♀ paratypes (29 C 10), Cerro Campana, Panama Province, Panama, deposited in The *Drosophila* Type and Reference Collection, The Genetics Foundation, The University of Texas, Austin, Texas.

Named in honor of Dr. Elsie Bodemann, Professor of Biology, Texas Technological College, Lubbock, Texas.

Drosophila whartoniae Pipkin and Heed, n. sp. Figs. 1H, 6.

External characters of imagines: ♂, ♀. Arista with 4 dorsal and 2 ventral branches in addition to terminal fork. Antenna white; segment 3 covered with amber hairs. Front white, not shining; about 6 whitish frontal hairs on each side; ocelli reddish. Orbits sooty in region of bases of vertical bristles; 4-5 orbital hairs. Proclinate orbital about 5/7 posterior reclinate; anterior reclinate very thin, about 3/5 proclinate. One prominent oral bristle; 2nd minute. Cheek from base of oral to eye border 1/13 greatest diameter of eye; absent posteriorly. Cheek ventral to oral bristle sooty; sides of clypeus sooty. Face white; carina broad, bulbous, not sulcate. Palpi golden laterally, whitish medially, with 1 long subapical hair and 4 shorter hairs on lateral margin. Proboscis golden, deeper color apically. Eyes bright red, very slightly darker above, covered with short white pile. Eye very narrow; eye index 1.85. Head greatly depressed; body bowed. *Acrostichal hairs* in 6 rows; only 3 rows reaching scutellum, last row slightly elongated. Mesonotum shining gray; body wall almost transparent, with fine pollinosity when viewed at an angle; scutellum ashy gray, pollinose; posterior scutellars crossed and held dorsally above scutellum. Pleura white; halteres white at base, pale gray at tip. Anterior sternopleural about 5/7 posterior; midsternopleural bristle very thin and 3/5 anterior. Coxae, trochantera, femora, proximal portions of tibiae, whitish; distal portion of tibiae and tarsi yellowish; 2 inconspicuous golden bristles at base of hind metatarsus. *Wing* with base (fig. 6) ashy for a distance equal to length of scutellum; posterior parts of wings yellowish brown; costa darkened and thickened immediately anterior to 1st costal break. Posterior crossvein strongly clouded; its cloud being continuous with a cloud on tip of V. Anterior crossvein not clouded but sides of III & IV slightly thickened in vicinity of anterior crossvein. II describes an S, first bending to costa, then strongly medially, and finally at almost a 90° angle to costa again; clouded at tip; apical portion of III makes a gradual bend medially to costa; clouded at tip; IV bends laterally, then medially, forming a large bow, clouded at tip; V meets costa in a cloud that is contiguous to cloud of posterior crossvein. Cloud in cell 3 over indented area; cloud in subproximal portion of cell 2. Costal index about 1.8; 4th vein index about 1; 5x index about 0.3; 4c index about 1. One strong bristle at apex of 1st costal section; heavy hairs on proximal 3/5 of 3rd costal section. *Abdomen* shining grayish tan with white pollinosity; no markings; sternites white. *Body length* (etherized) about 2.75 mm in ♂; 3 mm in ♀. *Wing length*, ♂, about 2.65 mm; ♀, 2.70 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubules pale straw; the single branch dividing into 2 at a distance equal to width of intestine; ends free anteriorly. Posterior Malpighian tubules apposed with continuous lumen. Testes of 7 whitish coils with faint tinge of yellow, all about the same diameter, *i. e.*, about 1/2 that of intestine; proximal coils tighter; two most distal coils looser. Sperm pump with 2 diverticula slightly more than 2x greater diameter of pump. Genitalia lost from only ♂ specimen. Spermathecae yellowish, oval, greatest length, 1.3x its greatest width in fresh dissection. Ventral receptacle very long, loosely coiled at base, tightly coiled distally, 38 gyres. Ovipositor plates (fig. 1H) golden, each with about 20 teeth.

Egg: With 4 filaments; 2 distal ones thinner and slightly less than length of egg; 2

proximal filaments slightly longer than egg; bases of filaments and area of their insertion on egg yellowish.

Puparium: Golden brown; horns including spiracles with about 22 pale amber filaments, joining black ringed distal end of anterior spiracles. Posterior spiracles white, parallel.

Chromosomes: Not studied.

Belongs in subgroup IV of the tripunctata group of the subgenus *Drosophila*; closest to *D. albescens* Frola-Pessoa which it resembles in the depressed head, narrow eye, absence of abdominal markings, extreme transparency of the mesonotum. Differs from *albescens* in the sinuous wing veins and clouding not found in the latter. Both *whartoniae* and *albescens* are related to *suchaeae*, n. sp. and *albirostris* (*albicans*).

DISTRIBUTION: Single ♀, Cerro Campana, Panama Province, Panama, sweeping over blossoms of *Calocarpum viride* Pittier in transitional altitude forest zone, 670 m, XI. 1960. One ♂ and 2 ♀ progeny were bred from this ♀.

Anterior 1/2 of holotype ♂ (31 C 4), and 2 paratype ♀♀, Cerro Campana, Panama Province, Panama (DTRC, Austin).

Named in honor of Dr. Linda Wharton McDonald, Galveston, Texas.

Drosophila greerae Pipkin and Heed, n. sp. Fig. 1 A-E, I.

External characters of imagines: ♂, ♀. Arista with 6 dorsal and 2 ventral branches in addition to terminal fork. Front brown, orbits slightly darker and shiny; darker within ocellar triangle; ocelli pink; 4 pale inconspicuous frontal hairs; 5 orbital hairs, on each side. Proclinate orbital 3/4 posterior reclinate; anterior reclinate thin, about 1/3 proclinate. Face yellowish; carina not sulcate. One prominent oral bristle; 2nd, less than 1/3 the 1st; proboscis yellowish. Cheeks pale straw; width of cheek from base of oral bristle to eye border 1/6 greatest diameter of eye. Eye dull red, covered with short straw-colored pile. Eye index 1.3. Palpi yellowish, with 1 subapical bristle and 2 more smaller bristles on anterolateral margin in addition to inconspicuous hairs. *Aerostichal hairs* in 6 row; mesonotum and scutellum shining brown; area between dorsocentrals darker brown or with darker indistinct stripes just within the dorsocentral bristle line seen clearly in living specimens; pleura shining light brown, darker along suture; halteres yellow. Anterior sternopleural about 4/7 posterior sternopleural; midsternopleural thin, about 1/2 anterior. Legs yellowish brown; many recurved hairs on foretarsi; 2 golden hairs on base of hind metatarsus of the 3rd pair of legs. *Wing* unicolorous brownish; posterior crossvein lightly clouded. Costal index about 2.8; 4th vein index, about 1.5; 5X index, about 1.5; 4c index, about 0.8. Third costal section with heavy hairs on basal 1/2; 2 prominent bristles at apex of 1st costal section. *Abdomen* of ♂ shining brown; tergite 2 with broad black apical band the width of tergite, indented medially and fading at lateral bend of tergite; tergite 3 with broad black apical bands the width of tergite, fading at lateral bend; tergite 4 with broad black median stripe with black lateral extensions as far as the bend of the tergite; tergites 5, 6 with black median stripe more narrow and lacking lateral extensions. ♀ similarly marked; stripes on tergites 5 & 6 somewhat more narrow; tergite 7 yellowish brown. *Body length* (etherized) ♂, about 2 mm; ♀, about 2.5 mm. *Wing length* ♂, 1.85 mm; ♀, 2.4 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubule branched basal-

