

BULLETIN OF THE CALIFORNIA INSECT SURVEY
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OF CALIFORNIA

BY
D. HENDRICKSON

UNIVERSITY OF CALIFORNIA, BERKELEY
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D. ELMO HARDY

(Hawaii Agricultural Experiment Station, Honolulu, Hawaii)

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D. ELMO HARDY

Of the approximately 75 species of bibionids known from the Nearctic region, 21 are known to occur in California. All but one of the California species belong to the genera *Bibio* and *Philia*, and that one belongs to the closely related genus *Bibiodes*: all are in the subfamily *Bibioninae*. The subfamilies *Pleciinae* and *Hesperininae* have not been recorded from this state although it is probable that one species of *Pleciinae* (*Penthetria heteroptera* Say) occurs in northern California, and another (*Plecia nearctica* Hardy) may occur in southern California.

Bibionids are most abundant in the spring months, from March to June. They are gregarious flies, usually occurring in large swarms, and seasonally are among the most numerous of the Diptera of California. The common name "March Flies" is somewhat inappropriately applied to the California bibionids, since the adults of many species appear earlier or later in different parts of the state.

The larvae of bibionids are primarily scavengers, living in decaying organic materials and the roots of grasses and other plants. Their most common habitats are manure, decaying leaves, grassy meadows, forest litter, and pastures. There is some evidence that they occasionally feed on the living roots of grasses and on the roots or underground parts of other plants. There are numerous records in the literature of damage to vegetable and cereal crops by bibionid larvae (e.g., Hardy, 1945:370 and 1958:8), but I have no evidence that either larvae or adults are of any economic importance in California. For morphological details and for information on life history and economic importance elsewhere, see Hardy (1945 and 1958).

I have recently studied approximately 5,000 specimens of *Bibionidae* from the collections of the California Insect Survey, Berkeley (C.I.S.), the University of California, Davis (U.C.D.), the California

Academy of Sciences, San Francisco (C.A.S.) and the State of California, Department of Agriculture, Sacramento (C.D.A.). Earlier, I studied many hundreds of specimens from California in the collections in the United States National Museum and the University of Kansas. For the privilege of studying the California collections, I am indebted to Edward L. Kessel, California Academy of Sciences; Paul D. Hurd, Jr., University of California, Berkeley; A.T. McClay, University of California, Davis; and H.H. Keifer and Paul H. Arnaud, Jr., State Department of Agriculture. The drawings have been prepared by Mrs. Phyllis Habeck and Mr. Peter Dease. The distributional data and maps have been compiled and prepared by Jerry A. Powell, California Insect Survey, University of California, Berkeley.

The family *Bibionidae* is divided into three subfamilies: the *Bibioninae*, which have strong spurs (fig. 5a) or two or three series of spines or teeth (fig. 16a) on the front tibiae, and a simple radial sector (fig. 5b); the *Pleciinae*, which lack such spurs or spines and have a furcate radial sector; and the *Hesperininae*, which have a very elongate antennae, and dichoptic eyes in the male. Only the subfamily *Bibioninae* is represented in California.

Key to the Genera of *Bibionidae* Known in the United States

1. Radial sector furcate; legs simple 2
Radial sector simple, not furcate (fig. 4a); front tibia with large apical spurs or with two or three sets of spines (figs. 9a and 16a) 4
2. Antenna robust, third segment not greatly lengthened . 3
Antenna very elongate, third segment as long or longer than the next two segments (northern United States and Canada) *Hesperinus* Walker

- 3. Vein R_{2+3} short, oblique or vertical in position (southern United States, Neotropical region, etc.)
 *Plecia* Wiedemann
 Vein R_{2+3} rather elongate, almost horizontal in position (widespread over North and South America but has not been recorded in California) . . *Penthetria* Meigen
- 4. Front tibia produced apically to form two spurs (fig. 5a) 5
 Front tibia not produced at apices but with two or more series of spines (fig. 17a) (widely distributed)
 *Philia* Meigen
- 5. Radial sector and vein M_{1+2} coalesced for a short distance, obliterating the r-m crossvein (fig. 10b); claspers of the male bilobed (fig. 10c) (Canada, western United States and Mexico) . . . *Bibiodes* Coquillett
 Radial sector and M_{1+2} not coalesced, joined by the r-m crossvein (fig. 5b); claspers of male simple (fig. 5c) (widely distributed) *Bibio* Geoffroy

Of the three genera of Bibionidae which have been recorded from California the larvae of only two, *Bibio* and *Philia*, are known. The immature stages of *Bibiodes* have not been studied. The larvae of *Bibio* and *Philia* may be distinguished by the following characteristics: *Bibio* have two openings in each posterior spiracle (Hardy, 1958, plate 1, fig. 4) and the labium does not have a median process on the front margin (Hardy, 1958, plate 1, fig. 3); *Philia* have three openings in each posterior spiracle (Hardy, 1958, plate 1, fig. 5), and the labium has a median process on the front margin (Hardy, 1958, plate 1, fig. 2).

Genus *Bibio* Geoffroy

Bibio Geoffroy, 1764, Hist. Nat. des Ins., 2:571.
Pullata Harris, 1776, Expos. Eng. Ins., p. 76.
Hirtea Fabricius, 1798, Ent. Syst., Suppl., p. 551 (*nec* Scopoli, 1763).
Type of genus.—*Tipula hortulana* Linnaeus.

This genus is characterized by the development of strong apical spurs on the front tibiae and by the presence of the radio-medial crossvein in the wings. It is related to the genus *Bibiodes* Coquillett but is readily distinguished from it by the differences in the male genitalia (figs. 10c and 4d) and by the wing venation (figs. 10b and 4a).

Members of this genus are comparatively large and rather conspicuously hairy. They occur predominantly in the spring of the year and are commonly given the name "March Flies." The genus is best developed in the temperate regions of the world.

Key to the Species of the Genus *Bibio*
 Known from California

- 1. Inner spur of front tibia short, not more than half as long as the outer spur (figs. 3b, 6a) 2
 Inner spur elongate, subequal to the outer (figs. 4b, 5a) 9
- 2. Crossvein r-m short, about one-fourth as long as basal portion of radial sector (fig. 1c); entirely dark brown to black species 3
 Crossvein r-m elongate, at least half as long as basal portion of radial sector (fig. 2b); legs at least in part rufous 4
- 3. Moderately large species, length of wing usually 7.5 to 9 mm.; antennae nine-segmented; body typically covered with dense pale pile
 *albipennis* Say (p. 181)
 Small, brown to black pilose species, wing length 5 to 6 mm.; antennae seven-segmented (fig. 3a)
 *melanopilosus* Hardy (p. 184)
- 4. Femora predominantly dark brown to black 5
 Femora rufous 6
- 5. Antenna short, flagellum with only three clearly defined segments (fig. 2a); each palpus with only three visible segments (fig. 2a); apex of hind femur thicker than the tibia (fig. 2f) *cognatus* Hardy (p. 183)
 Antenna normal in development, the flagellum with seven distinct segments; palpi four-segmented; apex of hind tibia equal to or thicker than femur (males)
 *nigrifemoratus* Hardy (p. 186)
- 6. Posterior veins brown; crossvein r-m about equal in length to basal portion of Rs; pile pale (rarely black pilose in aberrant specimens); front of female opaque black; pile of front short extending about as high as ocellar tubercle 7
 Posterior veins concolorous with the wing membrane; crossvein r-m half as long as basal portion of Rs; densely black pilose species; front of female polished black; front and vertex covered with long black hairs which reach twice as high as ocellar tubercle
 *sierrae* Hardy (p. 186)
- 7. Small species, length of wing 5 to 5.5 mm.; male (of *imparilis* Hardy) with hind basitarsus slightly swollen 8
 Larger species, wing length typically 7.5 to 9.5 mm.; femora rufous in both sexes, hind basitarsi slender; antenna ten-segmented; last two palpal segments three times as long as wide (fig. 9c)
 *xanthopus* Wiedemann (p. 188)
- 8. Antenna with only five distinct flagellar segments; femora rufous in both sexes; hind basitarsus of male slightly swollen and apex of hind tibia thicker than femur *imparilis* Hardy (p. 183)
 Antenna with seven distinct segments in the flagellum (females) *nigrifemoratus* Hardy (p. 186)

- 9. Crossvein r-m about equal in length to basal section of radial sector 10
 Crossvein r-m short, about one-fourth as long as basal section of Rs; entirely black species with black pile on mesonotum *necotus* Hardy (p. 185)
- 10. Males 11
 Females¹ 13
- 11. Legs all black 12
 Only femora brown to black, often just the basal half darkened, middle and hind tibiae rufous
 *vestitus* Walker (p. 186)
- 12. Posterior veins yellow-brown, darker than membrane; inner spur of front tibia about three-fourths as long as outer *utahensis* Hardy (p. 186)
 Posterior veins concolorous with membrane; inner spur of front tibia nearly equal to outer (fig. 4b)
 *mickeli* Hardy (p. 184)
- 13. Tibiae and tarsi dark colored, brown to black
 *mickeli* Hardy (p. 184)
 Tibiae and tarsi rufous *vestitus* Walker (p. 186)

Bibio albipennis Say
(Figs. 1a-d)

Bibio albipennis Say, 1823, Journ. Acad. Nat. Sci. Philia., 3:78
Bibio hirtus Loew, 1864, Berlin. Ent. Zeitschr., 8:51.
Bibio tenuipes Coquillett, 1902, Proc. U.S. Natl. Mus., 25:95.
Bibio conjunctivus Hardy, 1937, Proc. Utah Acad. Sci., 14:200.

Type locality.—"Pennsylvania." The type has been lost.

Geographic distribution.—Widely distributed in the Nearctic region. This is the most common species of Bibionidae throughout much of the United States and Canada. It also ranges south into Mexico.

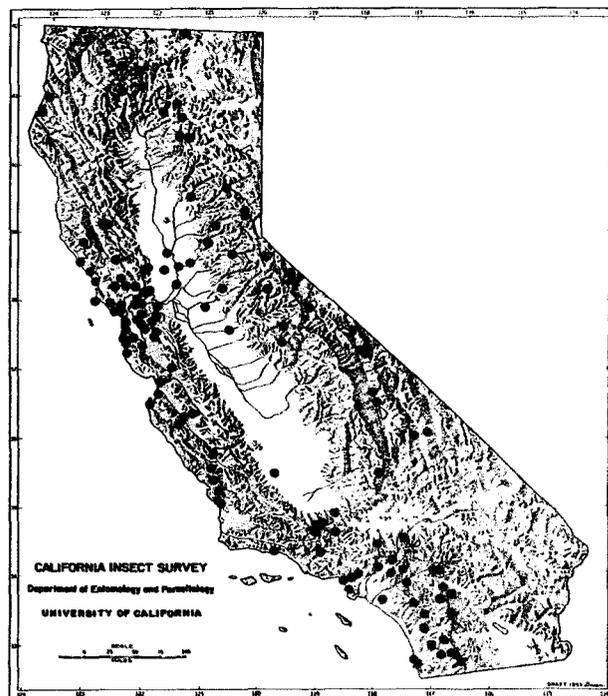
California distribution (map 1).—Apparently the most widespread and commonest of the California bibionids, occurring throughout most of the state except in higher boreal situations and the most arid Lower Sonoran zones. Records in the central valley of California probably represent populations in riparian associations. The species has been taken on the margins of the deserts at Victorville and Taquitz Canyon near Palm Springs. The adults fly during May in the northern counties, in June throughout the Sierra Nevada at moderate elevations, and at various localities on the east side of the Sierra over a wide range of dates (April 25, Panamint Mts., to July 3, Westgard Pass) and elevations (3,700 feet, Lone Pine, to at least 8,500 feet, Whitney Trail). In the central coast counties adults are usually taken in April, the earliest record seen being March 11 (San Francisco) and the latest, May 6

¹The female of *utahensis* is not known, but it would probably key in couplet 13. The females of the species included here are sometimes difficult to differentiate without the males.

