

THE NORTH AMERICAN SPECIES OF THE
FORCIPOMYIA (LEPIDOHELEA) BICOLOR SUBGROUP
(DIPTERA: CERATOPOGONIDAE)

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Abstract.—The *bicolor* Subgroup of the genus *Forcipomyia* Meigen, subgenus *Lepidohelea* Kieffer, is represented in the Nearctic Region by nine species. Keys are presented for their identification, and to distinguish them from other groups of the subgenus *Lepidohelea* in North America. The two previously known species, *F. christiansoni* Wirth and Hubert and *F. varipennis* Wirth and Williams, are redescribed and illustrated, as well as the following seven new species: *acinacis*, *cochisei*, *dubiamima*, *eadsi*, *edmistoni*, *usingeri*, and *wernerii*. The immature stages of *F. edmistoni* and *F. usingeri* are described and illustrated; they were found under tree bark. *F. christiansoni* was reared from rotting *Opuntia* cacti in California.

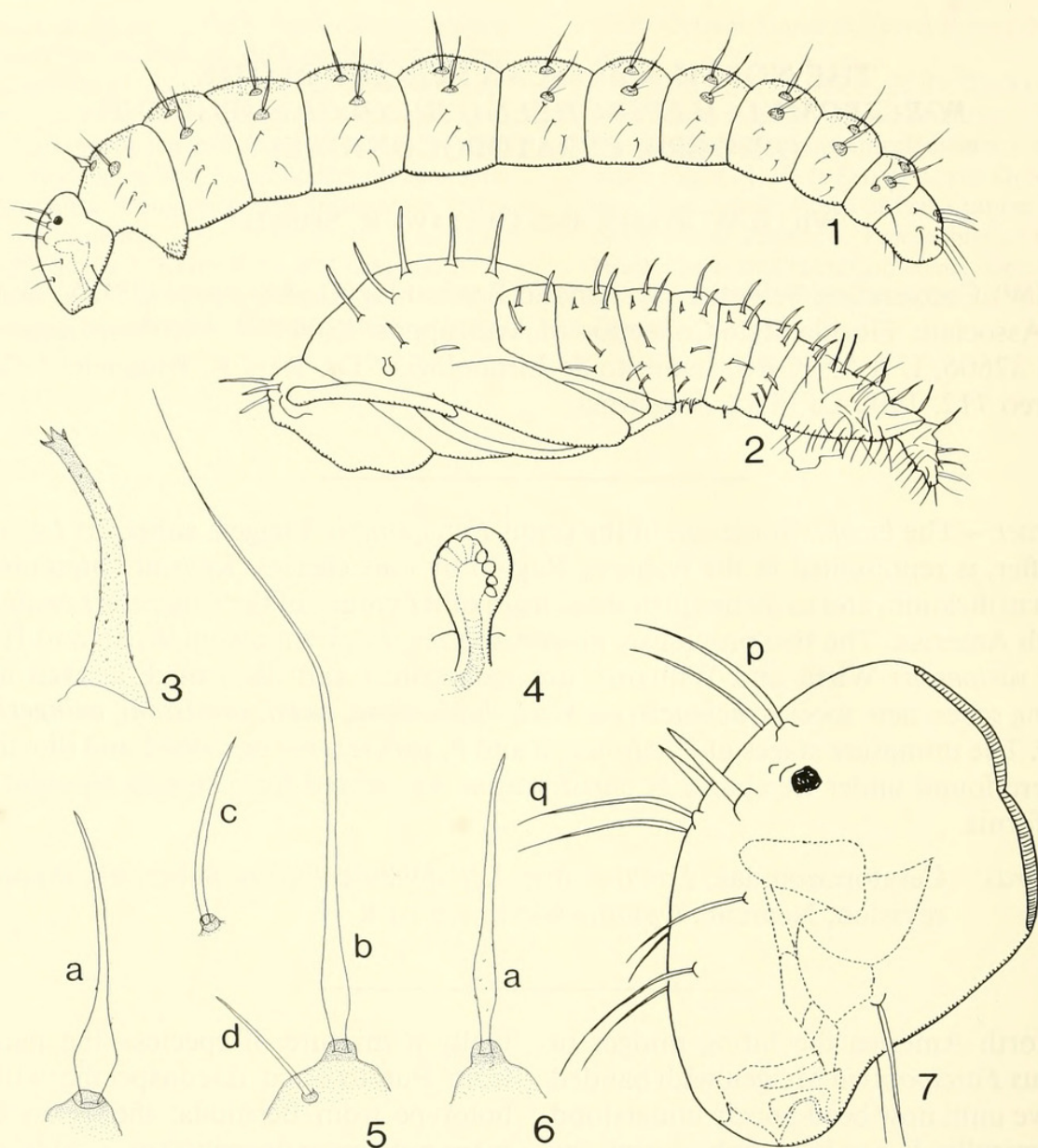
Key Words: Ceratopogonidae, *Forcipomyia*, *Lepidohelea*, *bicolor* Subgroup, taxonomic revision, Nearctic, *Opuntia* cacti, tree bark