ly at a distance the width of intestine; free at ends; anterior tubules rather short in comparison with other members of the group, being about $4\times$ width of intestine. Posterior tubules fused with continuous lumen. Testes with 3 whitish thicker proximal coils (the vas deferens); 5-7 straw-colored thinner distal coils (the testes proper). Sperm pump with 2 short diverticula. Anal plate of ♂ without distinctive tuft of hairs on ventral border. Last sternite of ♂ not darkened. Forceps (fig. 1B) with 7-9 primary teeth (median, 8), arranged in a weak curve, the 2 forcipces joined by a medially grooved chitinous plate. No secondary teeth; 8-10 bristles on upper surface of forceps continuous with 8-9 marginal bristles. One prominent bristle on genital arch at base of insertion of forceps. Hypandrium with 2 small pairs of medial bristles and 1 long pair of lateral bristles (fig. 1A). Apodeme of phallus a slightly bent rod; head of phallus simple. Toe slightly rounded with 3-6 bristles. Spermathecae oval, dark brown on distal $1/4$, paler proximally; inner duct narrow at base, widening apically. Ventral receptacle a long, tightly coiled tube with about 18 gyres. Ovipositor plates yellowish brown, acuminate at apex, each with about 17 teeth (fig. 1I).

Egg: With 4 slender filaments, the proximal ones approximately $4/5$ length of egg; distal ones $2/3$ length of egg.

Puparium: Golden brown; anterior spiracles with 31 pale amber filaments; horns including anterior spiracles about $7/11$ length of puparium. Posterior spiracles whitish with pale yellow tips; parallel.

Chromosomes: Laboratory culture 7 M F 25 shows ♂ larval ganglion cells (fig. 1E) with 1 large rod-shaped X chromosome displaying chromatids falling apart in a spurious V, a medium sized rod-shaped Y-chromosome, and autosomes consisting of 3 pairs of medium sized rods, 1 pair of large rods, and 1 pair of dots. One of the pairs of medium rods in fig. 1E shows the chromatids apart in a spurious V. Females (fig. 1C, D) show 2 large rod-shaped X's and autosomes like those of the ♂. Satellites are seen on one of the medium rod-shaped chromosomes in fig. 1C and E. Salivary chromosomes from the laboratory stock were consistently poor.

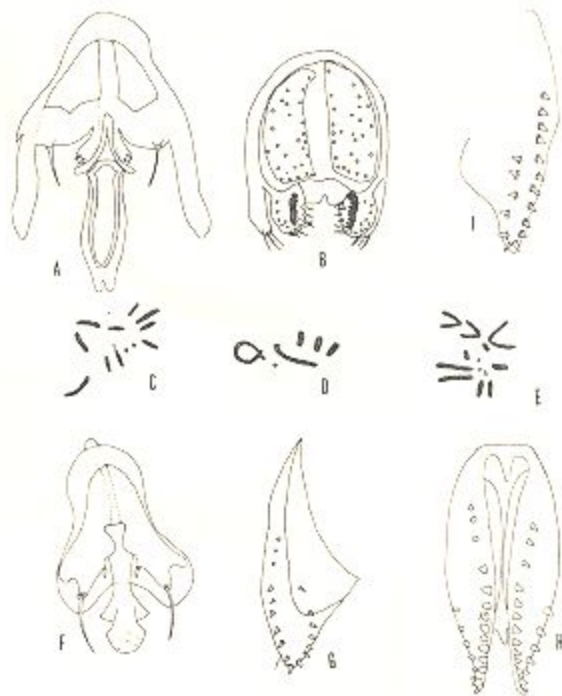


FIG. 1. *D. greerae*: A, ventral view of hypandrium and phallus with bow of hypandrium removed; B, forceps, genital arch, and anal plates; C, chromosomes of larval ganglion cell of ♀; D, very close somatic pairing of homologous chromosomes in larval ganglion cell of ♂; E, chromosomes of larval ganglion cell of ♂, 1 pair of medium rods and the x showing the chromatids falling apart in a spurious V; I, ovipositor plate. *D. suchae*: F, ventral view of hypandrium and phallus, with bow of hypandrium removed; G, ovipositor plate. *D. whartoniae*: H, ovipositor plates.

Belongs in subgroup IV of the tripunctata species group of the subgenus *Drosophila*.

DISTRIBUTION: Collected IX.1960; XI-XII.1961, sweeping over fruit of a *Clusia* sp. (an undescribed forest tree) at Barro Colorado I., Canal Zone; I-III, V.1961, Madden Forest, Canal Zone, sweeping along bank of stream; VII, IX.1961, Cerro Campana, Panama Province, Panama, sweeping along stream in transitional forest area, 670 m. "Bred" from the blossoms of *Bombax harrigon* (Seem.) Decaisne; seen also at El Volcán, Chiriqui Province, Panama, VI.1962.

Holotype ♂, 25 ♂ and 25 ♀ paratypes from laboratory stock 7 M F 25, developed from founders collected at Madden Forest, Canal Zone (USNM), Ten ♂ and 10 ♀ paratypes from laboratory stock 7 M F 25 (DTRC, Austin).

Named in honor of Mrs. Lillian Greer Bedichek, in appreciation of her translations from Portuguese of taxonomic papers on the Drosophilidae.

Drosophila *sucheae* Pipkin and Heed, n. sp. Fig. 1 F-G.

