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Revision of the Nearctic *Drosophila pinicola* species group (Diptera, Drosophilidae)

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Drosophila flavopinicola Wheeler, 1954 and *D. pinicola* Sturtevant, 1942, belonging to the small Nearctic *pinicola* group, are redescribed based both on types, whenever they were available, and ordinary specimens deposited in The American Museum of Natural History (New York), The National Museum of Natural History (Washington, D.C.), and in the Zoologisches Museum der Universität Zürich. *Drosophila luisserrai* Vilela and Bächli, 2002, a species previously not assigned to any group, is considered a junior synonym of *D. flavopinicola* Wheeler, 1954. Photomicrographs and line drawings of male terminalia are also provided.

Keywords. Western USA, Southwestern Canada, fleshy fungi, male terminalia, new synonym, *Sequoiadendron giganteum*.

INTRODUCTION

In September 2001, we had the opportunity to analyze two conspecific male specimens of a *Drosophila* species from the northwestern United States. They had been sent to the senior author by Prof. Luis Serra, from the Universidad de Barcelona, Spain, who made the collection at Bellingham, Washington, USA, in September 1995. Our attempt to identify the flies using the key to North American species of *Drosophila* published by Patterson (1943) was completely unsuccessful. Being unable to ascribe the two male specimens to any of the described species included in that key, and believing they belonged to a species new to science we decided to describe them as *Drosophila luisserrai* Vilela and Bächli, 2002, honoring the collector.

Early in 2004, while revising the literature regarding published drawings of the male terminalia of species of *Drosophila* for one of the last versions of a manuscript of a book on the Scandinavian Drosophilidae (Bächli *et al.* 2004), we realized that we had overlooked a paper by Malogolowkin (1953) who had depicted the male terminalia somewhat similar to those we had published for *Drosophila luisserrai*. According to the figure caption, Malogolowkin's (1953: 246, figs 1 and 2) drawings depicted *Drosophila pinicola* Sturtevant, 1942, intriguingly a species included in Patterson's key (op. cit.) we had previously checked.

Then, we surveyed the literature regarding keys to and descriptions of the species of *Drosophila* included in the *pinicola* group. Surprisingly we found a key to the *Drosophila* species of the United States in another overlooked publication aimed at teaching practical experiments in Genetics with *Drosophila* (Strickberger 1962:

117), and therefore not expected to have taxonomy information. In the couplet of the *pinicola* group, the two males we described as *Drosophila luisserrai* run to *Drosophila flavopinicola* Wheeler, 1954, a species obviously absent from Patterson's 1943 key as it was described later.

The only two species of *Drosophila* currently ascribed to the *pinicola* group, namely *D. pinicola* and *D. flavopinicola*, occur allopatrically (Spieth & Heed 1975) in the extreme western United States; the latter species is also found in southwestern Canada (Wheeler 1981a). The first one, as implied by its epithet *pinicola* (Latin *pinus* = pine + *cola* = dweller), lives in close association with conifers and is probably a sap-feeder (Sturtevant 1942: 42), as it has been observed on moist spots on the trunks of *Sequoia gigantea* [currently *Sequoiadendron giganteum* (Lindl.)]. Additionally, according to a personal communication of Theodosius Dobzhansky to Spieth & Heed (1975: 288), it has been reared from field-collected mushrooms. As originally suspected by Wheeler (1954: 48), *D. flavopinicola* has also been bred from several fungal species (Spieth & Heed 1975: 288), in particular those of the genus *Amanita*.

The present revision was designed to clarify both the identities of the two species of *Drosophila* currently ascribed to the *pinicola* group and their relation with *Drosophila luisserrai*.

MATERIAL AND METHODS

The 55 specimens analyzed in the present revision are housed in the following institutions: American Museum of Natural History, New York (AMNH), National Museum of Natural History, Washington, D.C. (NMNH), Zoologisches Museum der Universität Zürich, Zurich (ZMUZ).

Label data attached to each specimen are cited in full with a backslash indicating a label change. Our own notes or interpretations are included in brackets (also in other items throughout the text). Where appropriate, one or two of the following additional labels were added to every analyzed specimen: «Drosophila pinicola Sturtevant, 1942 Bächli & Vilela det. 2007», «Drosophila flavopinicola Wheeler, 1954 Bächli & Vilela det. 2007», «terminalia illustrated and photographed». Only a sample of the examined material was used for measurements.

Preparations of microscope slides were made following Wheeler & Kambysellis (1966) and Kaneshiro (1969). The abdominal sclerites, including the disarticulated terminalia, are preserved in microvials filled with glycerin and attached by the stopper to the pin of the respective specimen. Refer to Bächli *et al.* (2004) for further details.

Male terminalia were drawn using a camera lucida (1.8x) attachment on a compound microscope under a 20x or 25x or 40x objective. They were all photographed with a photomicroscope under a 6.3x objective.

Whenever in the same plate, all figures were drawn to the same scale and all photomicrographs were taken and enlarged to the same magnification, unless otherwise indicated.

For measurements and indices see Vilela & Bächli (1990), for morphological terminology see Vilela & Bächli (2000) and Bächli *et al.* (2004).