In North America the biting midges of the genus *Forcipomyia* Meigen with banded legs have until now been poorly understood taxonomically. It has been only during the past five years that serious attention has been given to their taxonomy. Coquillett (1905) described the first of these problematical species with banded legs as *Ceratopogon cinctipes* (Coquillett) from Florida. Wirth (1952) identified as *Forcipomyia cinctipes* a common species from California that he reared from under the bark of dead Monterey pines; and is herein described as *F. usingeri* n. sp. This new species is apparently closely related to *F. christiansoni* Wirth and Hubert (1960), which was originally described from *Opuntia* cacti in California. Wirth and Williams (1957) described *F. varipennis* from Bermuda, Texas, Puerto Rico, and Guatemala; the type series is ac-

tually a mixture of species—the paratype from Puerto Rico is conspecific with the holotype from Bermuda; the Texas specimens are herein described as *F. eadsi* n. sp., and the identity of the Guatemalan specimens is still doubtful.

All of these species were placed by Wirth (1976) in the subgenus *Forcipomyia* in a group which he named the *Forcipomyia cinctipes* group. In this group he inferentially placed *F. cinctipes*, added *F. pictoni* Macfie which had been described from Trinidad, and two new species from Florida, *F. beckae* Wirth and *F. seminole* Wirth.

Debenham (1987), in a magnificent comprehensive study of the Australian *Forcipomyia*, first brought order into the chaotic state of taxonomy of *Forcipomyia* (s. str.) and the subgenus *Lepidohelea* Kieffer, in which she outlined characters for the reli-



Figs. 1-7. *Forcipomyia usingeri*; 1, 5-7, larva; 2-4, pupa: 1, larva, habitus, side view; 2, pupa, habitus, side view; 3, cuticular process of cephalothorax; 4, respiratory horn; 5, body hairs of prothorax, lettering as in text; 6, a hair of remaining body segments; 7, head, side view.

able separation of the two subgenera and for species groups within the subgenus *Lepidohelea*. She included some Australian species in the so-called "*cinctipes* Group," and pointed out that *F. pictoni* really belonged in the subgenus *Forcipomyia*, while *F. beckae* and *F. seminole* belonged to *Lepidohelea*.

Wirth (1990) redescribed *Forcipomyia cinctipes* and transferred it to the subgenus *Schizoforcipomyia* Chan and LeRoux (1971). He pointed out that "The species

that Wirth (1952) described and figured as *Forcipomyia cinctipes* from California, including the immature stages, was misdetermined and actually belongs to a group of banded-legged species in the subgenus *Lepidohelea*. Therefore the *cinctipes* Group of Wirth and other authors is a misnomer and must take a new name based on an included species." Following up on his 1990 paper, Wirth (1991a, b) divided the American species of *Lepidohelea* into two groups, based

mostly on species that Lutz (1914) and Macfie (1939) had described from Brazil.

In the *annulatus* group Wirth (1991b) included three species, *annulatus*, *brasilensis*, and *kuanoskeles*, all described by Macfie (1939) from southern Brazil. In the *bicolor* group he included the following Neotropical species: *bicolor* Lutz (1914), *dubia* Macfie (1939), and *lacrimatorii* Macfie (1939), which he redescribed from types, and *squamithorax* Claesrier (1972), *abercrombyi* Macfie (1938), *seminole* Wirth, *varipennis* Wirth and Williams, *winderi* Wirth (1991a), and *flavifemoris* Macfie (1940).

Wirth and Spinelli (1992) have divided the *bicolor* group into two subgroups, the *bicolor* subgroup, and the *seminole* subgroup, the latter including three species, *beckae* Wirth, *seminole* Wirth, and *luteigena* Wirth and Spinelli. Species of the *seminole* subgroup were distinguished by the color of the hind femur, which is pale except for a narrow dark band just distad of midlength; whereas in the *bicolor* subgroup at least the distal half of the hind femur is dark.

Explanation of the taxonomic characters used can be found in the general papers on Ceratopogonidae by Wirth et al. (1977) and Downes and Wirth (1981), and the revision of the North American *Forcipomyia* (*Euprojoannisia*) by Bystrak and Wirth (1978). Terminology of the larval and pupal chaetotaxy follows the system of Saunders (1924, 1956).