External characters of imagines: ♂, ♀. Arista with 5 dorsal and 2 ventral branches in addition to terminal fork. Front dull pale tan, 4 minute golden frontal hairs on each side; 5 inconspicuous orbital hairs. Ocelli reddish. Proclinate orbital 6/7 posterior reclinate; anterior reclinate thin, 1/3 proclinate. One prominent oral bristle, 2nd, less than 1/2 the 1st. Cheek from base of oral to eye border 1/9 greatest diameter of eye; sooty gray ventrally. Face white, carina broad, not sulcate. Palpi yellowish with an apical and sub-apical bristles and 2-3 shorter bristles on lateral margin in addition to inconspicuous hairs. Proboscis brownish yellow with small golden hairs. Eyes bright red with yellow pile; eye index 1.5. Head somewhat depressed. *Acrostichal hairs* in 6 rows; mesonotum shining brownish gray with some pollinosity; almost translucent; scutellum shining brownish gray. Pleura shining pale gray above, paler below. Anterior sternopleural about 4/5 posterior, the mid bristle thin and about 3/4 anterior; halteres yellowish. Legs yellowish, 2 golden hairs at base of hind metatarsus. *Wing* tan with both anterior and posterior crossveins strongly clouded; tips of II & III slightly darkened. Tip of II bends slightly to costa. Posterior crossvein slightly sinuous. Cloud on posterior crossvein appears like an abdominal apical band when wing is at rest. Costal index about 3.6; 4th vein index about 2.0; 5X index 1.3; 4c index about 0.88. Heavy bristles on approximately the basal 1/2 of 3rd costal section; 1 prominent bristle at apex of 1st costal section. *Abdomen* shining yellowish with broad black apical bands fading at lateral bend on tergites 2 & 3, slightly extended medially; tergite 4 with small medial black flattened triangular mark; tergites 5 & 6 entirely yellow; sternites pale. Female with black apical bands on tergites 2-4 fading at lateral bend of tergites, with slight medial extensions; tergites 5-7 bare; ovipositor plates golden. *Body length* (etherized), ♂, about 2.25 mm; ♀, 2.4 mm. *Wing length*, ♂, 2.1 mm; ♀, 2.14 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubules straw-colored, distal 1/3 chalky white and slightly thicker than proximal portion; free at ends; 2X as long as posterior tubules. Posterior tubules apposed but lumen not continuous. Both anterior and posterior single tubes branch at a distance of 3X the width of intestine. Testes with 1 basal inner gyre and 3 1/2 outer gyres, all straw-colored. Sperm pump with 2 diverticula, each slightly more than 4X the greater diameter of pump. Forceps with 6 extremely short teeth in a straight row; no secondary teeth; 6 marginal bristles; single long

bristle on genital arch just dorsal to point of attachment of forceps; toe with 2 small bristles. Two pairs of hypandrium bristles, the longer lateral pair far posterior to shorter medial pair; head of phallus bulbous with a subapical expansion; apodeme of phallus a straight rod (fig. 1F). Anal plates of ♂ with no marked tuft of bristles on ventral medial margin. Spermathecae oval, light brown, the chitinous inner part almost globular. Inner duct with no pronounced constriction or telescoping at base; funnel shaped distally. Ventral receptacle with about 38 coils of which 15 represent tight proximal coils. Ovipositor plates broad near apices, each with about 23 teeth. (fig. 1G).

Egg: With 4 filaments each slightly longer than the egg.

Puparium: Unknown.

Chromosomes: Unknown. The species does not breed readily on laboratory medium.

Belongs in subgroup IV of the tripunctata group of the subgenus *Drosophila*. Related to *whartoniae*, n. sp. in the highly shining, nearly translucent mesonotum and depressed head. *Sucehae* differs from *whartoniae* in the more scant mesonotum pollinosity, less depressed head, absence of pronounced sinuosity of longitudinal wing veins; presence of clouding on anterior crossveins, presence of apical bands on certain abdominal tergites, and the more rounded eye. Also related to *albirostris* Sturtevant in the white face, highly shining mesonotum and similar tergite banding in the ♀; from which *sucehae* differs by having a less chunky body, more depressed head, more narrow eye, grayer mesonotum, presence of clouded anterior crossvein, and the absence of medial stripes on terminal tergites of ♂ abdomen. *Sucehae* also resembles *tristriata* Heed & Wheeler in the shining mesonotum, clouding of both anterior and posterior crossveins, bending of vein II L to costa at its tip and apical darkening of 2L. *Sucehae* differs from *tristriata* in the slightly depressed head, absence of median longitudinal stripes on tergites 4-6, and fewer forceps teeth.

DISTRIBUTION: Cerro Campana, Panama Province, Panama, in transitional altitude forest, 670 m, XI-XII, 1960, sweeping over blossoms of unknown forest tree; IX-X, 1961, same area, sweeping over small red drupe, El Valle Forest, Coclé Province, Panama, IX, 1962.

Holotype ♂ (43 C 5), Cerro Campana, Panama Province, Panama (USNM). One ♂ and 5 ♀ paratypes (30 C 30), same data, (DTRC, Austin).

Named in honor of Dr. Meta Suche Brown, Prof. of Soil and Crop Sciences, The Agricultural and Mechanical College of Texas, College Station, Texas.

***Drosophila pellewae* Pipkin and Heed, n. sp. Fig. 2 A-D, I.**

External characters of imagines: ♂, ♀. Arista with 7 dorsal and 3 ventral branches in addition to terminal fork. Front yellowish brown, not shining, darker within ocellar triangle; ocelli pink; few frontal hairs at apex of frontal triangle; orbital hairs, 6. Proclinate orbital 4/5 posterior reclinate; anterior reclinate thin, about 1/4 proclinate. Face shining yellowish; carina brownish, broad and flat distally. One prominent oral bristle; proboscis yellowish, brown at tip. Cheek yellowish brown; no cheek behind, width of cheek from base of oral bristle to eye border 1/12 the greatest diameter of eye. Eye dull red, slightly darker in the upper 1/5, with straw-colored pile. Eye index 1.3. Palpi yellowish brown with numerous short hairs. *Acrostichal hairs* in 6 rows; mesonotum shining brown, almost translucent; pleura shining dusky above, becoming paler below. Scutellum shining dark

brown dorsally and below. Halteres dusky yellowish. Anterior sternopleural about $3/8$ posterior sternopleural; midsternopleural thin, $3/4$ anterior sternopleural. Legs yellowish except front coxae which are whitish; 2 golden hairs at base of hind metatarsus of leg 3. *Wing* brown; veins darker brown; posterior crossvein clouded; anterior crossvein barely so; costal index 3.6; 4th vein index 1.4; 5X index 1.1; 4c index, 0.64; heavy bristles on basal $1/2$ of 3rd costal section; 1 prominent bristle at apex of 1st costal section. *Abdomen* (δ) shining black with indistinct medial interruptions on tergites 4-6; tergite 2 with dark apical band, fading at lateral bend of tergite. Anal plates dark brown with bent hairs on ventral margin. Sternites gray except most posterior one which is dark brown. Female abdomen yellowish brown with black apical bands fading at lateral bend of tergite; those on tergites 3 & 4 thickened, almost filling width of tergite, with paramedial extensions; those on