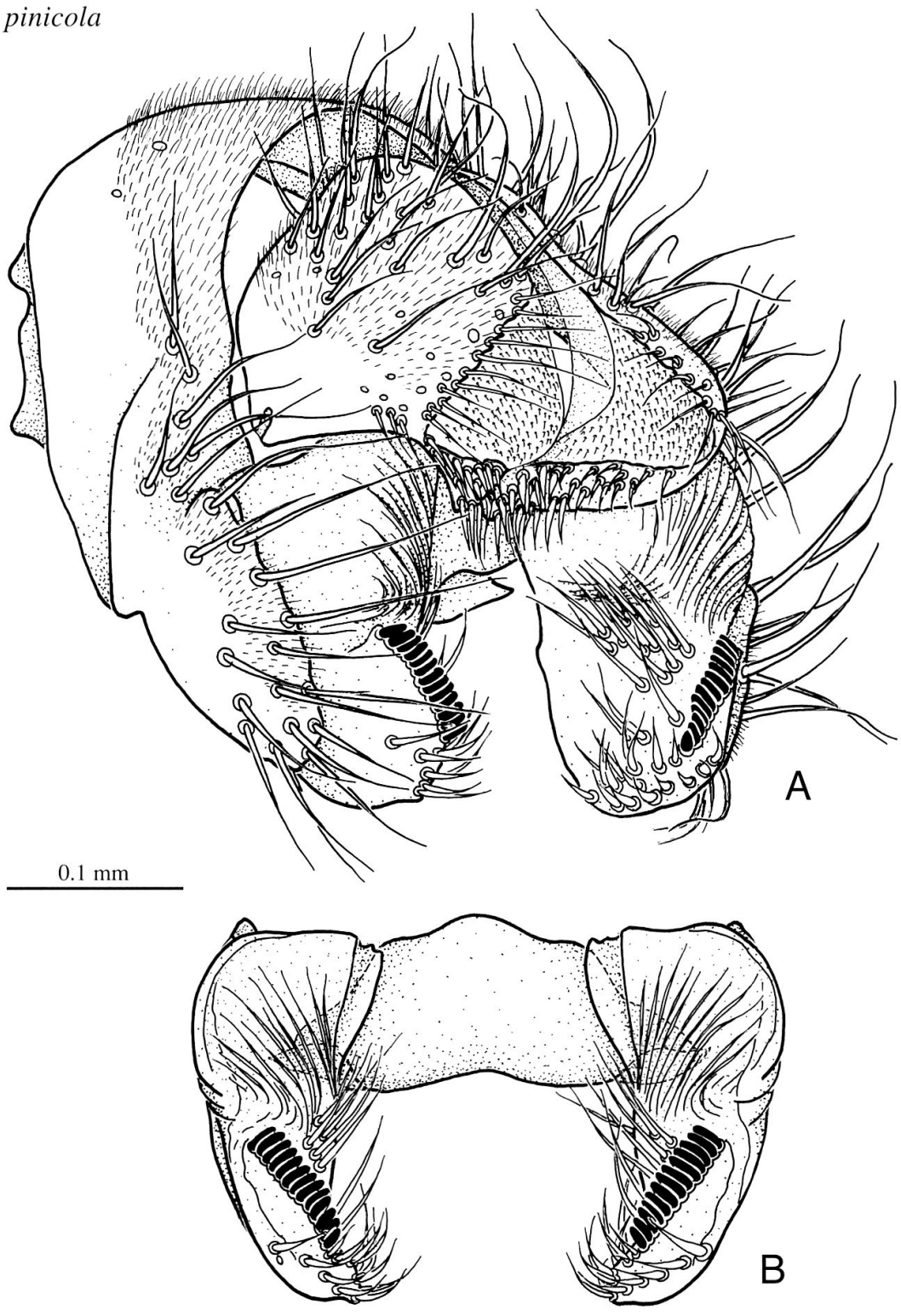

Fig. 1. *Drosophila pinicola* Sturtevant from Santa Anita Canyon, California, USA, July 1949 (stock), external male terminalia. A, epandrium, cerci, surstyli, and decasternum, oblique posterior view. B, surstyli and decasternum, posterior view.

TAXONOMY

Drosophila pinicola species group

pinicola species group Sturtevant 1942: 30 [diagnosis]; Freire-Maia & Pavan 1950: 22 [Portuguese diagnosis]; Patterson & Stone 1952: 22 [diagnosis, ecology, distribution]; Okada 1958: 267 [description]; Hardy 1965: 26 [ecology]; Spieth & Heed 1975: 287 [taxa included]; Throckmorton 1975: 449, 461 [phylogeny]; Hardy & Kaneshiro 1981: 333 [phylogeny]; Carson & Yoon 1982: 330 [phylogeny]; Beverley & Wilson 1984: 9 [phylogeny]; Stacey et al. 1986: 526 [phylogeny]; Ashburner et al. 2005: 1129, 1194 [phylogeny].

Diagnosis. Thorax ground color yellowish or brownish; scutum with a faint median stripe; acrostichals in six rows; anterior scutellars parallel; both or only the posterior crossveins clouded; inner subventral region of cerci conspicuously membranous; surstyli longer than wide, dorsally membranous and pleated; hypandrium wider than long.

Taxa included (2). *Drosophila flavopinicola* Wheeler, 1954; *D. pinicola* Sturtevant, 1942.

Distribution. According to Spieth & Heed (1975: 288), both species occur allopatrically in the extreme western USA, and *D. flavopinicola* also reaches southwestern Canada. However, based on the specimens' labels, we found out that at least in one of the collection sites located in the state of Washington (10 mi N. of Raymond) both species were collected together in the same patch of forest. Refer to the list of material examined under each binomial for further data.

Ecology. Both species live in cool and moist areas, are fungivorous during their larval stage, and females need temperatures below 18 ºC to produce mature eggs (Spieth & Heed 1975: 290, 292). Whether the adults of both species are obligatory sap-feeders remains an open question.

Comments. Although Spieth & Heed (1975: 290) stated that the male genitalia of both species are essentially identical except for size, we figured out that, in addition to the differences in adult body size and color (*D. flavopinicola* is larger and the wings are partially brownish; *D. pinicola* is smaller and the wings are generally hyaline), the detailed structures of some of the male terminalia sclerites, such as surstyli, decasternum, gonopods, and aedeagus, are the most reliable way to tell them apart.