(Mill Valley). In southern California the flight period ranges from March through April at lower elevations to the to the end of May in the mountains.

This species is readily differentiated from other species of *Bibio* by the very short r-m crossvein (fig. 1c), and by the short inner spurs of the front tibiae (fig. 1a). It differs from *melanopilosus* Hardy in being larger, having predominantly pale pile, and having nine segments in the antennae.

This is a shining black species, rather densely covered with gray to yellow-gray pile, although in some specimens the pile, especially on the mesonotum, is pale brown to black. Two subspecies have been previously recognized, based upon the density of the pile on the body. Specimens from the western United States, especially the males, are more densely pilose than specimens from the eastern United States. This is an extremely variable character, however, and does not appear to be of much value. In California most specimens are rather densely pilose, but varying degrees of pilosity are seen and some individuals resemble the eastern form. Size is also extremely variable in this species; the wing lengths of the of the specimens on hand vary from about 4.7 mm to about 9 mm. I am convinced that the so-called variety *tenuipes* Coquillett represents nothing more than small specimens of *albipennis*; I am unable to find any structural differences and see no reason for considering these undersized (malnourished?) individuals to be a separate variety.



Map 1. Distribution of *Bibio albipennis* Say.

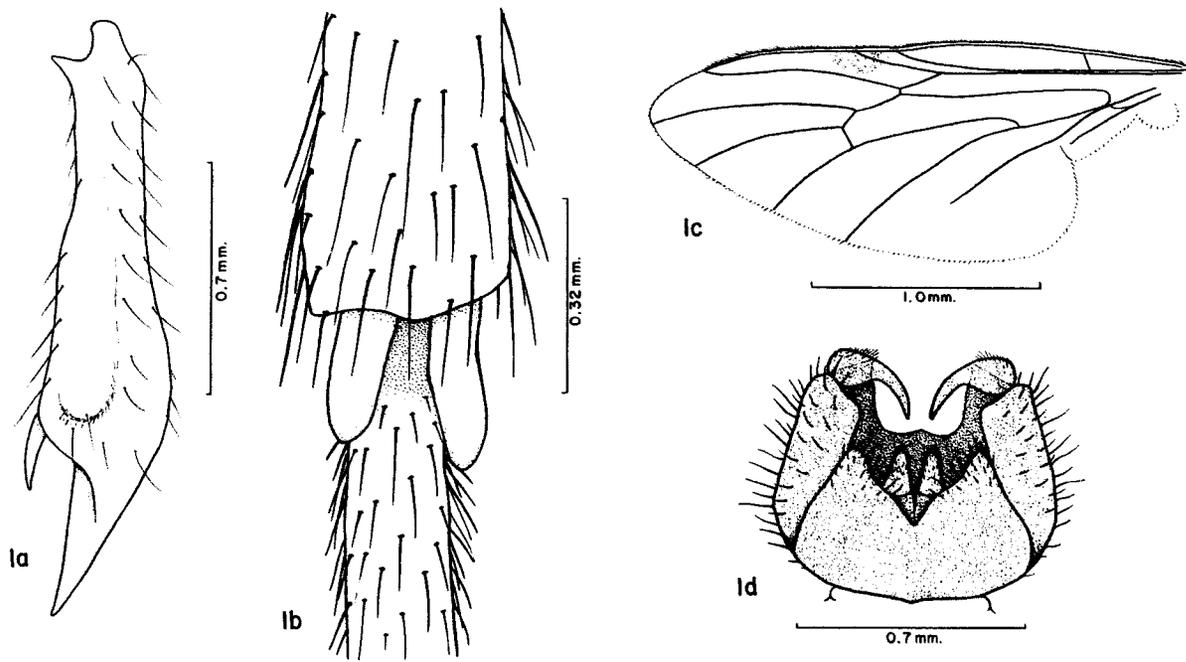


Fig. 1. *Bibio albipennis* Say. a, front tibia; b, apex of hind tibia; c, wing; d, male genitalia, dorsal view.

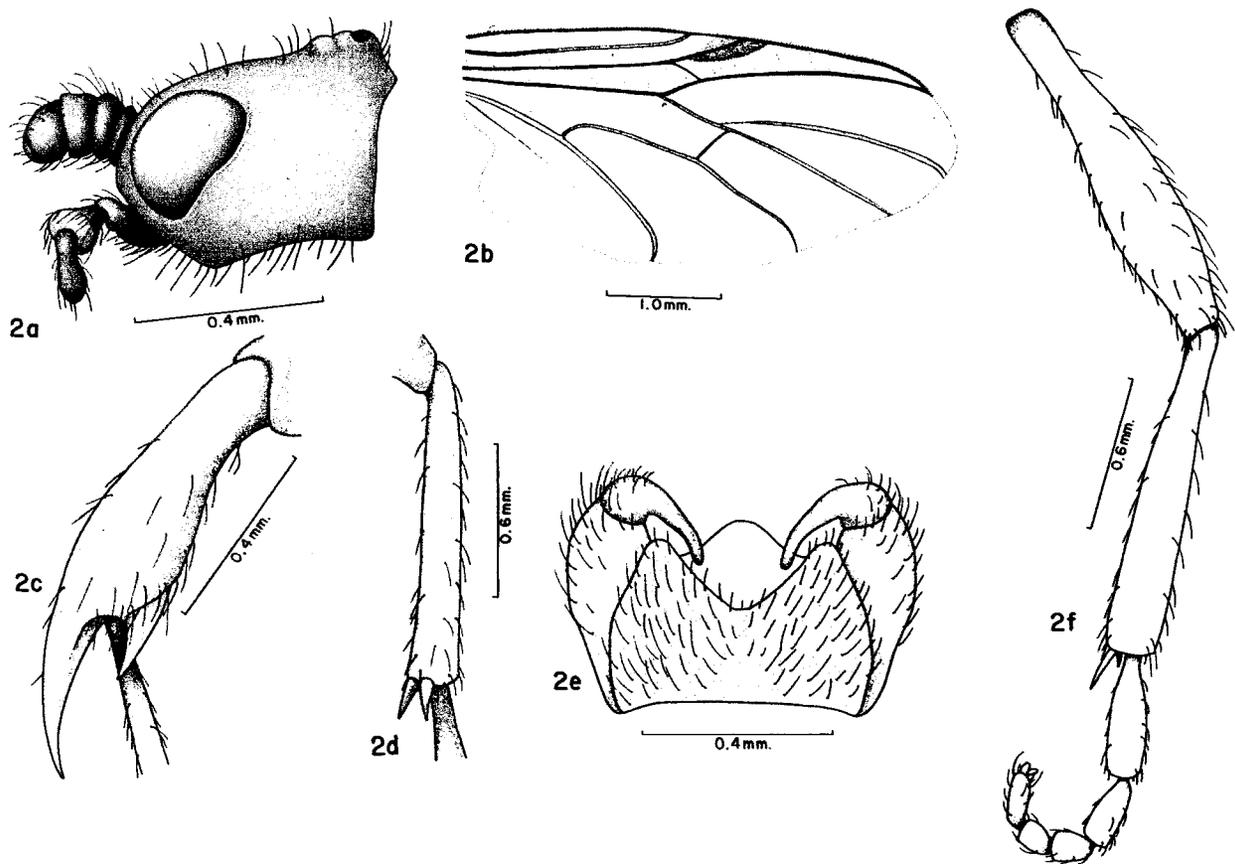


Fig. 2. *B. cognatus* Hardy. a, head of female, lateral view; b, wing; c, front tibia; d, hind tibia of male, posteroventral view; e, male genitalia, dorsal view; f, hind leg of male, lateral view.

The characteristics of the hind basitarsi and the front tibial spurs are illustrated in figures 1b and 1a, and the male genitalia are shown in figure 1d.

Specimens collected from loganberry at Richmond, Contra Costa County, April, 1946 (T.O. Thatcher) and Watsonville, Santa Cruz County, April, 1949, are entirely brown to black pilose, but otherwise seem to be typical *albipennis*. One specimen from San Francisco, April, 1920, has a rather elongate inner spur on the front tibia, about three-fourths as long as the outer spur and very similar in development to that of *utahensis* Hardy, but its other characters are typical of *albipennis*.

Bibio cognatus Hardy

(Figs. 2a-f)

Bibio cognatus Hardy, 1937, Proc. Utah Acad. Sci., 14:199.

Type locality.—Ellery Lake, Tioga Pass, California, 9,400 ft. Type in the U.S. National Museum.

Geographic distribution.—Previously known only from the type.

California record.—Shasta Co.: 3 miles southeast Mt. Lassen, VII-8-55 (J.W. MacSwain).

B. cognatus, like *B. nigrifemoratus* Hardy, has predominantly dark-colored femora. It also shows relationship to *knowltoni* Hardy but is readily differentiated from both of these as well as from other known Nearctic *Bibio* by the reduced segmentation of the antennae (fig. 2a), and by the shortened segments of the palpi (fig. 2a).

This is a small, predominantly shining black species. The first antennal segment is very short, scarcely discernible. The second segment (pedicel) is moderately developed, and the flagellum is made up of only three clearly defined segments; the apical portion of the flagellum obviously consists of two closely fused segments (fig. 2a). *In situ* the palpi appear to have just three segments; the second is broad and flattened dorsally, a large sensory organ occupying the dorsal surface. The thorax is shining black, except for the yellow humeral ridges. The vestiture is entirely black. The mesonotum is thickly covered with short hairs on the sides but has a broad, bare stripe extending the entire length of the median portion. The coxae and trochanters are shining black and the femora are predominantly dark brown to black, with a rufous tinge; the attenuated portion of each hind femur is yellow. The basal third of each hind femur is rather strongly attenuated and the apical two-thirds is swollen; at the widest point the femur is distinctly broader than the tibia. The front tibia

is somewhat slender, the inner spur is short, scarcely one-third as long as the outer (fig. 2c). The hind tibiae are moderately swollen, rather evenly tapered to their bases; the apical spurs are sharp pointed (fig. 2d). The segments of the hind tarsi are moderately short and thick but are not distinctly swollen; the basitarsus is about three times as long as the inner tibial spur and nearly four times as long as its greatest width (fig. 2f). The wings are faintly colored yellow-brown, slightly darker on the anterior portion; the stigma is dark brown. The costa ends just beyond the apex of the radial sector and the basal section of the radial sector is about two-thirds to three-fourths as long as the r-m crossvein. The posterior veins of the wing are yellow-brown, just slightly darker than the wing membrane. The m crossvein is very weak and poorly developed (fig. 2b); in some wings it is completely lacking. The abdomen is polished black, the ninth sternum (basistyli) is tinged with red and the claspers (dististyli) are yellow. The ninth tergum has a rather broad U-shaped cleft on the hind margin (fig. 2e). Length: body 4–4.2 mm; wings 4.5–5.5 mm.