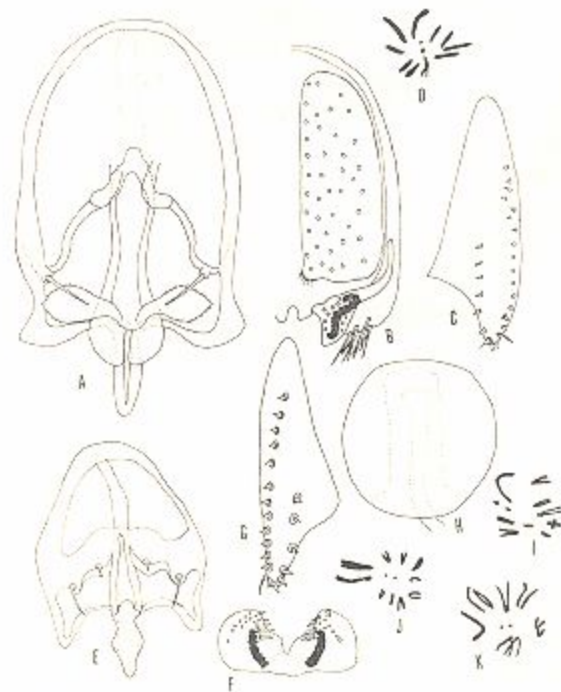


Fig. 2. *D. pellewae*: A, ventral view of hypandrium with bow present, and phallus; B, $1/2$ of genital arch, forceps, and anal plate; C, ovipositor plate; D, chromosomes of larval ganglion cell of δ ; I, chromosomes of larval ganglion cell of δ ; *D. metzlii*: J, chromosomes of larval ganglion cell of δ ; K, chromosomes of larval ganglion cell of δ , the x showing the chromatids falling apart in a spurious V; *D. bodemanae*: E, ventral view of hypandrium, with bow present, and phallus; F, forceps; G, ovipositor plate; H, spermatheca.

tergite 2 & 5 with indistinct medial interruption and paramedial extensions; that of tergite 6 with medial extension; tergite 7, yellow. Sternites pale; ovipositor plates yellowish, rounded at apices. *Body length* (etherized) δ , about 2.8 mm; δ , 3.2 mm. *Wing length*, δ , about 2.5 mm; δ , about 2.8 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubules branched basally at a distance the width of intestine, free with distal ends turned back; posterior Malpighian tubules apposed with lumen continuous by a narrow bridge of protoplasm. Testes pale yellow, 3 inner coils (the vas deferens) and 4 outer coils (testes proper). Sperm pump with 2 diverticula, 2X greater diameter of pump. Anal plate of δ with distinctive small tuft of hairs on medial ventral border. Forceps (fig. 2 B) with 14-15 primary teeth arranged in a sinuous row; no secondary teeth, the 2 forcipes joined by a medially grooved plate; about 8 marginal bristles and 7 bristles on upper surface of forceps; toe rounded with 7-11 bristles. A long medially directed bristle placed far posterior on each concha of hypandrium (fig. 2A). Apodeme of phallus a slightly bent rod; head of phallus simple, bulbous distally, with ventrally

attached laterally projecting ears. Spermathecae dark brown; oval; no constriction on inner duct. Ventral receptacle a long thin, coiled tube with about 22 gyres. Ovipositor plates rounded at tips, each with about 24 teeth (fig. 2C).

Egg: With 4 slender filaments each slightly less than length of egg.

Puparium: Golden brown; anterior spiracles with about 26 amber filaments; horns including spiracles a little more than 1/2 the length of puparium. Posterior spiracles black, apart.

Chromosomes: Laboratory culture 23 B 6, Barro Colorado Island, Canal Zone, showed larval ganglion cells of ♂ (fig. 2I) with 1 medium sized rod-shaped X chromosome, a large J-shaped Y chromosome; 1 pair of long rod-shaped autosomes, 3 pairs of medium sized rod-shaped autosomes, and a pair of dot-shaped autosomes. Female (fig. 2D) with a pair of medium sized rod-shaped X chromosomes, and autosomes like those of ♂. Salivary chromosomes from larvae of laboratory culture were consistently poor.

Belongs in subgroup IV of the tripunctata species group of the subgenus *Drosophila*, being a sibling species of *metzii* which possesses a similar sexual dimorphism in abdominal coloration and almost identical ♂ genitalia, and similar karyotype (fig. 2J,K) in larval ganglion cells. *Pellewae* differs from *metzii* in lacking the chalk white face and carina and in possessing somewhat wider dark apical bands of ♀ abdominal tergites. Reciprocal crosses of sympatric strains of *pellewae* and *metzii* from Barro Colorado Island, Canal Zone, and from El Real, Darien Province, Panama, respectively, give a few F₁ hybrids, sterile *inter se*, but weakly fertile in laboratory back crosses with each parental species.

DISTRIBUTION: Single ♀♀ collected VI-VIII. 1960, sweeping over fallen fruit of a *Clusia* sp., Barro Colorado I., Canal Zone; large population, about 60% *pellewae* and 40% *metzii*, feeding over unknown forest fruit in forest nr. El Real, Darien Province, Panama, XI. 1962; Rio Raposo (nr. Buenaventura), Colombia, VI. 1963.

Holotype ♂, 25 ♂ and 25 ♀ paratypes from laboratory stock 23 B 6, developed from single ♀ founder collected at Barro Colorado I., Canal Zone (USNM). Ten ♂ and 10 ♀ paratypes from laboratory stock 23 B 6, same data (DTRC, Austin).

Named in honor of the late Miss Caroline Pellew, The John Innes Horticultural Institution, England.

***Drosophila johnstonae* Pipkin and Heed, n. sp. Fig. 3 A, E.**

External characters of imagines: ♂, ♀. Arista with 6 dorsal and 2 ventral branches in addition to terminal fork. Front dull yellowish brown, pollinose, shining amber when viewed from an angle; darker within ocellar triangle; ocelli yellowish; 7 frontal hairs; 8 orbital hairs. Proclinate orbital 4/7 posterior reclinate; anterior reclinate about 1/4 proclinate. Face yellowish brown; carina not sulcate. One prominent oral bristle, 2nd less than 1/2 1st; proboscis yellowish with yellow hairs. Cheek yellowish; width of cheek from base of oral bristle to eye border 1/7 greatest diameter of eye. Eye bright red, scarcely darker dorsally, with yellow pile. Eye index 1.27. Palpi yellowish with 1 subapical bristle and 3 shorter bristles on lateral margin. *Acrostichal hairs* in 6 rows; mesonotum and scutellum dull unicolorous yellowish brown; pleura pale straw; halteres yellowish. Anterior sternopleural about 3/5 posterior; midsternopleural thin, about 2/3 anterior. Legs yellowish; 2 golden bristles at base of hind metatarsus. *Wing* tan with darker veins; posterior crossvein clouded; anterior crossvein, only lightly so. Costal index 5; 4th vein index 1.5; 4c index, 0.5; 5x index, 1.4; 1 prominent bristle at apex of 1st costal section; heavy hairs on basal 1/2 of 3rd costal section. *Abdomen*, ♂ yellowish, with thin black apical bands on

tergites 2-4, fading at lateral bend of tergite, the bands widely interrupted medially, with slight paramedial extensions. Tergites 5, 6 bare, except for a very small oval median dark mark, usually present, but easily missed in pinned specimens. Sternites pale. Female with abdominal markings similar to that of ♂; ovipositor plate reddish. *Body length* (etherized), ♂, about 3.25 mm; ♀, about 3.75 mm. *Wing length*, ♂, 3.05 mm; ♀, 3.55 mm.