Drosophila flavopinicola Wheeler, 1954

(Figs 2D, 4B, E–G, J)

Drosophila flavopinicola Wheeler, 1954: 47, 48 [description]. Clayton & Ward 1954: 99, 101 [karyotypes]; Wheeler 1959: 190 [catalog]; Wheeler 1960: 136 [supplementary description]; Strickberger 1962: 117 [key]; Wheeler 1965: 764 [Nearctic catalog]; Spieth 1974: 146 [ecology]; Clayton & Wheeler 1975: 481 [karyotypes]; Spieth & Heed 1975: 288 [distribution, breeding sites], 289–294 [feeding sites and behavior, life cycle, sexual behavior, relationships]; Kaneshiro *et al.* 1977: 85 [ecology]; Lakovaara *et al.* 1977: 323 [polymorphism]; Hardy & Kaneshiro 1981: 333 [phylogeny], Wheeler 1981a: 41 [World catalog]; Wheeler 1981b: 116 [distribution]; Carson & Yoon 1982: 330 [phylogeny]; Shorrocks 1982: 409 [ecology]; Beverley & Wilson 1982: 256, 262 [phylogeny]; Courtney *et al.* 1990: 241 [ecology]; Pascual *et al.* 1993: 219, 225 [distribution]; Brake & Bächli 2008: 55 [World catalogue].

Drosophila luisserrai Vilela and Bächli, 2002: 211 [description]; Brake & Bächli 2008: 65 [World catalogue]. **New Synonymy**.

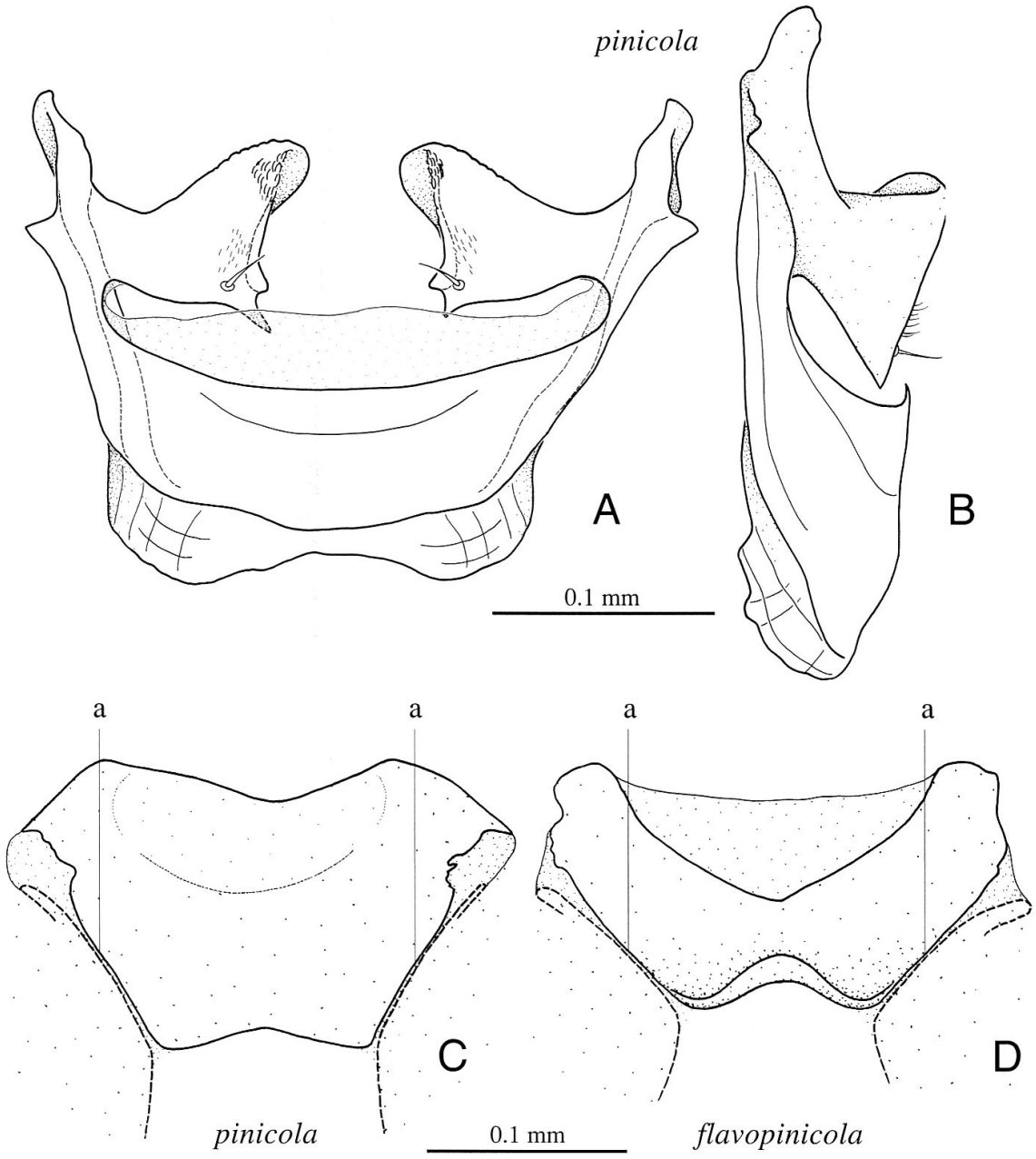

Fig. 2. Male terminalia of species of *Drosophila* of the *pinicola* group: A–C, *D. pinicola*, two specimens (B and C, same specimen) from Santa Anita Canyon, California, USA, July 1949 (stock). D, *D. flavopinicola*, holotype. A and B, hypandrium and gonopods, ventral and left lateral view respectively. C and D, decasternum, dorsal view. The letters «a» indicate the membranous articulations between decasternum and surstyli.