The female has not previously been described. The head is short and broad, in dorsal view it is about as wide as long. The eyes are nearly circular, the head is slightly produced in front of the eyes, and the part behind the eyes is about equal in length to the compound eyes (fig. 2a). The hind tibiae and tarsi are slender compared to those of the male. The abdomen is dark brown to black, with a very light rufous tinge in the ground color. The cerci are brown, yellow around the margins, and very densely yellow pilose. Length: body 4–4.2 mm; wings 5.5 mm.

Bibio imparilis Hardy

Bibio imparilis Hardy, 1959, Pan-Pacific Ent., 35 (4): 209.

Type locality.—Yosemite Valley, Mariposa Co., California. The type is in the collections of the California Academy of Sciences.

Geographic distribution.—Known only from the type series.

A small predominantly shining black species related to *B. nigrifemoratus* Hardy but having only five distinct segments in the flagellum, rufous femora, and slightly swollen hind basitarsi. *B. imparilis* also resembles *cognatus* Hardy but has five clearly defined segments in the flagellum of the antenna rather than only three, the femora is rufous rather than black, the body pile is yellow rather than black, and the hind basitarsi are slightly thicker than those of *cognatus*.

For a complete description and figures see Hardy (1959).

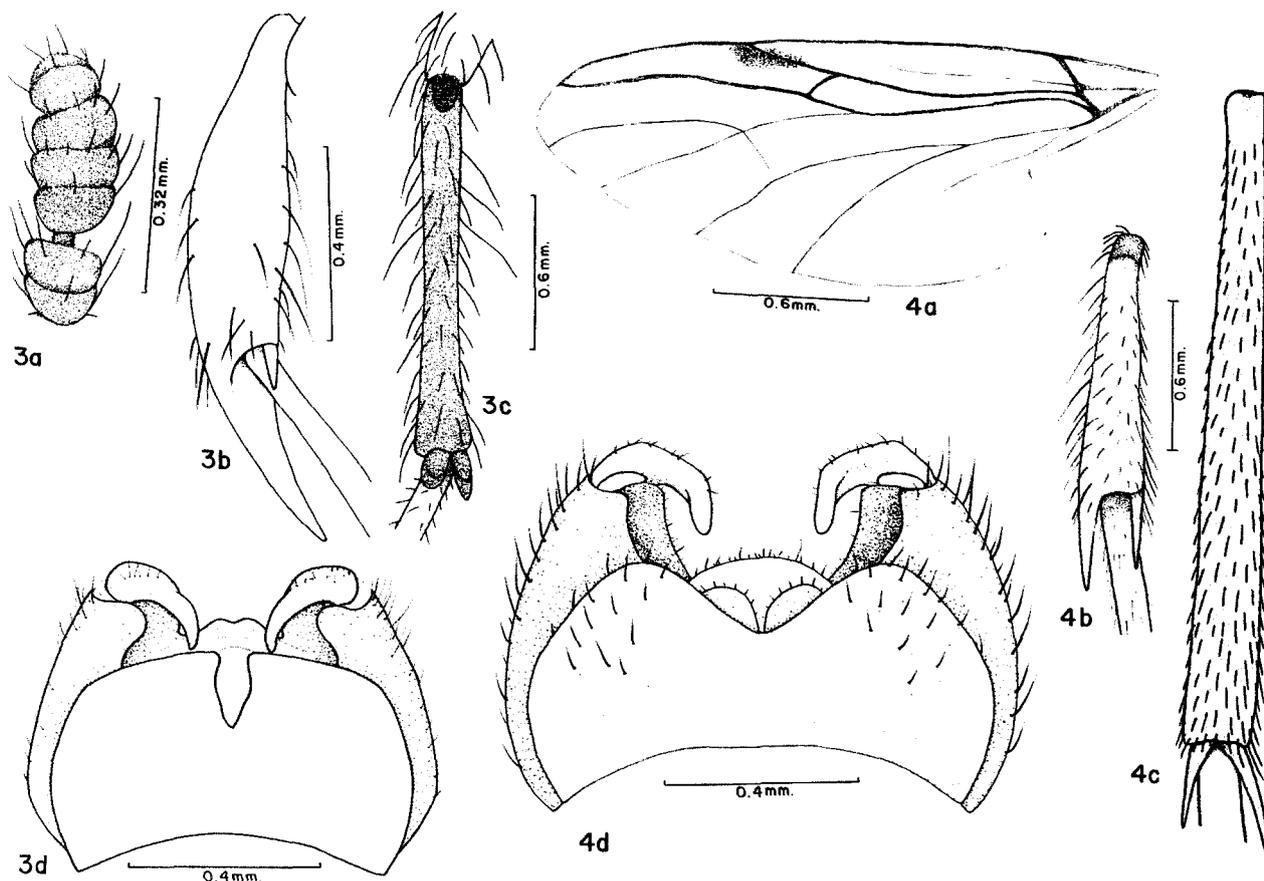


Fig. 3. *B. melanopilus* Hardy. a, antenna; b, front tibia; c, hind tibia; d, male genitalia, dorsal view.
Fig. 4. *B. mickeli* Hardy. a, wing; b, front tibia; c, hind tibia; d, male genitalia, dorsal view.

Bibio melanopilus Hardy
(Figs. 3a-d)

Bibio melanopilus Hardy, 1936, Proc. Utah Acad. Sci., 13:195.

Type locality.—Spanish Fork, Utah. Type in the Brigham Young University collection, Provo, Utah.

Geographic distribution.—Previously recorded only from Utah but probably distributed throughout the western United States.

California records.—Inyo Co.: Big Pine Creek, 4,500 ft., V-18-47 (R.M. Bohart, U.C.D.). Kern Co.: Ft. Tejon, IV-6-32 (E.P. Van Duzee, C.A.S.).

A small species, rather close to *albipennis*, with the r-m crossvein short, the inner spurs of the front tibiae small, and the legs predominantly black. It is differentiated from *albipennis* by its small size, chiefly black vestiture, and by its antennae, which have only seven segments, rather than nine. The spurs of the front and hind tibiae are shown in figures 3b and 3c, the male genitalia in figure 3d, and the antennae in figure 3a, the two apical segments being closely joined. Length of wing: 5–6 mm.

Bibio mickeli Hardy
(Figs. 4a-d)

Bibio mickeli Hardy, 1937, Proc. Utah Acad. Sci., 14:204.

Type locality.—Prontenac, Minnesota. Type in the University of Minnesota collection.

Geographic distribution.—Widespread over the northern half of the United States from New York to California. It has also been recorded from British Columbia.

California records.—El Dorado Co.: Fallen Leaf Lake, VII-20-50 (R.C. Bechtel, U.C.D.); Lake Tahoe, VI-18-53 (W.D. McLellan, U.C.D.). Mariposa Co.: Yosemite Valley, VII-8-21 (E.C. Van Dyke, C.A.S.). Mono Co.: Sardine Creek, 8,500 ft., VII-12-51 (A.T. McClay, U.C.D.). Plumas Co.: Meadow Valley, 3,500-4,000 ft., VI-1-24 (E.C. Van Dyke, C.A.S.); Silver Lake, VI-19-21 (E.C. Van Dyke, C.A.S.). Riverside Co.: Taquitz Valley, San Jacinto Mts., VI-14-39 (E.G. Linsley, C.I.S.). San Francisco Co.: Twin Peaks, IV-3-59 (J.C. Downey, U.C.D.). Shasta Co.: Summit Lake, VII-2-47 (T.F. Leigh, C.I.S.). Tuolumne Co.: Base Mt. Conness, Yosemite Natl. Park, VII-25-26 (W.B. Herman, C.A.S.).

This species resembles *B. utahensis* Hardy but is easily differentiated by the following characters: the posterior veins of the wings are concolorous with the

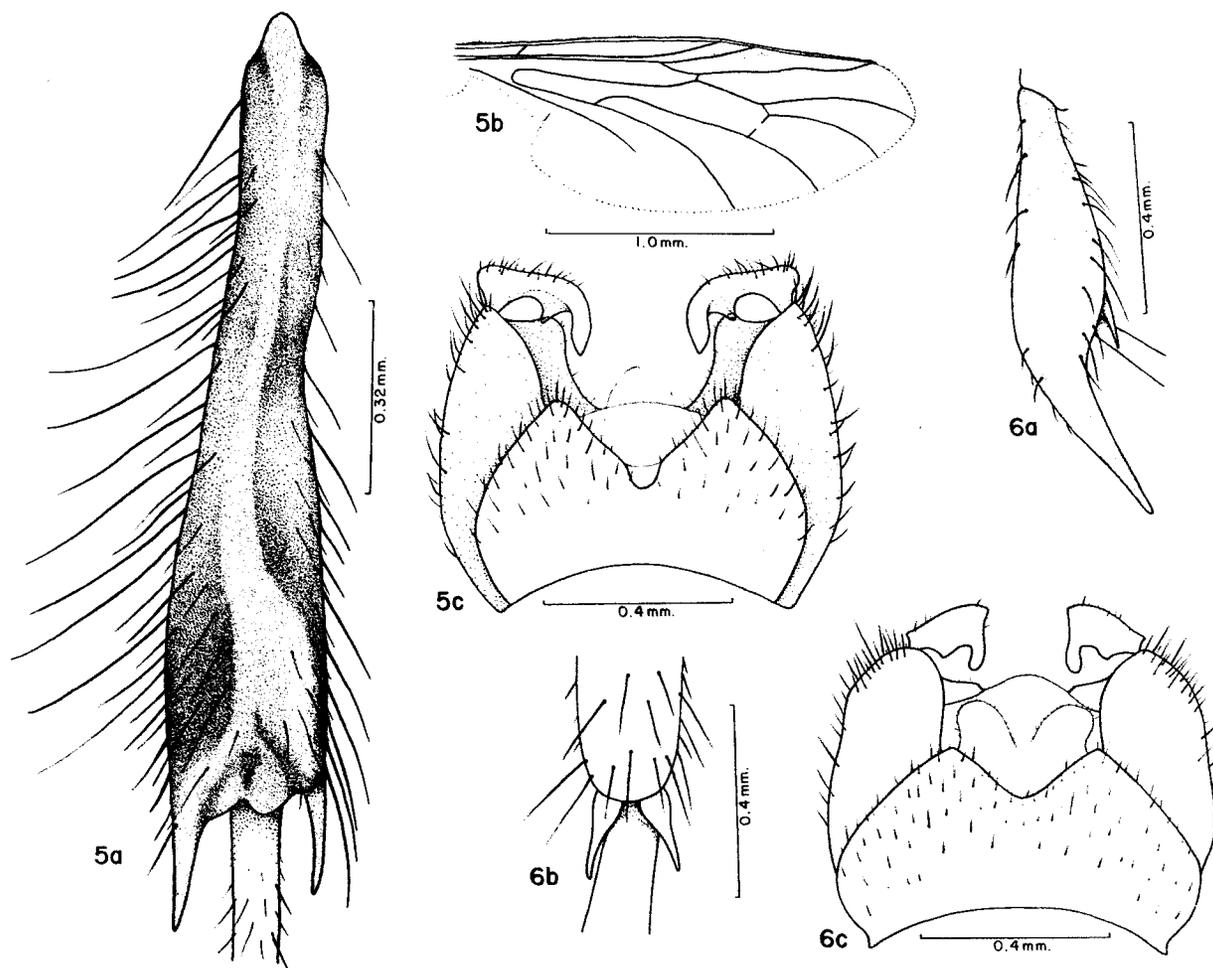


Fig. 5. *B. necotus* Hardy. a, front tibia; b, wing; c, male genitalia, dorsal view. Fig. 6. *B. nigrifemoratus* Hardy. a, front tibia; b, apex of hind tibia; c, male genitalia, dorsal view.

membrane (fig. 4a), the inner spur of the front tibia is about equal in length to the outer (fig. 4b), the spurs of the hind tibiae are more slender (fig. 4c), and the vestiture of the thorax and abdomen is pale yellow. The male genitalia are shown in figure 4d. Length of wing: 7.5–9 mm.