Internal characters of imagines and genitalia: Malpighian tubules straw colored; anterior tubule branched at a distance equal to width of intestine; anterior ends free and turned back. Posterior Malpighian tubules apposed, with continuous lumen. Testes straw-colored with 4 proximal and 6 distal gyres, the latter lying in a flat rosette; proximal and distal coils about the same diameter. Sperm pump with 2 short diverticula about equal to greater diameter of sperm pump. No distinctive tuft of small hairs on medial ventral border of anal plate of ♂. Forceps with 7-8 teeth arranged in a slight curve, increasing in size toward ventral margin, 5 bristles on upper surface of forceps; 5 marginal bristles; the 2 forcipes joined by a medially grooved plate. Toe rounded, with 1-3 bristles. One prominent bristle on genital arch near insertion of forceps. Larger pair of medial bristles, smaller pair of lateral bristles on conchae of hypandrium (fig. 3A). Apodeme of phallus rod-like; head of phallus simple, arrow shaped, fringed with small saw teeth subapically (fig. 3E). Spermathecae straw-colored; inner tube of uniform diameter with apical indentation. Ventral receptacle very long, tightly coiled, with about 113 gyres. Ovipositor plate very narrow apically, with about 24 teeth (fig. 4D).

Egg: With 2 proximal filaments only, these 1.3× length of egg; area at bases of 2 filaments and proximal portions of latter yellowish as if strongly chitinized.

Puparium: Reddish brown, with 11 long and 6 very short pale filaments on anterior spiracles. Horns including anterior spiracles about 1/2 length of puparium. Posterior spiracles black, apart.

Chromosomes: Laboratory culture 49 C 8, Cerro Campana, Panama, showed larval ganglion cells of ♀♀ with 1 large pair of rod-shaped X chromosomes, the autosomes consisting of 4 pairs of medium length rods and a pair of dot-shaped chromosomes (fig. 4E). Fig. 4H shows close somatic pairing of homologous chromosomes in a ♀ ganglion cell. Males with a large J-shaped Y chromosome, 1 large rod-shaped X chromosome, autosomes like those of ♀ (fig. 4F). In fig. 4F the chromatids of the X chromosome have fallen apart, spuriously suggesting a V-shape. Salivaries with 1 very long arm, 4 medium arms, prominent nucleolus attached to 1 of the medium arms, scant chromocenter. The "dot" arm was not seen.

Belongs in subgroup III of the tripunctata group of the subgenus *Drosophila*. Close to *D. bifilum* Frota Pessoa (1954) but *Johnstonae* differs by the position of the posterior spiracles which are apart, presence of 6 short filaments in addition to 11 long filaments in the anterior spiracle of the puparium; the very small size (occasional absence) of the mark on tergite 6 of both sexes; presence of a small lateral pair of bristles (rarely seen) in addition to the larger medial pair of bristles on the conchae of the hypandrium. *Johnstonae* is likewise very close to *D. blumelae* with which it is sympatric. It differs from *blumelae* by the absence of the striking sexual dimorphism of the strong marks on tergites 5 & 6 of the latter. Karyotypes of larval ganglion cells of the 2 species are very similar. *D. Johnstonae* is likewise closely related to *D. fairchildi*, differing from the latter in the much smaller black mark on tergite 6, and less wide apical bands on tergites 2-4.

DISTRIBUTION: Collected in transitional altitude forest, 670 m, Cerro Campana, Panama Province, Panama, X–XII.1959; I, XII. 1960, over fallen fruit of *Calocarpum viride* Pittier; IX. 1960, over fruit of *Spondias mombin* in garden of a home in Panama City; in cloud forest, 850 m, Cerro Campana, XI. 1961; in Goofy Lake Forest, Panama, VI. 1962; over fallen flowers of *Musa sapientum* L., 670 m, Cerro Campana, IX. 1962; in a large population with its sibling *D. blumelae*, over sprouting nuts, El Valle Forest, Coclé Province, Panama, IX. 1962.

Holotype ♂, 25♂ 25♀ and paratypes from laboratory stock 49 C 8, developed from founders collected at Cerro Campana, Panama Province, Panama (USNM). Ten ♂ and 10♀ paratypes from laboratory stock 49 C 8, same data (DTRC, Austin).

Named in honor of Dr. Ola Johnston, Professor of Biology, North Texas University, Denton, Texas.

Drosophila blumelae Pipkin and Heed, n. sp. Figs. 3C, F, 4A, C, G, I, J.

External characters of imagines: ♂ ♀. Arista with 6 dorsal and 3 ventral branches in addition to terminal fork. Front dull tan; area enclosed by ocelli, dark brown and slightly elevated. Ocelli pinkish. Frontal hairs about 4 on each side, scattered irregularly in area lateral to apex of frontal triangle. Proclinate orbital about 8/11 posterior reclinate; anterior reclinate thin, about 1/2 proclinate; orbital hairs, 7. Face pale straw; carina high, broad, widening below, flat-topped, not sulcate. Cheeks yellowish; distance from eye border to base of oral bristle 1/14 greatest diameter of eye. One prominent oral bristle, 2nd less than 1/2 the 1st. Eye red as in *D. melanogaster*, darker in dorsal 1/4, with yellow pile. Eye index, 1.27. Palpi with 1 prominent subapical bristle, a 2nd prominent bristle below it on antero-lateral margin, together with shorter bristles and hairs. Proboscis yellowish. **Acrostichal hairs** in 6 rows; mesonotum and scutellum dull unicolorous yellowish brown; pleura and halteres, pale straw. Anterior sternopleural thin, slightly less than posterior sternopleural; midsternopleural thin, 3/7 anterior. Legs unicolorous yellowish; 3 golden hairs at base of hind metatarsus. **Wing** brownish with dark brown veins; posterior crossvein lightly clouded. Costal index about 4.5; 4th vein index, 1.25; 4c index, 0.5; 5x index, 1.0. Apex of 1st costal section with 1 prominent bristle;

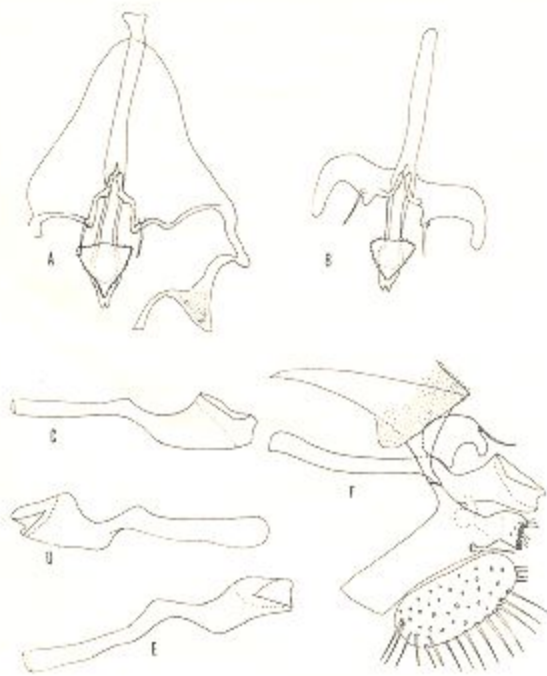


Fig. 3. *D. johnstonae*: A, dorsal view of hypandrium, with bow partly removed, and phallus; E, side view of phallus; *D. fairchildi*: B, dorsal view of phallus and conchae of hypandrium (bow and remainder of hypandrium removed); D, side view of phallus; *D. blumelae*: C, side view of phallus; F, side view of hypandrium, forceps, and anal plate (bit of tissue surmounting hypandrium is from lining of genital cavity).