Diagnosis. Generally yellowish flies; scutum with a faint median stripe; pleura brownish-yellow, with diffuse darkenings along the upper margin and through katepisternum; tergites with diffuse, usually medially interrupted brown marginal bands; wing with brown shadows along both main crossveins and a distinctly brownish costal margin; surstylus with ca. 10 cone-shaped prensisetae; anterior region of decasternum with a large, open V-shaped membranous area; posterior inner margin

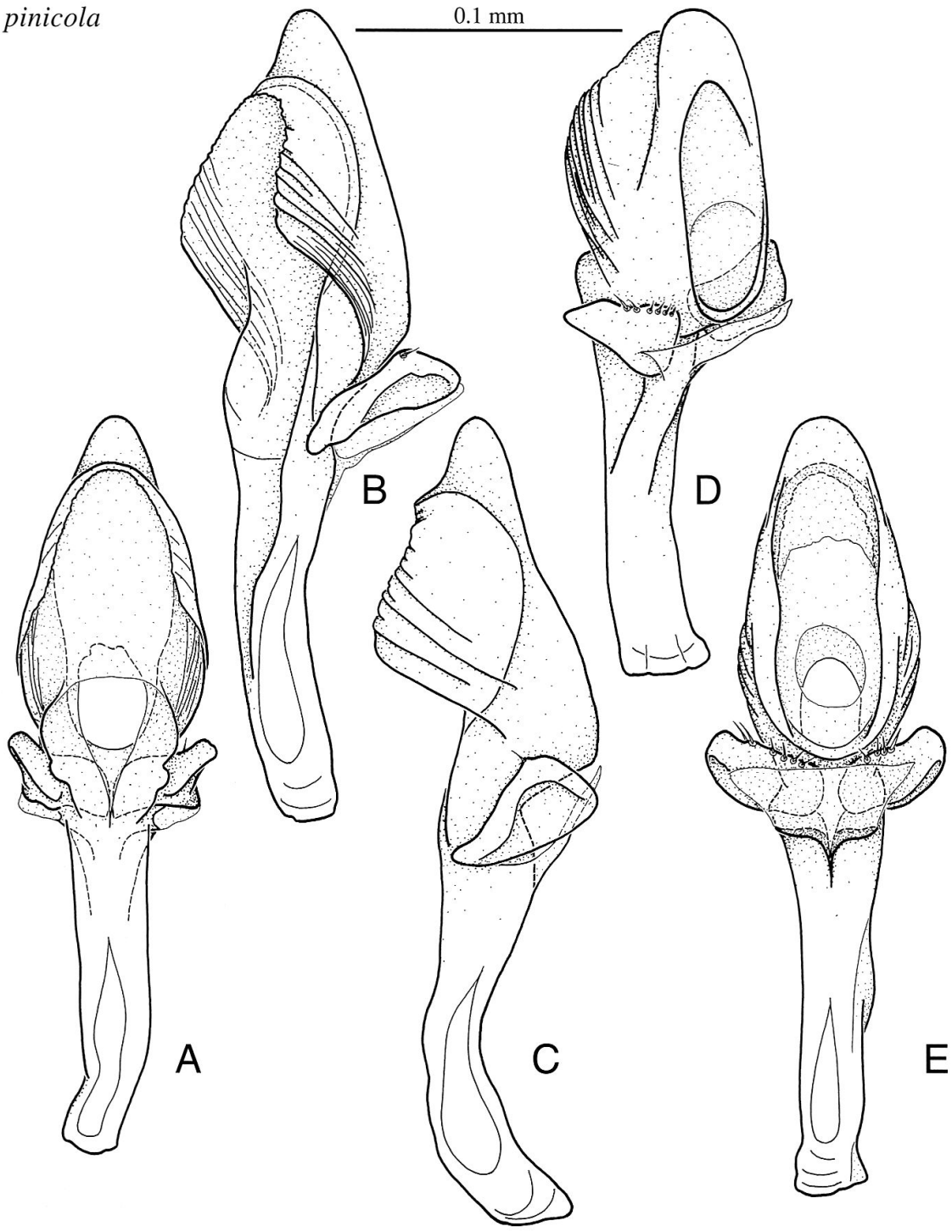

Fig. 3. *Drosophila pinicola* Sturtevant from Santa Anita Canyon, California, USA, July 1949 (two specimens [A–C, one; D, E, another] from the same stock). A–E, aedeagus+aedeagal apodeme and paraphyses, several aspects from dorsal through ventral.

of gonopod not projected backwards; aedeagus pointed at tip in dorsal view, bearing a pair of short dorsal expansions projected frontwards; paraphysis microtrichose in the inner wall.

Material examined (10 ♂♂, 16 ♀♀). Holotype ♂ (dissected, deposited in the NMNH), labelled: «Prarie [sic] Creek S.P. [Prairie Creek Redwoods State Park],

Calif. July 1951 \ MR Wheeler WBHeed \ 2179.4 yellow pinicola \ HOLOTYPE [red label] \ Drosophila flavopinicola Wheeler». Paratypes (6 ♂♂, 14 ♀♀, AMNH); 6 ♀♀: same labels as holotype [except the last two; with yellow paratype labels]; 3 ♂♂, 6 ♀♀: «Rogue River NE Gold Beach Oregon \ MR Wheeler HB Heed June [strikethrough] 1951 JULY \ PARATYPE [yellow label]»; 3 ♂♂, 1 ♀: «Olympic Natl. For. nr Sequim, Wash. Aug 3, 1951 \ PARATYPE [yellow label]»; 1 ♀: «WASHINGTON: 10 mi. N. Raymond 2186.5 VII/31–VIII/1/51 W.B.Heed/ M.R.Wheeler \ PARATYPE [yellow label]». Fife ordinary specimens deposited in the AMNH (3 ♂♂, 2 ♀♀); 1 ♂, 2 ♀♀: «Carmel Calif. \ A. Sokoloff July 1958»; 1 ♂: «OREGON: Lake Creek, 40 mi. W. N.W. Eugene VII\29–VII\30\51 2184.10 W.B. Heed/M.R. Wheeler»; 1 ♂, dissected: «Prarie [sic] Creek S.P. [Prairie Creek Redwoods State Park], Calif. July 1951 \ MR Wheeler WBHeed \ 2179.4 flavicola [sic, manuscript name]».

Type locality. Prairie Creek Redwood State Park, near Crescent City, California, USA.

Redescription (n = 7). ♂.