The females resemble *femoratus* Wiedemann but the coxae and trochanters are rufous, rather than black.

Bibio necotus Hardy
(Figs. 5a-c)

Bibio necotus Hardy, 1937, Proc. Utah Acad. Sci., 14:205.

Type locality.—San Francisco. Type in the Cornell University collection, Ithaca, New York.

Geographic distribution.—Known only from California and Washington.

California records.—Alameda Co.: Berkeley, III-1931 (C.A.S.). Contra Costa Co.: Orinda, IV-1949 (D.J. Gould,

C.I.S.). Marin Co.: Inverness, IV-1957 (R.P. Allen, C.D.A.); Pt. Reyes, III-30-56 (W.H. Lange, U.C.D.), III-1956 (A.M. Barnes, J.M. Burns, C.I.S.), IV-7-56 (D.D. Linsdale, C.I.S.), III-31-59 (J. Powell, C.I.S.), IV-11-59 (R.W. Thorp, C.I.S.); Kirby Beach, North Shore Golden Gate Strait, IV-1950 (E.S. Ross, C.A.S.). San Francisco Co.: San Francisco, II, III-1920, 1925, 1932 (A.J. Basinger, H.H. Keifer, E.S. Ross, M.C. Van Duzee, C.A.S.); San Francisco sand dunes, *Salix* flowers, III-29-52 (H.B. Leech, C.A.S.); Presidio, San Francisco, III-18-53, IV-3-54 (W.H. Lange, U.C.D.). San Mateo Co.: Half Moon Bay, III-23-37, reared from larvae in association with *Erigeron glaucus* (P.C. Ting, C.D.A.), III-28-52 (W.H. McLellan, U.C.D.), IV-1-58 (W.T. Crites, U.C.D.). Sonoma Co.: Bodega Bay, III-24-56 (H.R. Moffitt, U.C.D.).

This species is differentiated from all other *Bibio* that have a long inner spur on the front tibia (fig. 5a) by its very short r-m crossvein (fig. 5b). The male genitalia are shown in figure 5c. The legs are entirely black and the mesonotum is densely brown to black pilose.

Bibio nigrifemoratus Hardy

(Figs. 6a-c)

Bibio nigrifemoratus Hardy, 1937, Proc. Utah Acad. Sci., 14:206.*Bibio nigrifemoratus* var. *gilvus* Hardy, 1937, Proc. Utah Acad. Sci., 14:206.

Type locality.—Typical *nigrifemoratus*, Monte Lake, British Columbia; of variety *gilvus*, Ogden, Utah. Type of *nigrifemoratus* in the Canadian National Museum; of the variety *gilvus* in the United States National Museum.

Geographic distribution.—Western and northwestern United States and British Columbia.

California records.—Contra Costa Co.: Mt. Diablo, III-4-59 (G.I. Stage, C.I.S.). Los Angeles Co.: Tanbark Flat, III-30-57 (D.D. Linsdale, C.I.S.). San Bernardino Co.: Mountain Home Canyon, VII-21 (F.R. Cole, C.I.S.). San Francisco Co.: South San Francisco, III-1950 (R.S. Beal, C.I.S.). Siskiyou Co.: Yreka, IV-1914 (W.E. Glendenning, C.I.S.).

A rather small species which may be distinguished from other species of the genus *Bibio* that have a short inner spur on the front tibia and a moderately long r-m crossvein by its predominantly dark brown to black femora. The inner spur of the front tibia is very tiny, scarcely one-fourth as long as the outer (fig. 6a). The spurs of the hind tibiae are rather slender and are approximately equal in size (fig. 6b). The wings of the male are hyaline to faintly yellow, those of the female are more dusky yellow fumose. The posterior veins are yellow-brown in both sexes. The male genitalia are distinctive, but have not previously been described or pictured: the ninth tergum is nearly two times as wide as long and has a broad U-shaped cleft in the middle of the hind margin; the claspers are truncate on the inner margins and each has a backward-projecting beaklike point on the lower edge (fig. 6c). Length of wing: 5–5.5 mm.

I have previously described two varieties of this species, differentiated by the color of the pile on the mesonotum: in typical *nigrifemoratus* this is chiefly black with yellow pile intermixed, in variety *gilvus* Hardy (1937:206) it is entirely yellow. This difference in color of the pile has been seen in the California specimens studied, but I now feel that it is not necessary to treat these as distinct varieties.

Bibio sierrae Hardy*Bibio sierrae* Hardy, 1960, Proc. Hawaiian Ent. Soc., 17(2): 17.

Type locality.—Dana Fork, Tuolumne River, Yosemite National Park, California, 10,000 ft. Type in the collection of the University of California, Davis.

Geographic distribution.—Known only from the type series.

B. sierrae is related to *knowltoni* Hardy but differs in having all black pile, the posterior veins hyaline (concolorous with the membrane), the r-m crossvein one-half as long as the basal portion of Rs, the flagellum of the antenna thickened basally, the spurs of the hind tibiae slender and sharp pointed, and the front of the female entirely polished black and covered with moderately long black hairs.

For more details and for figures, see the original description (Hardy, 1960).

Bibio utahensis Hardy

(Figs. 7a-c)

Bibio utahensis Hardy, 1937, Proc. Utah Acad. Sci., 14:208.

Type locality.—Provo River, Utah. Type in the Brigham Young University collection at Provo, Utah.

Geographic distribution.—This species probably occurs in most of the western United States: it has been recorded from Utah, Washington, and California.

California records.—Inyo Co.: Bishop, V-20-51 (E.I. Schlinger, U.C.D.). Marin Co.: Bolinas, III-26-54 (E.I. Schlinger, U.C.D.); Larkspur, IV-4-53 (H.L. Mathis, U.C.D.). Napa Co.: Napa, IV-7-39 (M.A. Cazier, C.A.S.). San Francisco Co.: San Francisco, II-29-26 (M.C. Van Duzee, C.A.S.); Presidio, San Francisco, IV-3-54 (E.I. Schlinger, U.C.D.).

A black species somewhat resembling *B. albipennis* Say but with the r-m crossvein from two-thirds as long to the same length as the basal portion of the radial sector, the inner spur of the front tibia elongate (fig. 7a), the spurs of the hind tibia slender and sharp pointed (fig. 7b), and the pile of the mesonotum dark colored. *B. utahensis* is also related to *B. mickeli* Hardy but is differentiated by the dark-colored posterior veins of the wing, by the predominantly dark body pile, and by the differences in the spurs of the front and hind tibiae (compare figs. 4c and 7b). The male genitalia are shown in figure 7c. Length of wing: 6–8.5 mm.

Bibio vestitus Walker

(Figs. 8a-c)

Bibio vestita Walker, 1848, List Dipt. Ins. Brit. Mus., 1:122.*Bibio nervosus* Loew, 1864, Berlin. Ent. Zeitschr., 8:52.*Bibio variabilis* Loew, 1864, Berlin. Ent. Zeitschr., 8:53.

Type locality.—Of *vestitus*, "Nova Scotia": type in the British Museum (Natural History). Cotypes of *B. nervosus*, from Sitka, Alaska, and New Hampshire, in the Cambridge Museum of Comparative Zoölogy. For a discussion of this synonymy refer to Hardy (1956:90).

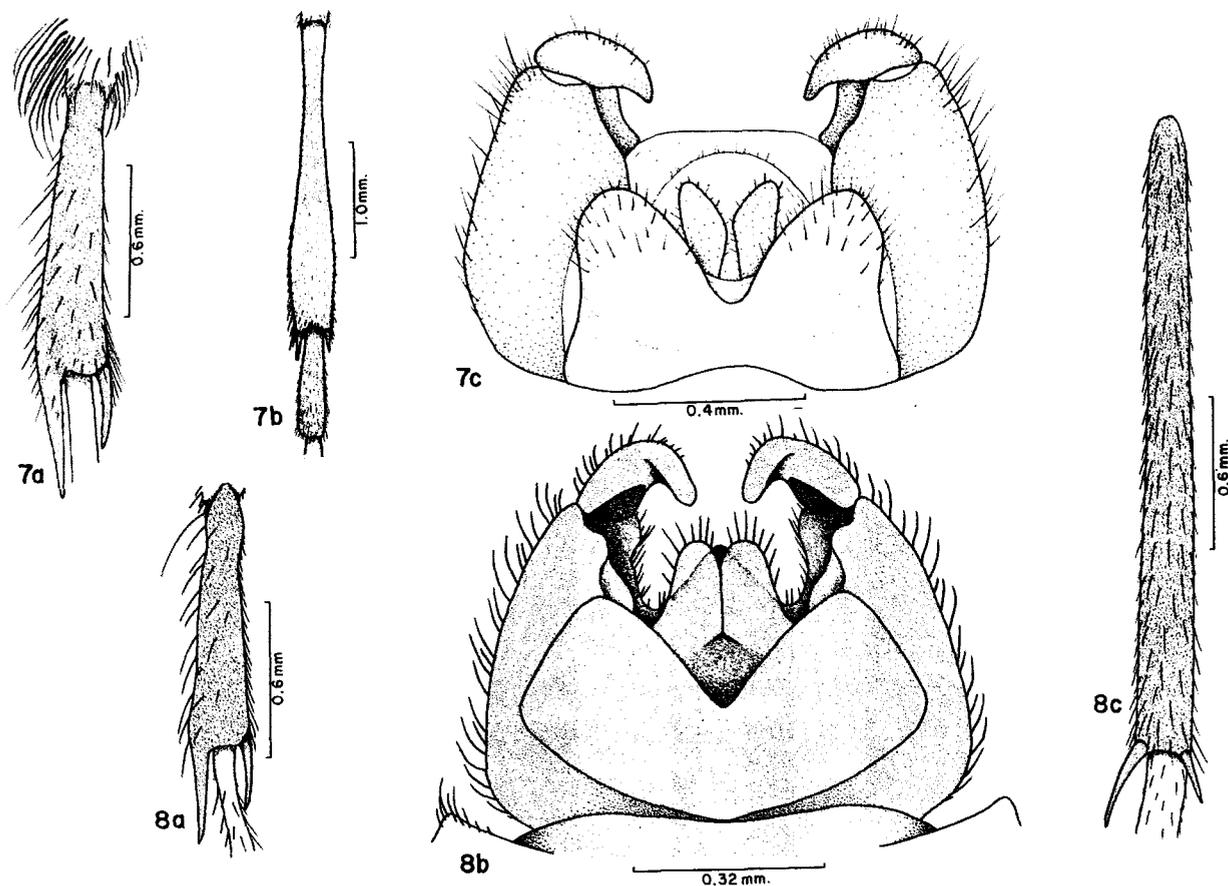


Fig. 7. *B. utahensis* Hardy. a, front tibia; b, hind tibia; c, male genitalia, ventral view.
 Fig. 8. *B. vesitus* Walker. a, front tibia; b, male genitalia, dorsal view; c, hind tibia.

Geographic distribution.—This species ranges over the northern United States and has been recorded in all of the Canadian provinces except Saskatchewan. It is more abundant in northwestern America.