heavy hairs on basal 1/4 of 3rd costal section. *Abdomen* of ♂, dull yellowish tan; tergites 2-4 with narrow black apical bands, medially interrupted and with medial extensions, fading at lateral bend of tergites; tergite 5 with a large medial triangular black mark; tergite 6 with a large black rectangular medial mark. Abdomen of ♀ with tergites 2-4 as in ♂; tergite 5 either bare or a small medial dark triangular mark; tergite 6 always a large black medial triangular mark: circumanal tergite black dorsally. *Body length* (etherized), ♂, about 3 mm; ♀, about 4 mm. *Wing length*, ♂, about 1.75 mm; ♀, about 3.53 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubule branched at a distance of about 2× width of intestine; ends free. Posterior Malpighian tubule similarly branched, ends apposed with continuous lumen. Testes with 4 inner whitish coils (the vas deferens), about 8 pale straw looser outer coils wound posteriorly around inner coils; diameter of inner and outer coils about the same. Sperm pump with a pair of J-shaped diverticula about 1 1/2× length of pump. Forceps with 8 primary teeth in a wide curve, no secondary teeth; 6 prominent bristles on lateral surface of each forceps; 6 marginal bristles. Apodeme of phallus an almost straight rod; end of phallus expanded; bearing a short ventral prolongation (fig. 3C). Genital arch with 1 prominent bristle near point of juncture with forceps; toe small with 1 long bristle. Hypandrium with 1 pair of prominent bristles (fig. 3F). Spermathecae pear-shaped; upper 2/3 amber; lower 1/3 clear; inner duct broadens apically into a funnel-like opening (fig. 4C). Ovipositor plates golden, very narrow apically with about 26 spines (fig. 4A).

Egg: With 2 filaments only, each a little longer than egg itself; proximal portion of filaments and area at base of filaments yellowish.

Puparium: Mahogany brown; anterior spiracles with about 18 filaments, of which 6 are very short. Horns, including anterior spiracles, about 4× length of puparium. Posterior spiracles black, apart.

Chromosomes: Laboratory culture 3 C 24, Cerro Campana, Panama, shows ♀ larval ganglion cells (fig. 4I) with 2 large rod-shaped X chromosomes, and autosomes consisting of 4 pairs of medium rods and 1 pair of dot-shaped chromosomes. Males (fig. 4J), with 1 large rod-shaped X chromosome, 1 large J-shaped Y chromosome and autosomes like those of ♀. The chromatids of the X chromosome (fig. 4J), have fallen apart suggesting a spurious V shape. Salivaries with 1 very long arm, and 4 medium arms in 2 of which single short inversions occur. Chromocenter scant.

Belongs in subgroup III of the tripunctata specimen group of the subgenus *Drosophila*, forming a sibling set within the subgroup with *bifilum* Frota-Pessoa, *johnstonae*, n. sp., and *fairchildi*, n. sp. The ♂ genitalia and spermathecae are extremely similar in all of the species as are the larval ganglion cell karyotypes of *johnstonae* and *blumelae*. Karyotype of the ♂ *fairchildi* differs from *johnstonae* and *blumelae* in having a medium sized rod-shaped Y chromosome in contrast with a large J-shaped Y chromosome in the latter 2 species. Markings on abdominal tergites 5 & 6 differentiate these 4 sibling species between 3 of which, *johnstonae*, *blumelae*, and *fairchildi*, reciprocal mass matings have proven sterile; hybrid larvae, dying either at or before pupation, are seen only rarely. A culture of *D. bifilum* Frota-Pessoa from Brazil was not available for testing.

DISTRIBUTION: Transitional altitude forest, 670 m, Cerro Campana, Panama Province, Panama, I. 1960, over fallen fruit of *Calocarpum viride* Pittier, III. 1960; over fallen fruits

of a *Clusia* sp., Barro Colorado Island, Canal Zone, VI. 1960; over *Clusia* fruits, cloud forest, 850 m, Cerro Campana, Panama; in El Volcán, Chiriqui Province, Panama, forest 1400 m; VIII. 1961; over fallen fruits of *Coffea arabica*, Turrialba, Costa Rica, XII. 1961, X. 1962; over sprouting nuts, El Valle Forest, Coclé Province, Panama, IX. 1962.

Holotype ♂, 25 ♂ and 25 ♀ paratypes from laboratory stock 3 C 24, developed from founders collected at Cerro Campana, Panama Province, Panama (USNM). Ten ♂ and 10 ♀ paratypes from laboratory stock 3 C 24 (DTRC, Austin).

Named in honor of the late Dr. Johannan Blumel, School of Medicine, The University of Texas, Galveston, Texas.

***Drosophila fairchildi* Pipkin and Heed, n. sp.** Figs. 3 B, D, 4 B, K, L.

External characters of imagines: ♂, ♀. Arista with 6 dorsal and 2 ventral branches in addition to terminal fork. Front dull tan; area enclosed by ocelli, dark brown and slightly elevated. Ocelli pinkish. Frontal hairs about 4 on each side, scattered irregularly in area lateral to apex of frontal triangle. Proclinate orbital bristle about 4/5 posterior reclinate; anterior reclinate thin and 1/4 the proclinate; orbital hairs 6. Face pale straw; carina high, broad, widening below, flat-topped, not sulcate. Cheeks yellowish; distance between eye border and base of oral bristle 1/13 greatest diameter of eye. One prominent oral bristle, 2nd less than 1/2 the 1st. Eye red as in *D. melanogaster*, darker in dorsal 1/4; with yellow pile. Eye index 1.20. Palpi with 1 prominent subapical bristle, a 2nd prominent bristle below it on antero-lateral margin, together with shorter bristles and hairs. Proboscis yellowish. *Acrostichal hairs* in 6 rows; mesonotum and scutellum dull unicolorous yellowish brown; pleura and halteres pale straw. Anterior sternopleural thin, about 5/8 posterior sternopleural; midsternopleural thin, 2/5 the anterior. Legs unicolorous yellowish; 3 golden hairs at base of hind metatarsus. *Wing* brownish with dark brown veins; posterior crossvein lightly clouded. Costal index about 5.0; 4th vein index, 1.2; 4c index, 0.42; 5x index, 1.25. Apex of 1st costal section with 1 prominent bristle; heavy hairs on basal 1/3 of 3rd costal section. *Abdomen* of ♂ dull yellowish tan; tergites 2-4 with narrow black apical bands, medially interrupted and with medial extensions, fading at lateral bends of tergites; tergite 5 either well marked with paramedian diagonally, placed black marks or with gray irregular marks. Tergite 6 with a large black trapezoid-shaped black mark. Female with tergites 2-4 similar to those of ♂; tergite 5 with a very narrow apical band; tergite 6 with a large rectangular or trapezoidal mark. Circumanal tergite yellowish. *Body length* (etherized), ♂, 3.25 mm; ♀, 4 mm. *Wing length*, ♂, 3.1 mm; ♀, 3.7 mm.