Head. Frons brownish-yellow, darker brownish towards vertex, frontal length 0.38 (0.32–0.42) mm; frontal index = 1.00 (0.96–1.09), top to bottom width ratio = 1.32 (1.21–1.41). Frontal triangle blackish-brown, grayish microtrichose, laterally slightly convex, about 58–76 % of frontal length; ocellar triangle blackish-brown, prominent, about 40–56 % of frontal length. Orbital plates blackish-brown, grayish microtrichose, apically diverging from eye margin, about 72–87 % of frontal length. Orbital setae black, almost in a line, distance of or3 to or1 = 86–112 % of or3 to vtm, or1 / or3 ratio = 0.89 (0.79–1.07), or2 / or1 ratio = 0.53 (0.40–0.64), postvertical setae = 60 (47–72) %, ocellar setae = 68 (50–82) % of frontal length; vibrissal index = 0.40 (0.38–0.43). Face brownish-yellow. Carina nose-like, high, longitudinally slightly carved. Cheek pale yellow, narrowly brownish along the lower genal margin, index about 6 (4–9). Eye with short, dense pile, main axis oblique, index = 1.14 (1.00–1.25). Antennae brownish, length to width ratio of flagellomere 1 = 1.45 (1.29–1.60). Arista with 3 (–4) dorsal, (1–) 2 ventral and about 6 small inner branches, plus terminal fork. Proboscis and palpus yellowish.

Thorax length 1.30 (1.04–1.53) mm. Scutum yellowish, centrally slightly darker, forming a diffuse brownish stripe which is darker towards scutellum, 6–8 rows of acrostichal setae. h index = 1.72 (1.50–1.91). Transverse distance of dorsocentral setae 153–215 % of longitudinal distance; dc index = 0.67 (0.59–0.76). Scutellum basal-centrally darker brownish, laterally yellowish, distance between apical scutellar setae about 71–82 % of that between apical and basal one, scut index = 1.03 (0.72–1.14). Pleura yellowish, slightly darkened along upper margin, forming a stripe in some specimens, also katepisternum somewhat darkened, sterno index = 0.54 (0.48–0.59), median katepisternal seta about 41 (38–44) % of the anterior one. Halter yellow. Legs brownish-yellow, preapical seta on tibia 3, apical seta on tibia 2.

Wing distinctly darkened along costal margin, reaching close to the tip of R_{4+5}, veins R_{4+5} and M apically slightly convergent, in some specimens with darkened tips, both main crossveins more or less darkened, length 3.22 (2.45–3.68) mm, length to width ratio = 2.22 (2.09–2.33). Indices: C = 3.64 (3.24–4.05), ac = 2.48 (2.11–3.00), hb = 0.41 (0.33–0.44), 4C = 0.67 (0.59–0.75), 4v = 1.58 (1.44–1.67), 5x = 1.34 (1.20–1.44), M = 0.49 (0.40–0.55), prox. x = 0.53 (0.46–0.62).

Abdomen predominantly yellowish, with more or less diffuse brownish marginal bands which are medially interrupted on tergites 2 and 3, broadened, reaching almost the anterior margins on tergites 4 to 6; ventral margins of all tergites dark.

♂ terminalia (n = 2) (Figs 2D, 4B, E–G, J). See Vilela & Bächli (2002) for additional detailed illustrations (p. 212 [fig. 1]) and description (p. 213) of the male terminalia sclerites of its junior synonym *Drosophila luisserrai*.

♀ (n = 5)

Measurements: Frontal length 0.42 (0.39–0.44) mm; frontal index = 0.89 (0.85–0.93), top to bottom width ratio = 1.27 (1.04–1.37). Frontal triangle about 64–72 % of frontal length; ocellar triangle about 40–50 % of frontal length. Orbital plates about 74–85 % of frontal length. Distance of or3 to or1 = 67–90 % of or3 to vtm, or1 / or3 ratio = 0.82 (0.76–0.88), or2 / or1 ratio = 0.65 (0.50–0.73), postvertical setae = 72 (64–76) %, ocellar setae = 84 (76–96) % of frontal length; vibrissal index = 0.42 (0.37–0.50). Cheek index about 5 (3–7). Eye index = 1.16 (1.10–1.24). Thorax length 1.57 (1.49–1.62) mm. h index = 1.81 (1.62–2,10). Transverse distance of dorsocentral setae 167–208 % of longitudinal distance; dc index = 0.65 (0.64–0.67). Distance between apical scutellar setae about 67–81 % of that between apical and basal one; scut index = 1.09 (1.03–1.23), sterno index = 0.57 (0.50–0.68), median katepisternal seta about 31 (29–33) % of anterior one. Wing length 3.76 (3.60–3.92) mm, length to width ratio = 2.32 (2.20–2.49). Indices: C = 3.78 (3.41–4.11), ac = 2.14 (1.90–2.33), hb = 0.46 (0.42–0.50), 4C = 0.65 (0.59–0.69), 4v = 1.55 (1.35–1.75), 5x = 1.14 (1.00–1.27), M = 0.42 (0.35–0.50), prox. x = 0.55 (0.50–0.61).

Distribution. Extreme western USA (Washington, Oregon and California) and southwestern Canada (British Columbia) (Wheeler 1965: 764).

Ecology. Fungivorous at larval stage. It has been reared from several fleshy fungi, especially of the genus *Amanita* (Spieth & Heed 1975: 288). Adult feeding site unknown.

Comments. In the original description, Wheeler (1954: 48) stated that 23 specimens were selected as paratypes. However we have received only 19 specimens labeled as such from the AMNH. We considered the last specimen cited in the item «material examined» as an aberrant individual of *Drosophila flavopinicola* as regards the internal male terminalia (aedeagus much shorter, although *D. flavopinicola*-like, Fig. 4E). It bears the same labels as the type series specimens, except for the manuscript name *flavicola* and the absence of a paratype label. We suppose it has been excluded from the type series by Wheeler because of its being an aberrant specimen. It was received from the AMNH loan together with the specimens identified as *Drosophila pinicola*, in spite of being abnormal as regards the body color (remarkably lighter).