California records.—Alpine Co.: Hope Valley, VII-1948 (A. Bartel, C.I.S.). El Dorado Co.: Echo Lake, VI-1957 (W.W. Middlekauff, C.I.S.). Inyo Co.: Bishop Creek, V-20-51 (E.I. Schlinger, U.C.D.). Marin Co.: Inverness, III-1949 (P.D. Hurd, C.I.S.), IV-27-51 (P.D. Ashlock, C.I.S.). Mariposa Co.: Yosemite Valley, VII-1921 (E.C. Van Dyke, C.A.S.); Yosemite, 3,880-4,000 ft., V-1928 (E.O. Essig, C.I.S.). Modoc Co.: Bridgeport, VI-1929 (E.P. Van Duzee, C.A.S.); Lost Lake (near), VI-1934 (J.T. Howell, C.A.S.). Mono Co.: Sardine Creek, 8,500 ft., VII-11-51 (D.P. Lawler, U.C.D.), VI-28-51, VII-12-51 (A.T. McClay, U.C.D.); Leavitt Meadow, VII-8-51 (R.W. Morgan, U.C.D.). Monterey Co.: Carmel, III-1923 (L.S. Slevin, C.A.S.). Nevada Co.: Sagehen, near Hobart Mills, VI-1954 (G. Schaeffers, C.I.S.); Truckee, VII-1927 (E.P. Van Duzee, C.A.S.). Placer Co.: Carnelian Bay, Lake Tahoe, VI-24-54 (R.M. Bohart, U.C.D.). Plumas Co.: Buck's Lake, VI-23-49 (E.I. Schlinger, U.C.D.). Riverside Co.: Tahquitz Valley, San Jacinto Mts., VI-1940 (H.T. Reynolds, C.I.S.). San Diego Co.: La Jolla, 1914

(E.C. Van Dyke, C.A.S.). San Francisco Co.: San Francisco, IV-1907 (S.C. Thompson, C.A.S.), IV-1912 (E.C. Van Dyke, C.A.S.); Liberty Hill, San Francisco, III-1908 (F.X. Williams, C.A.S.); South San Francisco, II-1950 (R.S. Beal, C.I.S.). Sonoma Co.: Stillwater Cove, V-23-54 (J.C. Downey, U.C.D.). Tuolumne Co.: Conness Creek, Yosemite Natl. Park, VIII-1936 (W.B. Herms, C.A.S.); Conness Glacier, Yosemite Natl. Park, VII-1936 (W.B. Herms, C.A.S.); Tioga Pass, VII-1936 (T. Aitken, C.A.S.); Sonora Pass, VI-27-51 (A.T. McClay, U.C.D.).

The females closely resemble those of *B. xanthopus* Wiedemann but differ in having the inner spur of the front tibia approximately as long as the outer (fig. 8a). The males are differentiated by the elongate inner spur of the front tibia and by the predominantly dark brown to black femora and apices of tibiae. The spurs of the apex of each hind tibia are shown in figure 8c. The males also differ from those of *xanthopus* in having the posterior veins of the wing concolorous with the wing membrane. The male genitalia are shown in figure 8b. Length of wing: 7-10 mm.

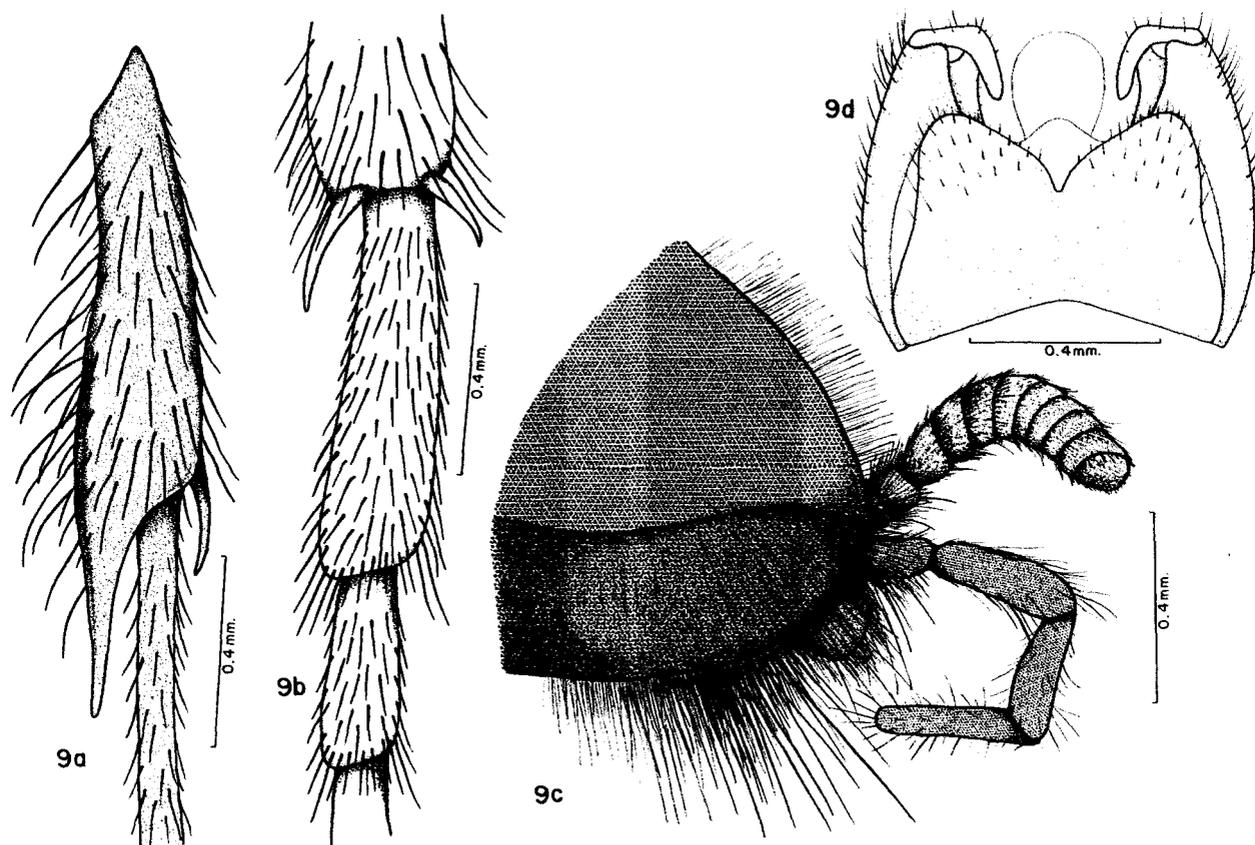


Fig. 9. *B. xanthopus* Say. a, front tibia; b, apex of hind tibia and basal segments of tarsus; c, head, lateral view; d, male genitalia, ventral view.

Bibio xanthopus Wiedemann
(Figs. 9a-d)

Bibio xanthopus Wiedemann, 1828, Aus. Zweifl. Ins., 1:80.
Bibio canadensis Macquart, 1838, Dipt. Exot., 1:129.
Bibio scita Walker, 1848, List Dipt. Ins. Brit. Mus., 1:122.
Bibio humeralis Walker, 1848, List Dipt. Ins. Brit. Mus., 1:121.

Bibio lugens Loew, 1864, Berlin. Ent. Zeitschr., 8:52.
Bibio obscurus Loew, 1864, Berlin. Ent. Zeitschr., 8:52.
Bibio xanthopus palliatus McAtee, 1921, Proc. U.S. Natl. Mus., 60(11):16.

Bibio macateei James, 1936, Amer. Mus. Novitates, 832:4.
Bibio signatus Hardy, 1937, Proc. Utah Acad. Sci., 14:208.

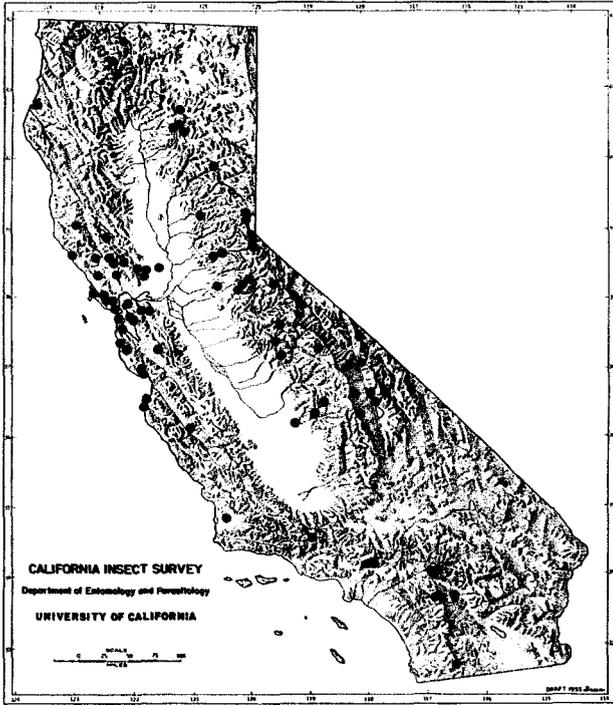
Type locality.—"New York." Type in the Vienna Natural History Museum.

Geographic distribution.—Widespread over the United States and Canada; one of the commonest species of *Bibio* in America.

California distribution (map 2).—Widespread in the mountainous parts of the state, they occupy a broader elevational range than the other California species of *Bibio* and thus the flies are encountered over a longer season. The flight period occurs in April, May, and June in various northern California areas, extending on through June and July at

higher elevations southward in the Sierra Nevada. Adults have been taken as early as March 17 at Placerville (1,850 ft.), in the foothills in El Dorado County, and as late as September 1 at Heart Lake (10,500 ft.) near the Sierra crest in Fresno County. In the centralcoastal counties the flight occurs about one month earlier than that of *B. albipennis* at the same localities, adults being most common during March (February 18 at Monterey to April 24 at Mt. Tamalpais, Marin County). In southern California the populations are evidently restricted to the mountains and fly from late March to early July at various elevations.

The size of this species varies greatly (the wing length from 5.5 to 9.5 mm.), as does the length of the inner spur of the front tibia, which is typically less than half the length of the outer spur (fig. 9a) but may in some specimens be approximately two-thirds as long as the outer. The body is black, covered with pale colored pile. The legs of both sexes are predominantly rufous. The spurs at the apex of the hind tibia are slender and sharp pointed and the basitarsus is about equal in length to the next two tarsal segments (fig. 9b). Male genitalia are shown in figure 9d. Length of wing: 5.5–9.5 mm.



Map 2. Distribution of *Bibio xanthopus* Wiedemann.

San Gabriel Mts., III-30-57 "prey of empids" (J. Powell, C.I.S.); Tanbark Flat, San Gabriel Mts., III-29-57 "prey of empids" (J. Powell, C.I.S.). Riverside Co.: Cherry Valley, (probably near Beaumont) I-1938 (Christenson and D.W. Clancy, C.D.A.); 5 mi. S.E. Riverside, III-15-57 (E.J. Schlinger, U.C.D.). San Bernardino Co.: East Highlands, XII-3-14 (F.R. Cole, C.I.S.). San Diego Co.: La Jolla, III-1-14 (E.P. Van Duzee, C.A.S.); Scissors Crossing, III-14-53 (J. Powell, C.I.S.).