Internal characters of imagines and genitalia: Anterior and posterior Malpighian tubules branched at a distance of about 2× width of intestine; 2 anterior branches free; posterior branches apposed with continuous lumen. Testes with 4 inner and about 8 outer pale straw coils. Sperm pump with a pair of J-shaped diverticula about 1.5× the length of pump. Forceps with 7 teeth in a wide curve, no secondary teeth; 6 prominent bristles on lateral surface of forceps; 4 marginal bristles. Apodeme of phallus an almost straight rod; end of phallus simple, expanded apically (fig. 3D). Genital arch with 1 prominent bristle near point of juncture with forceps; toe small, with 1 bristle. Hypandrium with 1 pair prominent bristles (fig. 3B). Heavily chitinized brown groove in bridge joining 2 forcipes, where horn of hypandrium bridge fits; visible in etherized fly. Spermathecae pear-shaped; upper 2/3 amber; lower 1/3 clear; inner duct broadens apically into funnel like opening.

Ventral receptacle a thin tightly coiled tube with about 82 coils. Ovipositor plates golden, very narrow apically each with about 23 spines (fig. 4B).

Egg: With 2 filaments only, each a little longer than egg itself; proximal portion of filaments and area at their base yellowish.

Puparium: Mahogany brown; anterior spiracles with about 13 filaments. Horns including anterior spiracles, about 4× length of puparium. Posterior spiracles black, apart.

Chromosomes: Laboratory culture 6 P S 20, El Volcán, Chiriqui Province, Panama, shows larval ganglion cells of ♀ with 2 long rod-shaped X chromosomes and autosomes consisting of 2 pairs of longer and 2 pairs of shorter medium rods; no dot-shaped chromosomes were seen (fig. 4L). Male ganglion cells show a long rod-shaped X, a medium sized rod-shaped Y chromosome, and autosomes like those of ♀ (fig. 4K). Cells of salivary gland show 1 very long arm with a complex inversion, 4 medium arms in one of which there are 2 pairs of small overlapping inversions. Chromocenter scant.

Belongs in subgroup III of the *Drosophila tripunctata* species group, a sibling species with *bifilum* Frota-Pessoa,

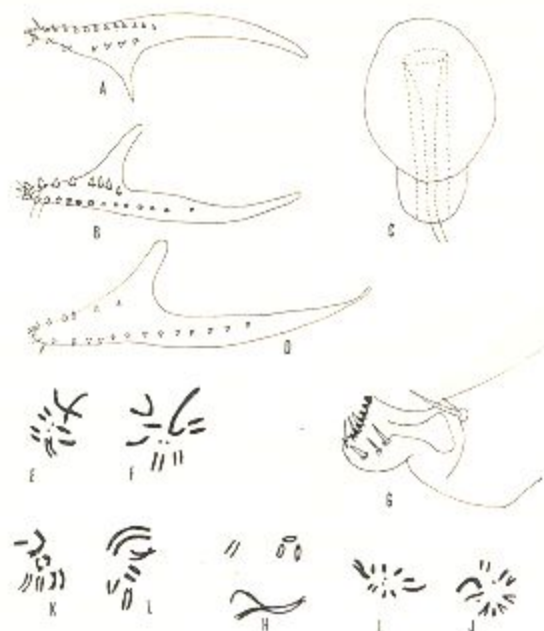


Fig. 4. *D. blumelae*: A, ovipositor plate; C, spermatheca; G, side view of forceps; L, chromosomes of larval ganglion cell of ♀; J, chromosomes of larval ganglion cell of ♂; *D. fairchildi*: B, ovipositor plate; K, chromosomes of larval ganglion cell of ♂; L, chromosomes of larval ganglion cells of ♀; *D. johnstonae*: D, ovipositor plate; E, chromosomes of larval ganglion cell of ♀; F, chromosomes of larval ganglion cell of ♂ with chromatids of X falling apart suggesting a spurious V; H, close somatic pairing of homologous chromosomes in a ♀ larval ganglion cell.

johnstonae, n. sp. and *blumelae*, n. sp. See discussion in description of *blumelae*.

DISTRIBUTION: Forest, 1400 m, nr. El Volcán, Chiriqui Province, Panama; VI, 1962 & VIII, 1963.

Holotype ♂, 25 ♂ and 25 ♀ paratypes from laboratory stock 6 P S 20, developed from founders collected at El Volcan, Chiriqui Province, Panama (USNM). Ten ♂ and 10 ♀ paratypes of laboratory stock 6 P S 20, developed from founders, same data (DTRC, Austin).

Named in honor of Dr. Graham Bell Fairchild, The Gorgas Memorial Laboratory, Panama City, Republic of Panama.

Drosophila roehrae Pipkin and Heed, n. sp. Fig. 5.

External characters of imagines: ♂, ♀. Arista with 7 dorsal and 3 ventral branches in addition to terminal fork. Front dull yellowish tan, shining silvery when viewed at an

angle; 9 frontal hairs on each side; 8 to 9 orbital hairs. Proclinate orbital about 4/5 posterior reclinate; anterior reclinate about 1/4 the proclinate. Face whitish; carina broad, flat-topped. Cheeks pale yellowish. Two prominent oral bristles, about the same length. Cheek width from base of 1st oral to eye border 1/14 greatest diameter of eye. Eye bright red, slightly darker in upper 1/4; yellowish pile. Eye index 1.3. Palpi with 4 prominent bristles on the anterolateral edge in addition to smaller hairs; proboscis yellowish, sooty at tip. *Acrostichal hairs* in 6 rows; mesonotum and scutellum dull yellowish tan; pleura and halteres dull yellowish. Anterior and midsternopleural thin, each about 4/9 posterior sternopleural. Forecoxae and area between front legs whitish; remainder of forelegs and other legs yellowish; recurved hairs on foretarsi; golden bristles at base of hind metatarsus. *Wing* unicolorous tan; posterior crossvein clouded; anterior one scarcely so. Costal index about 4.1; 4th vein index, about 1.2; 5x index about 1.3; 4c index about 0.5. Third costal section with heavy hairs on proximal 5/8. Two prominent bristles at apex of 1st costal section. *Abdomen* dull yellowish; tergites 2 & 3 with medially interrupted narrow dark apical bands, fading at lateral bend of tergite, and slightly extended medially; tergite 4 with very thin, widely interrupted apical band, not extended medially; tergite 5 bare; tergite 6 with or without a small black median oval mark. Last sternite of ♂ yellowish on posterior border; remaining sternites pale. Ovipositor plates of ♀ yellowish; tergite 7, yellowish. *Body length* (etherized), ♂, about 3.25 mm; ♀, 3.75 mm. *Wing length*, ♂, about 2.20 mm; ♀, 2.55 mm.