Drosophila pinicola Sturtevant, 1942

(Figs 1, 2A–C, 3, 4A, C, D, H, I)

Drosophila pinicola Sturtevant, 1942: 40–42 [description]. Patterson 1943: 49 [key], 97–98 [redescription], plate V [female imago illustration]; Patterson & Wagner 1943: 224–226 [distribution]; Dobzhansky 1948: 160 [distribution]; Patterson & Wheeler 1949: 225 [catalog]; Carson 1951: 92 [distribution, ecology]; da Cunha *et al.* 1951: 99, 100 [ecology]; Patterson & Stone 1952: 83–85, 437, 504 [phylogeny]; de Castro 1953: 365 [description], 368 [phylogeny]; Malogolowkin 1953: 246 [male terminalia]; Spiess 1953: 113 [distribution]; Carson *et al.* 1956: 541

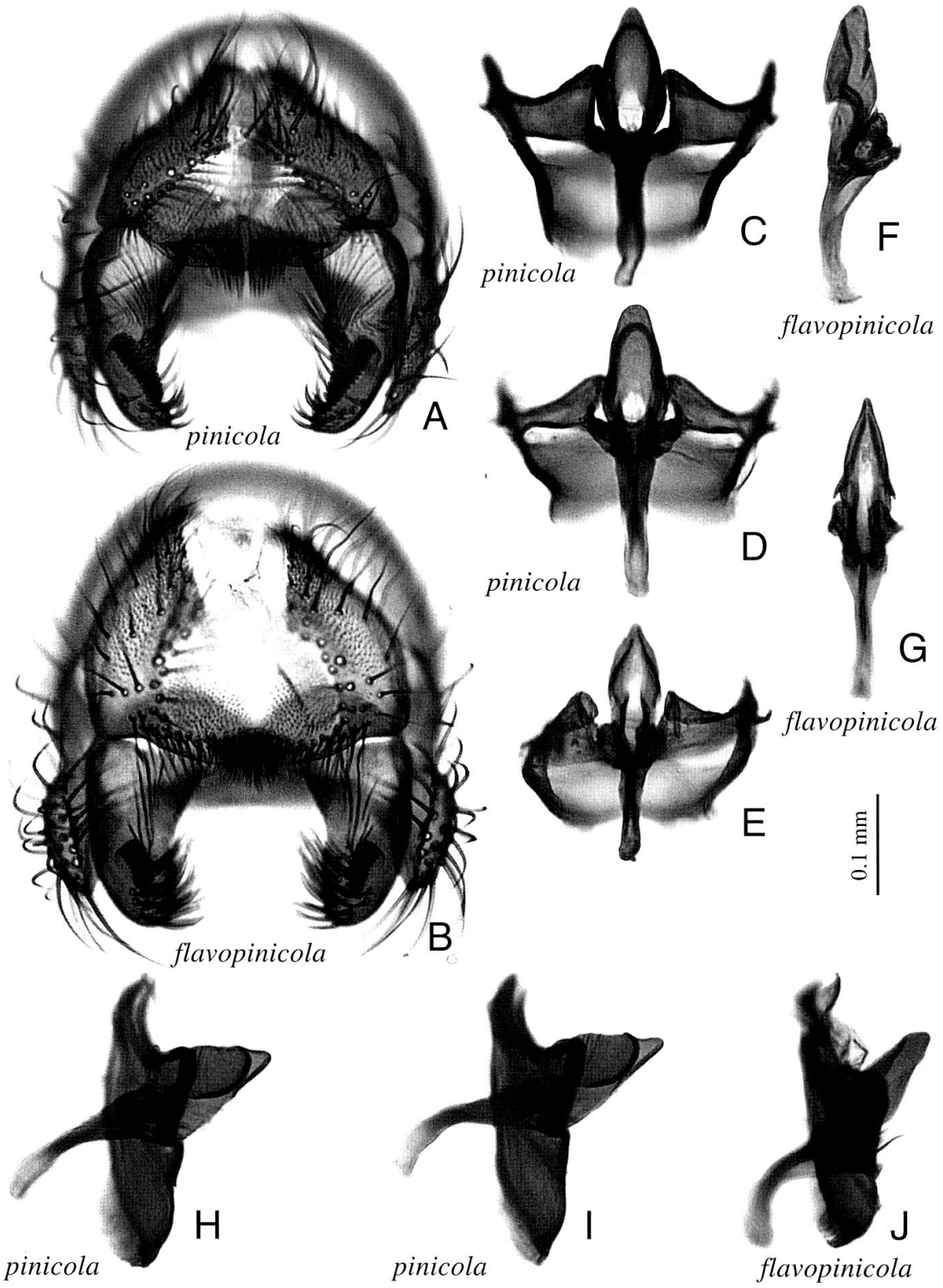

Fig. 4. Photomicrographs of male terminalia of *Drosophila* species of the *pinicola* group. *D. pinicola* Sturtevant : A, C, D, H, and I (two specimens [A, C, and I, one specimen; D and H, another specimen] from the same stock from Santa Anita Canyon, California, USA, July 1949). *D. flavopinicola* Wheeler: B, E–G, and J (B, F, and G, holotype; E, aberrant specimen from Prairie Creek Redwoods State Park, California, USA, July 1951; J, paratype of its junior synonym *Drosophila luisserrai* Vilela & Bächli). A, and B, posterior view; C–E, and G, dorsal view; F, H–J, left lateral view.