This species is readily separated from other California Bibionidae by the generic characters given above. In the past, *halteralis* has been distinguished largely by the color of the halteres, which are typically yellow, but the color is of questionable specific value. The halteres of two specimens from Tanbark Flat, San Dimas Experimental Forest, Los Angeles County, are predominantly brown to black, tinged lightly with yellow, and the apices of the halteres of specimens from Monterey, Nuevo Leon, Mexico, and Guadalupe Island, Mexico, are tinged with brown. The species is nearest *aestiva* Melander but differs in having the inner lobe of each clasper strongly developed, longer and larger than the outer lobe (fig. 10c), and also in having slender segments of the posterior tarsi slender. The characteristics of the wings, genitalia, and front tibiae are shown in figures 10a-10d. Length of wing: 3.5-5 mm.

Genus *Bibiodes* Coquillett

Bibiodes Coquillett, 1904, Proc. Ent. Soc. Wash., 6:171.
Type of genus.—*Bibiodes halteralis* Coquillett.

This genus is closely related to *Bibio*: in each, the spurs of the front tibiae are strongly developed. The genera are differentiated by the details of wing venation and by the male genitalia. In *Bibiodes* the posterior branch of the radius coalesces with vein M_{1+2} for a short distance in the middle of the wing, obliterating the r-m crossvein (fig. 10b), and the claspers (dististyli) of the male are bilobed (fig. 10c).

Bibiodes halteralis Coquillett
(Figs. 10a-d)

Bibiodes halteralis Coquillett, 1904, Proc. Ent. Soc. Wash., 6(3):171.
Type locality.—San Mateo County, California. Type in the U.S. National Museum.
Geographic distribution.—Apparently widely distributed. I have seen specimens from Saskatchewan, New Mexico, Arizona, Texas, Kansas, and Mexico.
California records.—Kern Co.: Frazier Park, V-2-52 (R.M. Bohart, U.C.D.). Los Angeles Co.: Bell Canyon,

Genus *Philia* Meigen

Philia Meigen, 1800, Nouv. Class. Mouch., 20.
Dilophus Meigen, 1803, Illiger's Mag. für Insektenk., 2:264.
Acanthocnemis Blanchard, 1852, in C. Gay, Hist. Chile Zool., 7:355.
Type of genus.—*Tipula febrilis* Linnaeus.

Members of this genus are characterized by two or three sets of strong spines on the front tibiae (fig. 16a), and two sets of combs on the anterior portion of the thorax (fig. 17b). The wing venation is also distinctive, the radial sector is simple, and the basal portion of the Rs is very short, about a third as long as the r-m crossvein (fig. 15c).

The adults are often attracted to blossoms of various plants and are sometimes taken at lights.

Key to the Species of *Philia*
Known from California

1. Rostrum elongate, longer than the antennae (fig. 19d); front tibia with three sets of spines (fig. 16a) 2
- Rostrum short, the head scarcely developed beyond the bases of the antennae (fig. 15d); front tibia with two sets of spines (fig. 17a) 3

- 2. Costa extending but a short distance beyond the tip of the radial sector; top set of spines on the front tibia with two teeth, and the middle set with three teeth; both sexes entirely black *tingi* Hardy (p.194)
Costa extending half the distance between the tips of veins Rs and M₁; front tibia with three teeth in the top set and four teeth in the middle set; dorsum of thorax chiefly rufous in the males, thorax entirely rufous in the females *spinipes* (Say)(p. 193)
- 3. Males 4
Females 10
- 4. Legs dark brown to black 5
Legs yellow to rufous . . . *arizonaensis* Hardy (p.190)
- 5. Pile of the legs and body brown to black; claspers each with a broad subbasal development on the inner margin (fig. 15a). *orbata* (Osten Sacken) (p.192)
Pile of the legs and body pale; claspers not as above . 6
- 6. Posterior margin of ninth tergum straight (fig. 18); stigma faint or obsolete 7
Posterior margin distinctly concave (fig. 13); stigma usually dark colored 8
- 7. Claspers slender, acutely pointed as seen in ventral or dorsal views (fig. 14a); truncate at apices as seen in lateral view (fig. 14b) . *occipitalis* (Coquillett) (p. 191)
Claspers slightly capitate, rounded apically.
. *tibialis* (Loew) (p. 194)
- 8. Ninth tergum gently but distinctly concave on hind margin (fig. 13). 9
Ninth tergum angulate emarginate, with a broadly V-shaped cleft on hind margin (fig. 12)
. *emarginata* (McAtee)(p. 190)
- 9. Anterior thoracic comb with 7 or 8 large, blunt teeth (fig. 17b); stigma of wing brown to black along the apical portion of vein R₁
. *strigilata* (McAtee)(p. 193)
Anterior thoracic comb with 10 or 11 short, pointed teeth; stigma obsolete
. *obesula* (Loew) (p. 191)
- 10. Wings hyaline; legs at least partially rufous 11
Wings dark colored, yellow-brown to smoky black; legs dark reddish brown to black
. *orbata* (Osten Sacken)(p. 192)
- 11. Teeth of thoracic and tibial combs very large and blunt (figs. 17b and 17a); 8 to 10 teeth in anterior thoracic comb *strigilata* (McAtee) (p. 193)
Teeth of thoracic and tibial combs small and sharp pointed; usually 12 to 14 teeth in anterior thoracic comb 12
- 12. Thorax chiefly rufous above 13
Mesonotum black 15
- 13. All tibiae dark reddish brown, darker in color than femora 14

- All tibiae yellow, concolorous with the femora
. *arizonaensis* Hardy (p. 190)
- 14. Sclerotized portion of head in front of eyes rather short, about equal in length to the two basal segments of the antennae, about a third as long as the eye, and distinctly shorter than head behind eye. In the California specimens both thoracic combs are brown to black and the antennae are all black
. *tibialis* var. *breviceps* (Loew)(p. 194)
Front portion of head rather elongate, as long as 3 or 4 antennal segments, about half as long as the eye, and about as long as the hind portion of head; thoracic combs yellow to rufous; two basal antennal segments yellow *occipitalis* (Coquillett)(p. 191)
- 15. Middle and hind femora dark colored
. *emarginata* (McAtee)(p. 190)
All femora rufous
. *obesula* (Loew) and typical *tibialis* (Loew)(p. 194)

Philia arizonaensis Hardy
(Fig. 11)

Philia arizonaensis Hardy, 1937, Proc. Utah Acad. Sci., 14:209.
Type locality.—Huachuca Mountains, Arizona. Type in the U.S. National Museum.
Geographic distribution.—Previously recorded from Arizona, New Mexico, and Nevada.
California records.—San Diego Co.: Descanso, IV-15-29 (E.P. Van Duzee, C.A.S.).

This species is differentiated from other Nearctic *Philia* that have two sets of spines on the front tibiae by its legs, which are chiefly yellow or rufous. The male genitalia have not previously been described or pictured. The ninth sternum (basistyli) has a rather shallow cleft in the middle of the posterior margin; this cleft extends scarcely one-fourth the length of the segment. The claspers (dististyli) are rather slender, pointed apically, and not capitate. The ninth tergum is about two-thirds as long as it is wide, and the posterior margin is straight (fig. 11).

The female differs from the male in having the thorax entirely yellow to rufous, the abdomen light yellow-brown, and the wings more yellow fumose. Length of wings: 3.5—4.5 mm.

Philia emarginata (McAtee)
(Fig. 12)

Dilophus emarginatus McAtee, 1921, Proc. U.S. Natl. Mus., 60:20.
Philia emarginata (McAtee), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):503.

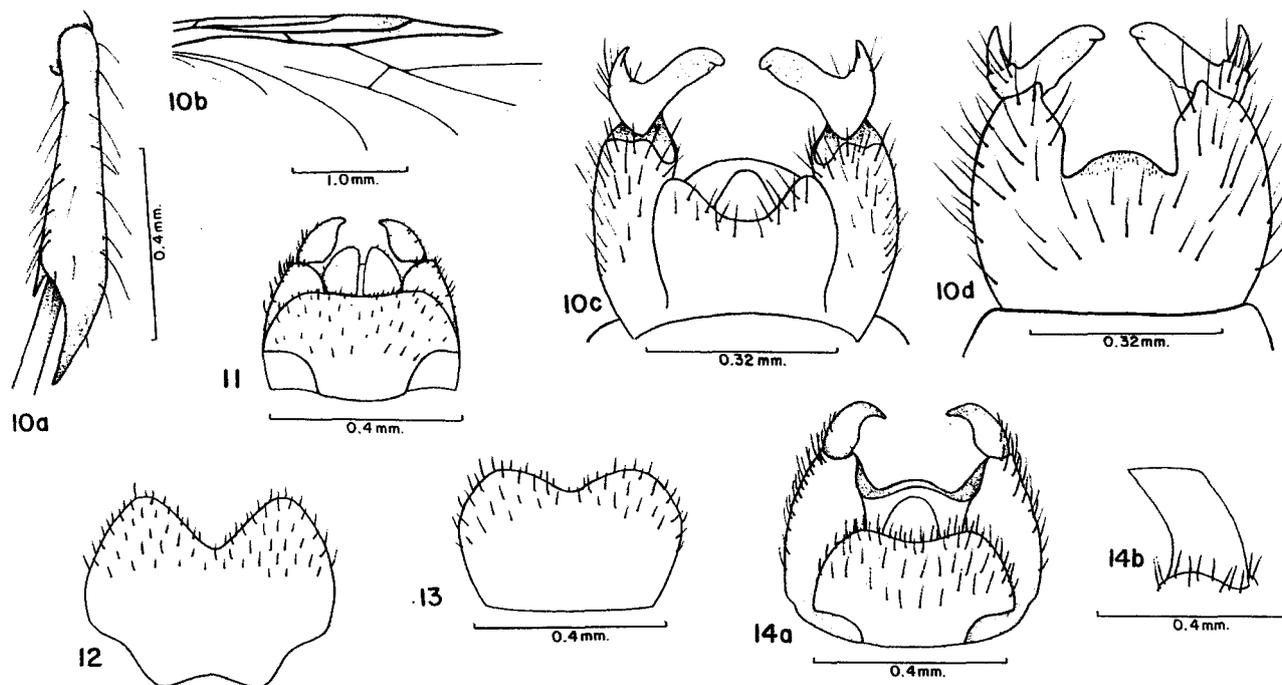


Fig. 10. *Bibiodes halteralis* Coquillett. a, front tibia; b, wing; c, male genitalia, dorsal view; d, genitalia, ventral view. Fig. 11. *Philia arizonaensis* Hardy. Male genitalia, dorsal view. Fig. 12. *P. emarginata* (McAtee). Ninth tergum of male. Fig. 13. *P. obesula* (Loew). Ninth tergum of male. Fig. 14. *P. occipitalis* (Coquillett). a, male genitalia, dorsal view; b, clasper, lateral view.

Type locality.—Samoa, Humboldt County, California. Type in the U.S. National Museum.

Geographic distribution.—Known only from the type, allotype, and one topotype male; the data on the latter specimen was the same as that of the type but was not designated as a paratype.

A predominantly shining black species, closely resembling *P. tibialis* (Loew), from which it is differentiated by a V-shaped cleft on the hind margin of the ninth tergum of the male (fig. 12).

Philia obesula (Loew)

(Fig. 13)

Dilophus obesulus Loew, 1869, Berlin. Ent. Zeitschr., 13:162.

Philia obesula (Loew), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):505.

Dilophus serraticollis Walker, 1848, List Dipt. Ins. Brit. Mus., 1:117. (Probable synonym; see notation below.)

Philia jamesi Hardy, 1937, Proc. Utah Acad. Sci., 14:210.

Type locality.—Of *obesula* (Loew), Dist. of Columbia. Type in the Museum of Comparative Zoology, Cambridge, Mass.