Internal characters of imagines and genitalia: Anterior Malpighian tubule branched basally near gut; ends free and turned back; posterior Malpighian tubules apposed, with continuous lumen. Testes with white inner coils of 1 1/2 gyres (the vas deferens), pale yellow distal coils of about 7 gyres (the testes proper), slightly smaller in diameter; sperm pump with a pair of J-shaped diverticula, about the length of greater diameter of pump. No distinctive tuft or hairs on ventral border of anal plates. Forceps with 6-7 primary teeth in a wide curve (fig. 5B); no secondary teeth; about 7 marginal bristles; no prominent bristles on upper surface of forceps; toe with 1 bristle. A slender medially placed bristle on each concha of hypandrium (fig. 5A). Apodeme of phallus slightly curved rod; head of phallus like bowl of a pipe in lateral view with 2 ventral wings (fig. 5C). Spermathecae (fig. 5F) brown, oval; inner duct widening apically into a funnel. Ovipositor plates (fig. 5D) narrow apically, each with about 20-21 teeth.

Egg: With 4 filaments, the 2 distal ones thin and about 4/11 length of egg; 2 proximal

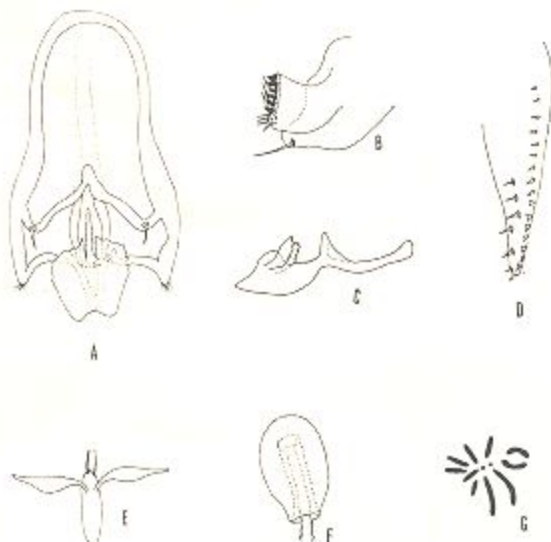


Fig. 5. *D. roehvae*: A, ventral view of hypandrium with bow and phallus; B, forceps; C, side view of phallus; D, ovipositor plate; E, eggs; F, spermatheca; G, chromosomes of larval ganglion cell of ♀.

ones expanded distally like oars, about 1 and 3/11 length of egg (fig. 5E).

Puparium: Golden brown, anterior spiracles with about 39 pale amber filaments of varying lengths; distal end of anterior horn not black ringed. Horns, including spiracles, about 1/4 length of puparium. Posterior spiracles black, parallel.

Chromosomes: Laboratory culture 37 C 25, Cerro Campana, Panama, shows ♂ larval ganglion cell with a long rod-shaped X chromosome, bearing a secondary constriction almost in middle of chromosome; a long rod-shaped Y chromosome with a subapical secondary constriction; autosomes consisting of 4 pairs of medium sized rods and a pair of dots. Females with 2 long rod-shaped X chromosomes and autosomes like that of ♂ (fig. 5G). One of the small rod-shaped autosome pairs bears a satellite, seen in some preparations. Salivaries with 1 very long arm; 1 medium arm paler in ♂♂, probably the X chromosome; and 3 shortish arms. The "dot" arm was not seen.

Belongs in subgroup II of the tripunctata species group of the subgenus *Drosophila*. *D. roehrae*, n. sp., is closest to *D. unipunctata* Patterson & Mainland with which it forms a sibling pair, from which *roehrae* differs chiefly in possessing expanded oar-like proximal egg filaments in contrast with thread-like egg filaments in *unipunctata*; a more yellowish cast to the abdomen, more grayish in *unipunctata*. The ♂ genitalia are almost identical differing mainly in slightly longer hypandrium bristles in *roehrae* than in *unipunctata*. They

both display a polymorphism of presence vs. absence of a small median roundish spot on abdominal tergite 6 in both sexes. Mass reciprocal matings between pure cultures of these 2 species are sterile.

DISTRIBUTION: Collected at Cerro Campana, Panama Province, Panama, both at 670 m, 850 m in almost every month of 1960, over both fallen blossoms and fallen fruit of *Calocarpum viride* Pittier, fallen fruit of *Clusia* sp., drupes, and fruit of *Gulliema gasipaes*; collected also over *Clusia* fruit at Barro Colorado Island, Canal Zone, V-VI. 1960; I, VI.

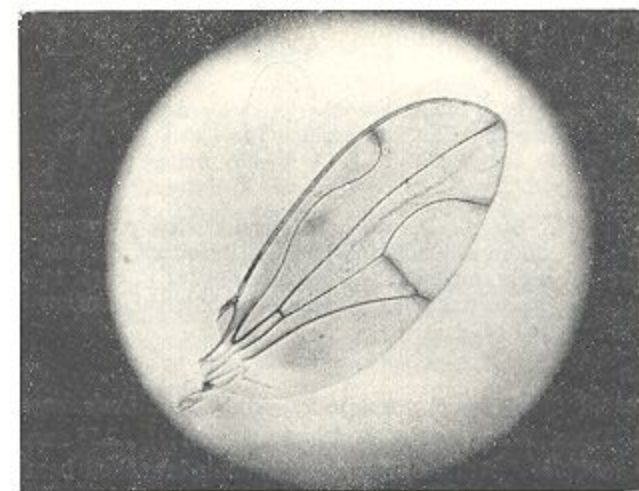


Fig. 6. Photograph of wing of *D. whartoniae*.

1961; IV. 1962; in mixed population with its sibling, *unipunctata*, over sprouting nuts, El Valle Forest, Coclé Province, Panama, IX. 1962; in forest, 1400 m, nr. El Volcán, Chiriqui Province, Panama; in forest nr. Almirante, Bocas del Toro Province, Panama, IV. 1962; in forest nr. Turrialba, Costa Rica, 670 m, X. 1962.

Holotype ♂ and 25 ♂ and 25 ♀ paratypes from laboratory stock 37 C 25, developed from founders collected at Cerro Campana, Panama Province, Panama (USNM). Ten ♂ and 10 ♀ paratypes from laboratory stock 37 C 25, same data (DTRC, Austin).

Named in honor of Mrs. Sarah Roehr Heed in appreciation of her extensive assistance in collection of Drosophilidae in the Caribbean area.

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