[distribution, ecology]; Cooper & Dobzhansky 1956: 528, 529 [distribution], 532 [sex ratio]; Dobzhansky *et al.* 1956: 545–549 [distribution, ecology]; Phaff *et al.* 1956: 535–538 [distribution, ecology]; Wheeler 1959: 195 [catalog]; Miller *et al.* 1962: 2, 4 [distribution, ecology]; Strickberger 1962: 117 [key]; Dobzhansky, 1963: 336 [distribution]; Sokoloff 1964: 207, 212 [distribution, ecology]; Wheeler 1965: 765 [Nearctic catalog]; Strickberger & Wills 1966: 595 [distribution]; Takada 1966: 45 [male external terminalia]; Cole 1970: 410 [distribution]; Anderson *et al.* 1972: 101 [distribution]; Spieth 1974: 146 [ecology]; Clayton & Wheeler 1975: 481 [karyotype]; Spieth & Heed 1975: 288 [distribution, breeding sites], 289–294 [feeding sites, behavior, life cycle, sexual behavior, relationship]; Kaneshiro *et al.* 1977: 85 [ecology]; Lakovaara *et al.* 1977: 323 [polymorphism]; Moore *et al.* 1979: 163 [distribution]; Taylor & Condra 1979: 299 [distribution]; Marks *et al.* 1980: 142 [distribution]; Starmer 1981: 49 [ecology]; Wheeler 1981a: 47 [World catalog]; Wheeler 1981b: 116 [distribution]; Beverley & Wilson 1982: 256, 262 [phylogeny]; Bryant *et al.* 1982: 28 [distribution]; Shorrocks 1982: 401, 409 [ecology]; Klaczko *et al.* 1983: 412 [distribution, ecology]; Moore & Moore 1984: 739, 740 [distribution]; Beckenbach & Prevosti 1986: 14 [distribution]; Zelentsova *et al.* 1986: 474 [phylogeny]; Prevosti *et al.* 1987: 8, 14 [distribution]; Spieth 1987: 249, 252 [distribution, ecology]; Prevosti *et al.* 1989: 116, 117 [distribution]; Courtney *et al.* 1990: 241, 250, 262 [ecology]; DeSalle 1992: 914 [phylogeny]; Pascual *et al.* 1993: 220, 221, 225 [distribution]; Lachance *et al.* 1995: 485, 486, 489–493 [distribution, ecology]; DeSalle *et al.* 1997: 471 [phylogeny]; Remsen & DeSalle 1998: 227–230 [phylogeny]; Remsen & O'Grady 2002: 254, 257, 258, 261 [phylogeny]; Brake & Bächli 2008: 80 [World catalogue].

Diagnosis. Generally brownish-yellow flies; scutum with a faint median stripe; pleura yellowish-brown, with a diffuse stripe along the upper margin; tergites with diffuse, medially interrupted brown marginal bands; wing almost hyaline with diffuse brown shadows along the posterior crossveins; surstylus with ca. 13 cone-shaped prensisetae; anterior region of decasternum an open V-shaped, non membranous area; posterior inner margin of gonopod roundish, corrugated and projected backwards; aedeagus roundish at tip in dorsal view, dorsomedially bubble-shaped in lateral view, projected dorsad, and anteriorly wrinkled; paraphysis not microtrichose on the inner wall.

Material examined (10 ♂♂, 19 ♀♀; all ordinary specimens, two males dissected). AMNH: 2 ♀♀: «CALIFORNIA: Six Rivers Nat. Forest, 5 mi. W. Willow Creek VII/26–VII/27/51 2181.12 W.B.Heed/M.R.Wheeler»; 1 ♂: «WASHINGTON: 10 mi. N. Raymond VII/31–VIII/1/51 2186.10 W.B. Heed/M.R. Wheeler»; 1 ♂, 5 ♀♀: «CALIFORNIA: Inyo Nat. Forest, nr. Lone Pine VII/19–VII/20/51 2176.3 W.B. Heed/M.R. Wheeler»; 2 ♂♂ [both dissected], 1 ♀: «CALIFORNIA: Santa Anita Canyon VII/49 [plus Stock and male symbol in one male]»; 1 ♀: «CALIFORNIA: Rio Hondo X/29/49 [female symbol]»; 2 ♂♂, 2 ♀♀: «CALIFORNIA: Monrovia III/27/50»; 1 ♂, 6 ♀♀ : «Carmel Calif. \ A. Sokoloff July 1958». Plus four ordinary specimens deposited in the NMNH: 3 ♂♂: «Kern. [sic] Cany. Calif. Apr. 34 \ A.H. Sturtevant Collection, 1970»; 1 ♀: «Keen [Hemet Valley; on the slopes of Mount San Jacinto], Calif. \ A.H. Sturtevant Collection, 1970»; ZMZ: 1 ♀: «Arcadia Cal. 10.4.49 M. Wheeler coll. \ D. pinicola do Frota [belonged to Dr. Frota-Pessoa]».

Type locality. Slopes of Mt. [Mount] San Jacinto, [San] Andreas Canyon, California, USA.

Redescription (n = 7). ♂.

Head. Frons brownish-yellow, darker brownish towards vertex, frontal length 0.38 (0.34–0.44) mm; frontal index = 1.10 (0.92–1.33), top to bottom width ratio = 1.40 (1.24–1.67). Frontal triangle blackish-brown, grayish microtrichose, laterally almost straight, about 62–75 % of frontal length; ocellar triangle blackish-brown, prominent, about 38–45 % of frontal length. Orbital plates blackish-brown, grayish

microtrichose, apically slightly diverging from eye margin, about 62–87 % of frontal length. Some specimens with a very narrow, grayish margin along the eye. Orbital setae black, almost in a line, distance of or3 to or1 = 75–100 % of or3 to vtm, or1 / or3 ratio = 0.90 (0.75–1.00), or2 / or1 ratio = 0.45 (0.31–0.58), postvertical setae = 54 (45–60) %, ocellar setae = 76 (60–83) % of frontal length; vibrissal index = 0.44 (0.33–0.57). Face brownish-yellow. Carina nose-like, high, longitudinally slightly carved. Cheek yellowish, in some specimens narrowly brownish along the lower genal margin, index about 6 (4–9). Eye index = 1.21 (1.13–1.27). Pedicel yellowish. Flagellomere 1 brownish, length to width ratio = 1.60 (1.40–1.80). Arista with 3 dorsal, (1–) 2 ventral and about 6 small inner branches, plus terminal fork. Proboscis and palpus yellowish.