Geographic distribution.—Widely distributed over much of the United States and Canada. I recorded it from California (1945:506) but did not give specific localities.

California records.—Lassen Co.: Hallelujah Jct., VII-12-54 (R.M. Bohart, U.C.D.). Sierra Co.: Sierraville, VII-24-54 (R.M. Bohart, U.C.D.). Solano Co.: Green Valley Park, IV-1941 (B. Brookman and T. Aitken, C.I.S.).

It appears probable that *P. obesula* is a synonym of *serraticollis* (Walker). From a study of Walker's type (*in situ*) I could find no way to differentiate it from *obesula* (Hardy, 1956:87). Since Walker's type has not been dissected and the synonymy must still be questionable I prefer to use the better known name *obesula* for this species.

P. obesula closely resembles *tibialis* (Loew); both have an obsolete stigma in the wing. It can be differentiated by the ninth tergum of the male, which is distinctively concave on its hind margin (fig. 13).

Philia occipitalis (Coquillett)

(Figs. 14a-b)

Dilophus occipitalis Coquillett, 1904, Invert. Pacifica, 1:20.

Philia oklahomensis Hardy, 1937, Proc. Utah Acad. Sci., 14:211. New synonym.

Type locality.—Claremont, California. Type in the U.S. National Museum.

Geographic distribution.—This species is evidently widespread over the southern United States. I have seen

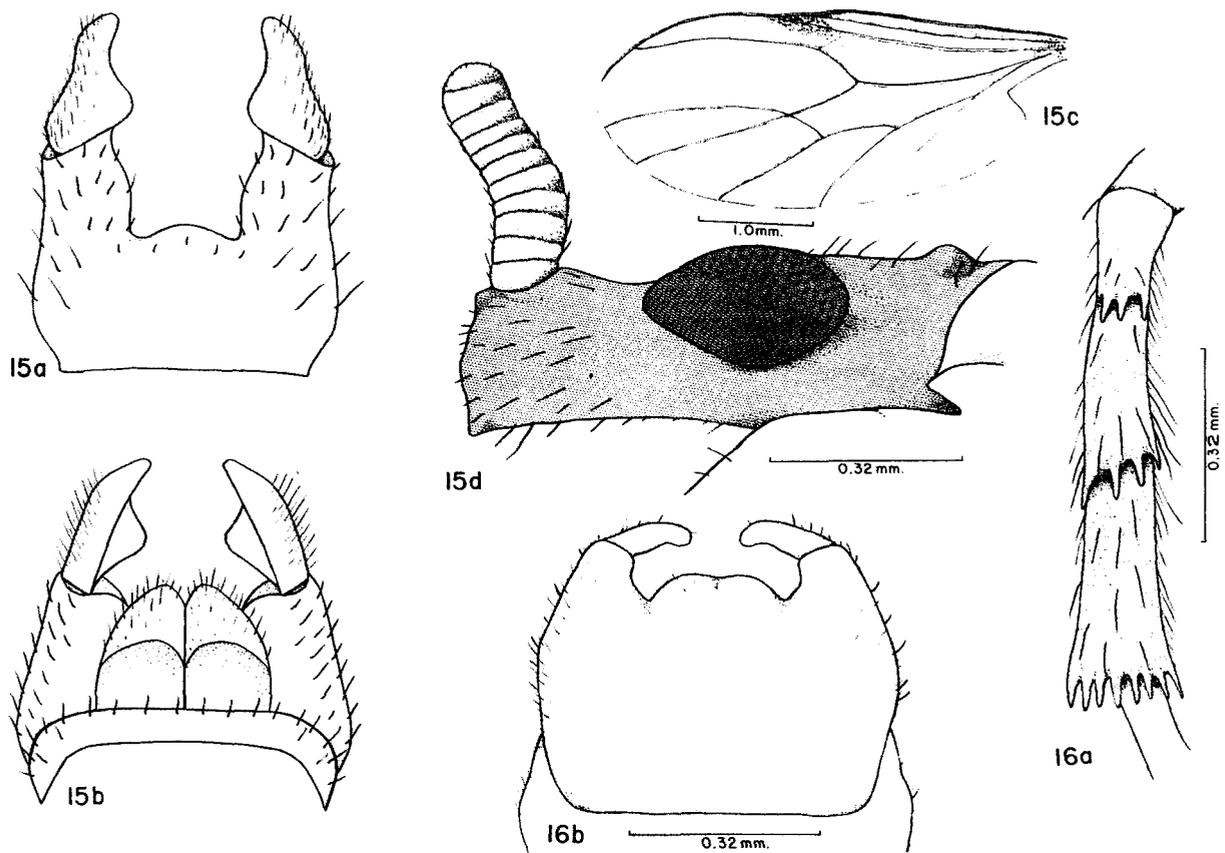


Fig. 15. *P. orbata* (Osten Sacken). a, male genitalia, ventral view; b, male genitalia, dorsal view; c, wing; d, head of female, lateral view. Fig. 16. *P. spinipes* (Say). a, front tibia; b, male genitalia, ventral view.

specimens from California, Oklahoma, Arizona, Texas, Louisiana, Tennessee, and North Carolina.

California records.—Los Angeles Co.: Pasadena, IV-1915 (F.R. Cole, C.I.S.). Riverside Co.: Riverside, X-1935 (C.M. Dammers, C.A.S.). San Diego Co.: Pauma, III-21-57 (E.I. Schlinger, U.C.D.); Carlsbad, VI-1-54 (J.C. Hall, U.C.D.); Escondido, VI-17-56 (E.I. Schlinger, U.C.D.); San Diego, IV-1890 (F.E. Blaisdell, C.A.S.), IV- (E.P. Van Duzee, C.A.S.); Descanso, IV-1920 (E.P. Van Duzee, C.A.S.); Alpine, IV-1915 (M.C. Van Duzee, C.A.S.); Desert Edge, IV-1915 (M.C. Van Duzee, C.A.S.).

P. occipitalis was described from one female specimen. The description is poor and it is not possible to identify the species from it. However, the examination of numerous specimens from California and information concerning the type which was supplied by Dr. Alan Stone leads me to believe that this is the same species as that which I described as *oklahomensis*.

This species closely resembles *P. tibialis* var. *breviceps* (Loew) but can be distinguished by the male genital characters, the coloration of the females, and the shape of the head. In ventral or dorsal view the

male claspers (dististyli) are rather evenly tapered to the apex, not capitate, (fig. 14a); in lateral view the claspers are truncate at their apices (fig. 14b). In the females the mesonotum, including the thoracic combs, is entirely yellow, as are the first two antennal segments. The sclerotized portion of the head beyond the eyes is more developed than in *breviceps*; it is equal in length to 3 or 4 antennal segments, about half as long as the eye, and approximately as long as the part of the head behind the eye.

Philia orbata (Osten Sacken)

(Figs. 15a-d)

Dilophus orbatus Osten Sacken, 1859, in LeConte, Complete writings of Thomas Say on the Entomology of North America, 2:70.

Philia orbata (Osten Sacken), Hardy 1945, Univ. Kans. Sci. Bull., 30(2):507.

Type locality.—"Florida." Present location of type, unknown.

Geographic distribution.—Widespread over the southern half of the United States from South Carolina to Texas and California.

California records.—Los Angeles Co.: Los Angeles, X-10-50, O.F.F. trap, 19-424 (C.D.A.); Glendale, VI-3-56 (E.I. Schlinger, U.C.D.). Riverside Co.: Riverside, IX-26-53 (J.C. Hall, U.C.D.). San Bernardino Co.: Chino, I-8-54 (G. Harper, C.D.A.).

This is an entirely black species. The males are differentiated from other species that have two sets of spines on the front tibia by the dark-colored pile of the legs and body and by the claspers, each of which has a broad lobate development on the inner margin (figs. 15a and 15b). The females are readily differentiated by the brown fumose wings (fig. 15c). The head is moderately elongate; in the female the rostrum is developed slightly beyond the bases of the antennae, and is almost as long as the eye (fig. 15d).

Philia spinipes (Say)

(Figs. 16a-b)

Dilophus spinipes Say, 1823, Jour. Acad. Nat. Sci. Phila., 3:79.

Dilophus thoracicus Say, 1823, Jour. Acad. Nat. Sci. Phila., 3:80.

Plecia bimaculata Walker, 1856, Ins. Saunders., 1:422.

Dilophus dimidiatus Loew, 1869, Berlin. Ent. Zeitschr., 13:4.

Philia spinipes (Say), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):510.

Type locality.—"Missouri." The type has been lost.

Geographic distribution.—Rather widespread throughout the United States, especially through the south, but extending as far north as New England.

California records.—I recorded this from California in my revision of the Nearctic Bibionidae (1945:510) but did not record any specific localities.

This species can be distinguished from other California *Philia* that have three sets of spines on the front tibia and the rostrum elongate by the predominantly rufous thorax of both sexes, the extension of the costa to well beyond the apex of the radial sector, the dusky to yellow-brown fumose wings, and the differences in the genitalia shown in fig. 16b. The spines of the front tibia are arranged as in figure 16a.

Philia strigilata (McAtee)

(Figs. 17a-d)

Dilophus strigilatus McAtee, 1921, Proc. U.S. Natl. Mus., 60(11):24.

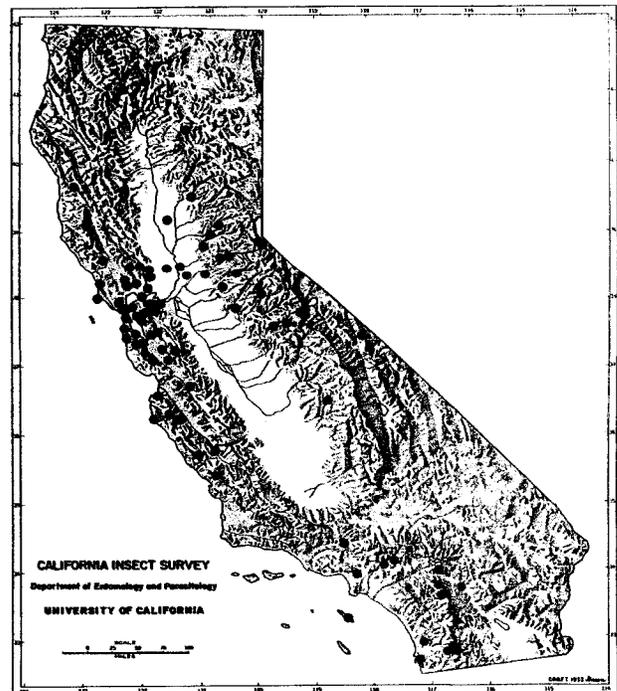
Philia strigilata (McAtee), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):512.

Type locality.—Catalina Island, California. Type in the U.S. National Museum.

Geographic distribution.—Known only from California.

California distribution (map 3).—This is the most abundant species of *Philia* found in California, and is common throughout much of the state. The adults fly later in the season than most other bibionids: in June in most northern counties, in late April and May southward through the foothills of the Sierra Nevada, and until late July at elevations over 10,000 feet (Mt. Conness, White Mts.). In the coastal areas the flight period is long, ranging from February to July. In the San Francisco Bay region the flies are usually encountered during April and May: there is only a single record for March (Mar. 15, San Francisco) in the material from this area, and the species has been taken as late as May 25. Most southern California records are from foothills and mountains, from April 10 (Alpine, San Diego County) to July 27 (San Diego). The adults are often taken in flowers, where they apparently feed on the nectar.

This species is readily differentiated from other *Philia* by the very large, blunt teeth of the thoracic combs (fig. 17b), and by the blunt teeth on the front tibiae (fig. 17a). The males are very similar to those of *P. caurina* (McAtee). The genitalia are much alike in these two species, although the cleft on the hind margin of the ninth sternum is much more distinctly expanded in *caurina* and the claspers are not so distinctly thickened apically in *strigilata* (fig. 17c). In *strigilata* the stigma at the apex of vein R_1 is dark



Map 3. Distribution of *Philia strigilata* (McAtee).

brown to black along the apical portion of the vein; in *caurina* the stigma is evenly brownish yellow. In *strigilata* the anterior thoracic comb is made up of seven or eight large, blunt teeth (fig. 17b), and is much more prominent than that of *caurina*, which is made up of nine to eleven short teeth. The hind margin of the ninth tergum of *strigilata* males is nearly straight, like that of *P. tibialis* (Loew), but the distinct stigma and the large teeth of the thoracic and tibial combs of *strigilata* readily differentiate the two species.

The females resemble those of *P. tibialis* (Loew), especially the variety *breviceps* (Loew), since the mesonotum is predominantly yellow to rufous, but they are easily recognized by the large blunt teeth of the thoracic and tibial combs. Many individuals have the mesonotum chiefly black, with only a light rufous tinge; the coloration of the thorax is not a dependable character.

Philia tibialis (Loew)

(Fig. 18)

Dilophus tibialis Loew, 1869, Berlin. Ent. Zeitschr., 13:162.

Philia tibialis (Loew), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):512.

Philia breviceps var. *atelestes* Hardy, 1937, Proc. Utah Acad. Sci., 14:210.

Dilophus breviceps Loew, 1869, Berlin. Ent. Zeitschr., 13:162.

Philia breviceps (Loew), Hardy, 1945, Univ. Kans. Sci. Bull., 30(2):501.

Philia tibialis var. *breviceps* (Loew), Hardy, 1958, Guide to the Insects of Conn. 6, the Diptera. . . , Fasc. 6:26.

Type locality.—Of *tibialis* Loew: Sitka, Alaska. Of *breviceps*: "New Hampshire." Both types in the Museum of Comparative Zoölogy, Cambridge, Mass.

Geographic distribution.—Common throughout the United States including Alaska, and throughout Canada. It ranges south through Louisiana, Alabama, and Mississippi. The variety *breviceps* probably extends over the range of the typical *tibialis* but appears to be more common in the southern part of the United States. Both of the varieties are evidently widespread throughout much of California.

California records.—El Dorado Co.: Echo Lake, VI-1953 (W.W. Middlekauff, C.I.S.); Myers, VII-1952 (W.C. Bentinck, C.I.S.); Tallac Lake, VII-15 (E.P. Van Duzee, C.A.S.) Fresno Co.: Huntington Lake, 7000 ft., VII-1919 (F.E. Blaisdell, C.A.S.); Mono Hot Springs, VIII-1956 (R.O. Schuster, C.I.S.). Inyo Co.: Ruby Lake, 11,250 ft., VII-13-57 (J. Powell, C.I.S.). Los Angeles Co.: Claremont, no date (Essig, C.D.A.). Marin Co.: Lagunitas, VI-1924 (E.H. Nash, C.A.S.). Mono Co.: Mammoth Lakes, VII-27-36 (R.M. Bohart, U.C.D.). Orange Co.: Corona del Mar, VII-1950, citronella bait trap (C.D.A.). Placer Co.: Cisco,

VII-28-54 (J.C. Downey, U.C.D.); Loomis, IV-10-51 (J.C. Hall, E.I. Schlinger, U.C.D.). San Diego Co.: San Diego, IV, V-1913 (E.P. Van Duzee, C.A.S.); Carlsbad, VI-1930 (Bartholomew, C.D.A.). San Francisco Co.: San Francisco, X-1919 (E.P. Van Duzee, C.A.S.), V-1938 (H.H. Keifer, C.A.S.). San Mateo Co.: Colma, II-1-56 (S.M. Fidel, U.C.D.). Shasta Co.: Manzanita Lake, III-6-41 (J.R. Fisher, U.C.D.), VI-1941 (C.D. Michener, C.I.S.). Sonoma Co.: Mt. St. Helena, IV-30-49 (A.T. McClay, U.C.D.). Sutter Co.: Sutter Buttes, V-5-40 (G.E. Bohart, U.C.D.). Tulare Co.: Long Meadow, Giant Forest, VII-1923 (C.L. Fox, C.A.S.). Tuolumne Co.: Tuolumne Meadows, Yosemite Natl. Park, VIII-1946 (C.A.S.); Tilden Lake, Yosemite Natl. Park, VII-1933 (C.A.S.); Strawberry, VI-17-57 (L.E. Campos, U.C.D.).

This species is differentiated from other *Philia* which have two sets of spines on the front tibia by the straight or nearly straight hind margin of the ninth tergum of the male (fig. 18), the slightly capitate male claspers (dististyli), and the very faint or obsolete stigma in the male. In the typical variety the thorax of the female is entirely black.

Previously *P. breviceps* has been treated as a distinct species, separate from *tibialis*, but as I have pointed out (Hardy 1958:26), it seems evident that the two are synonyms. The only difference I have been able to find is that the females of *breviceps* have a predominantly rufous mesonotum while those of *tibialis* have an entirely black thorax. The females of the variety *breviceps* closely resemble those of *occipitalis* (Coquillett) but the western specimens differ in having black thoracic combs and black basal segments of the antennae. As pointed out in the key to species, the shorter anterior portion of the head of *breviceps* appears to be a satisfactory character for separating the females. The female specimens which have been examined from the eastern United States have rufous thoracic combs and scutella, sometimes with a slight brownish tinge on the anterior comb.

Philia tingi Hardy

(Figs. 19a-d)

Philia tingi Hardy, 1942, Jour. Kansas Ent. Soc., 15(4):132.

Type locality.—Cronise Lake, San Bernardino County, California.

Geographic distribution.—Known only from California and Mexico. Specimens have recently been seen from 40 miles west of Mexicali, Lower California, April, 1939 (C.D. Michener).

California records.—Riverside Co.: Indio area, III-17-49 (C.I.S.); Biskra Palms, III-29-57 (J.C. Hall and E.I. Schlinger, U.C.D.). San Bernardino Co.: Vidal, 27 mi. N., IV-13-58 (E.G. Linsley, C.I.S.). San Diego Co.: Desert Edge, IV-14-15 (M.C. Van Duzee, C.A.S.); Borrego, IV-2-53

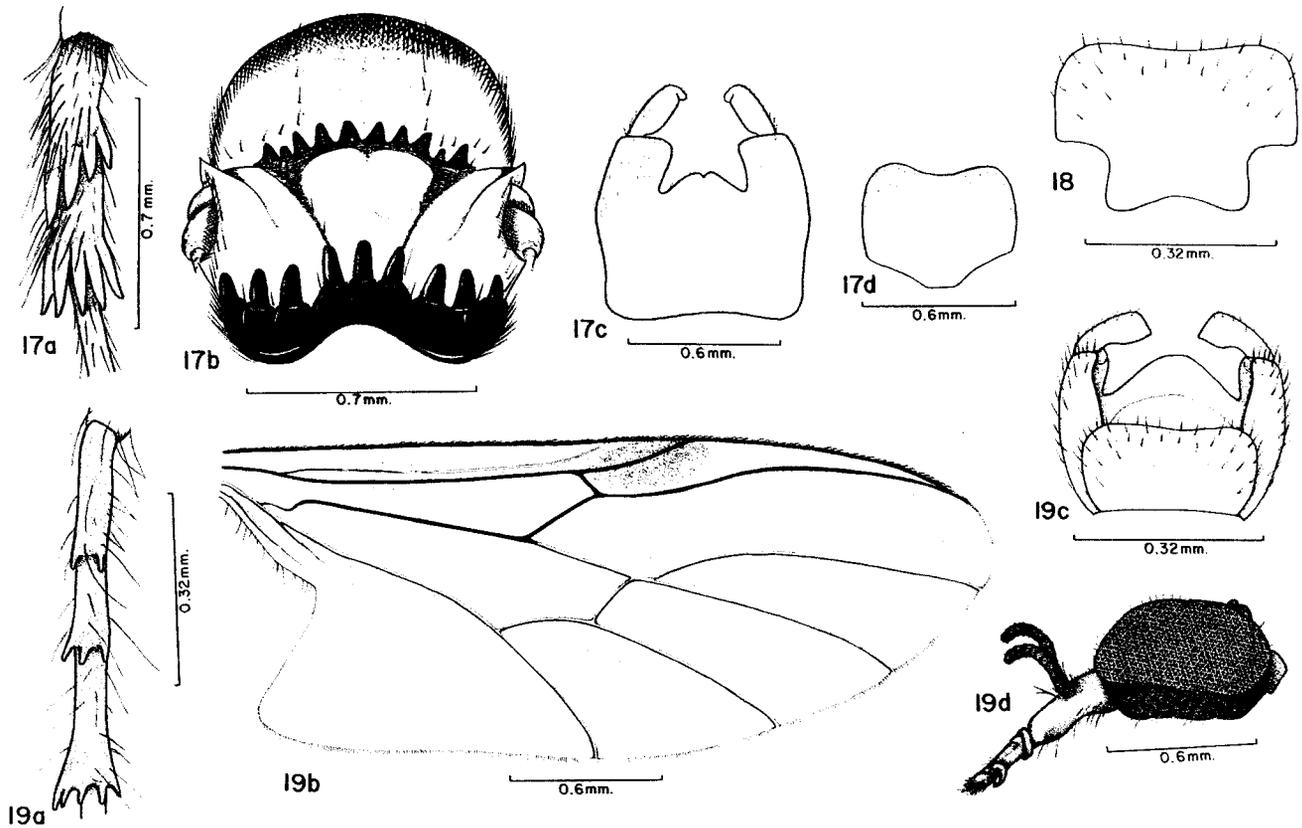


Fig. 17. *P. strigilata* (McAtee). a, front tibia; b, thoracic combs, anterior view; c, male genitalia, ventral view; d, ninth tergum of male. Fig. 18. *P. tibialis* (Loew). Ninth tergum of male. Fig. 19. *P. tingi* Hardy. a, front tibia; b, wing; c, male genitalia, dorsal view; d, head of male, lateral view.

(P. D. Hurd, C.I.S.); Borrego Valley, IV-18-57 (E. I. Schlinger, R.W. Bushing, R.M. Bohart, U.C.D.); Anza St. Park, IV-23-51 (E.I. Schlinger, U.C.D.).

This species is related to *P. spinipes* (Say); both have three sets of spines on each front tibia, and a rather elongate rostrum. The two species are, however, very dissimilar, and *tingi* is readily differentiated by its short costa, its all-black coloration, the blunt rounded teeth of its thoracic combs, its smaller size, and the shorter head length of the females.

This species is entirely black. The costa extends just a short distance beyond the tip of the radial sector (fig. 19b). The rostrum (the sclerotized portion of the head beyond the eyes) is slightly longer than the antennae (fig. 19d), and the extended mouth parts are nearly three times as long as the antennae. The male genitalia have not previously been described or pictured. The cleft at the apex of the ninth sternum is rather shallow, extending only about one-fourth the

length of the segment. The claspers are moderately broad and blunt, and slightly enlarged at the apices. The ninth tergum is nearly two times as wide as long, and the anterior margin is straight or nearly so (fig. 19c).

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