Thorax length 1.19 (0.98–1.34) mm. Scutum yellowish, in some specimens centrally slightly darker, forming a diffuse brownish stripe which is darker towards scutellum, 6 rows of acrostichal setae. h index = 2.09 (1.73–2.38). Transverse distance of dorsocentral setae 155–192 % of longitudinal distance; dc index = 0.73 (0.62–0.83). Scutellum basal-centrally darker brownish, laterally yellowish, distance between apical scutellar setae about 69–87 % of that between apical and basal one, scut index = 1.05 (0.97–1.13). Pleura yellowish, slightly darkened along upper margin, forming a stripe in some specimens, also katepisternum somewhat darkened, sterno index = 0.46 (0.42–0.48), median katepisternal seta about 54 (44–70) % of the anterior one. Halter yellow. Legs brownish-yellow, preapical seta on tibia 3, apical seta on tibia 2.

Wing almost hyaline, crossvein dM-Cu in some specimens slightly clouded and a diffuse shadow may occur also along the costal margin, veins R_{4+5} and M almost parallel, length 2.83 (2.66–3.01) mm, length to width ratio = 2.29 (2.23–2.38). Indices: C = 3.43 (3.06–3.86), ac = 2.36 (2.00–3.00), hb = 0.41 (0.38–0.44), 4C = 0.68 (0.61–0.85), 4v = 1.48 (1.35–1.85), 5x = 1.09 (1.00–1.25), M = 0.40 (0.36–0.50), prox. x = 0.56 (0.50–0.65).

Abdomen predominantly yellowish, with very diffuse darker marginal bands.

♂ terminalia (Figs 1A, B, 2A–C, 3, 4A, C, D, H, I). Epandrium posteriorly microtrichose, with ca. 7 median, and 2 upper setae; ventral lobe narrow, dorsoposteriorly microtrichose, with ca. 17 setae, partially covering surstylus. Cerci devoid of ventral lobe, mostly microtrichose, linked to epandrium by membranous tissue, conspicuously membranous on inner ventral region, except for the very ventral strip, which is sclerotized and bear a tuft of short setae (Figs 1A, 4A). Surstylus (Figs 1A, B, 4A) dorsally conspicuously membranous and pleated, not microtrichose, with a more or less straight row of 13 peg-like prensisetae, ca. 4 outer setae and 29 long setae. Decasternum as in Figs 1A, C, 2C, 4A. Hypandrium (Figs 2A, B, 4C, D, H, I) about half epandrium length, anterior margin concave and wide; posterior hypandrial process and dorsal arch absent; inner ventral margin of gonopod linked to paraphysis by membranous tissue, bearing one thin seta and a patch of microtrichia near the anterior inner margin; subdistal inner area and posterior inner margin slightly corrugated (Figs 2A, 4C, D). Aedeagus (Figs 3, 4C, D, H, I) short, roundish at tip in dorsal view, dorsomedially bubble-shaped in lateral view, projected dorsad, and anteriorly wrinkled. Aedeagal apodeme rod-shaped, as long as and posteriorly fused to aedeagus (Figs 3, 4B, D, H, I). Ventral rod dorsoventrally flattened, as long as paraphysis' ventral margin. Paraphysis triangle-shaped in profile, bearing a straight row of ca. 6 thin setulae in the inner wall (Figs 3D, E), but

devoid of microtrichia, linked to dorsodistal margin of aedeagal apodeme by membranous tissue (Fig. 3C).

♀ (n = 7)

Measurements: Frontal length 0.41 (0.39–0.42) mm; frontal index = 0.97 (0.88–1.04), top to bottom width ratio = 1.25 (1.19–1.39). Frontal triangle about 64–79 % of frontal length; ocellar triangle about 42–50 % of frontal length. Orbital plates about 79–87 % of frontal length. Distance of or3 to or1 = 78–112 % of or3 to vtm, or1 / or3 ratio = 0.75 (0.71–0.81), or2 / or1 ratio = 0.75 (0.62–0.85), postvertical setae = 53 (50–57) %, ocellar setae = 81 (76–88) % of frontal length; vibrissal index = 0.43 (0.36–0.53). Cheek index about 5 (5–7). Eye index = 1.17 (1.14–1.19). Thorax length 1.32 (1.29–1.36) mm. h index = 2.24 (2.00–2.83). Transverse distance of dorsocentral setae 153–192 % of longitudinal distance; dc index = 0.73 (0.67–0.81). Distance between apical scutellar setae about 59–86 % of that between apical and basal one; scut index = 0.99 (0.93–1.10), sterno index = 0.51 (0.46–0.55), median katepisternal seta about 47 (42–58) % of anterior one. Wing length 2.96 (2.80–3.08) mm, length to width ratio = 2.24 (2.15–2.34). Indices: C = 3.26 (3.17–3.35), ac = 2.32 (2.13–2.57), hb = 0.40 (0.35–0.44), 4C = 0.73 (0.68–0.78), 4v = 1.52 (1.40–1.61), 5x = 1.13 (1.00–1.22), M = 0.43 (0.40–0.44), prox. x = 0.59 (0.48–0.65).

Distribution. Extreme western USA (Washington and California).

Ecology. Bred from field-collected mushrooms (personal communication of T. Dobzhansky to Spieth and Heed, 1975: 288). Adults were observed on moist spots of Sequoia trunks and probably are sap-feeders (Sturtevant, 1942: 42).

Comments. The syntypes of *Drosophila pinicola* are supposed to be housed in the AMNH (Brake & Bächli, 2008: 80), however no specimens labelled as such were found either in the collections of the AMNH or in those of the NMNH. On the other hand, 8 out of 11 specimens of *Drosophila pinicola* we received as a loan from the NMNH are labelled «Keen, Calif. \ A.H. Sturtevant Collection, 1970». Considering that Keen is one of the three localities on the slopes of Mount San Jacinto (type locality), which in turn is part of the San Andreas Canyon (see fig. I of Wright *et al.* 1942: 364), there is a high probability that those 8 specimens from the Sturtevant Collection (now housed at the NMNH) belong to the type series of *Drosophila pinicola*. However, 7 out of those 8 specimens had no abdomen [probably eaten by dermestids, whose feces remained on the cardboard triangles of the double mountings] and their sexes could not be determined. The remaining one is a female in good conditions, and was analyzed and detailed under the item material examined.

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