Holotypes and allotypes of the new species are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Paratypes as available will be deposited in the California Academy of Sciences, San Francisco, Canadian National Insect Collection, Agriculture Canada, Ottawa; Florida State Collection of Arthropods, Gainesville; Natural History Museum, London; and Museum National d'Histoire Naturelle, Paris.

Subgenus *Lepidohelea* Kieffer

Lepidohelea Kieffer, 1917: 364 (as genus).

Type-species, *Ceratopogon chrysolophus* Kieffer, by original designation.

Diagnosis (modified from Debenham 1987).

Female.—Body usually with flattened striated scales, especially on legs and wings. Eyes bare. Mouthparts unarmed. Maxillary palpus 4- or 5-segmented, segments 4 and 5 fused in *annulatus* group; segment 3 slightly to moderately swollen, maximum width at center, there with a small to medium sensory pit. Antenna 15-segmented, segments 4–10 short to vase-shaped, distal five segments slightly more elongate. Legs with complex pattern of pale and dark bands; hind tibia usually with a broad dark band proximally, then a broad pale band, another broad dark band, and broad pale apex; fore and mid tibiae usually with similar bands, but bands often obscure or absent; tarsi dark with joints of segments distinctly pale. Hind tarsal ratio usually about 1.0. Empodium well developed; claws small, simple and gently curved, or sharply bent centrally and sometimes also with a central barb. Wing with pattern of pale and dark scale-like macrotrichia, the dark scales larger on the wing veins, especially dark and prominent over radial cells, anteriorly at midlength of cell R₅, and on branches of mediocubital fork. First radial cell closed, second open but short; costal ratio 0.4–0.5. Abdomen usually with well-developed genital sclerotization in form of a transverse arcuate band bearing small spines posteriorly at ends; one or two spermathecae.

Male.—Generally similar to female. Wing paler than in female, but the dark anterior spots and spot on vein CuA₂ smaller and more distinct. Hind tibial spur often enlarged and sometimes hook-like; outer claw of fore tarsus sometimes with distinct blunt tooth at midlength ventrally. Genitalia usually prominently bicolored; with prominent

pale yellowish areas on sternite 9 and gonocoxites, and gonostyli more or less whitish. Gonostylus variously shaped; straight, sinuous or bent, often with apex distinctly or grossly expanded; short setae often on basal portion, but long setae absent. Aedeagus variable, usually elongate rectangular or conical, often with complex apical processes. Parameres well developed, structure varies with species group.

Pupa.—Typical of *Forcipomyia*; larval exuviae retained on distal abdominal segments. Respiratory horn small, with or without basal heel, with row of spiracular openings around apex and extending down posterior side. Thorax with seven pairs of long cuticular processes, some of which are spinose apically. Abdomen with similar processes and/or smaller spinose tubercles on segments 1–8; large dorsal cuticular processes absent from 1 and 8. Terminal processes long and tapering. Male genital processes dorsal.

Larva.—Head hypognathous; antenna a simple tapered rod; *p* and *q* hairs long, expanded near base but becoming filamentous distally. Prothoracic pseudopod cleft apically, with four small dark spines at apex of each branch. Prothoracic *a* hair various; usually swollen near base and then filamentous, but short and swollen bulbously or vesicle-like in *annulatipes* group. Posterior body segments with *a* hairs rodlike with hastate apex; *b* hairs similar to prothoracic *a* hair but larger and longer, other setae simple. Segment 8 with *a* and *b* hairs all resembling prothoracic *a* hair but larger, the 4 hairs mounted on a common, halfmoon-shaped, chitinized base. Anal pseudopod cleft with each branch bearing 5–6 hooks apically and 3–4 on inner side. Cauda absent.

Larvae of *Lepidohelea* can be distinguished from larvae of the subgenera *Forcipomyia* s. str. and *Schizoforcipomyia* by means of the following key:

1. Head hairs *p* and *q* long and simple, sometimes hastate at tip; body hairs not thickened basally;

- a* hairs with distinctly hastate tips; body segment 8 with *a* and *b* hairs variable in shape, but not swollen at base, often with a narrow bridge of chitin between the 4 hairs Subgenus *Forcipomyia* s. str.
- Head hairs *p* and *q* thickened at base, then becoming filamentous distally; *a* hairs variable; body hairs *b* and *d* thickened basally; body segment 8 with *a* and *b* hairs all resembling prothoracic *a* hair but larger, the 4 hairs mounted on a common halfmoon-shaped sclerotized base 2
 - 2. Body with *a* hairs hastate apically Subgenus *Schizoforcipomyia*
 - Body with *a* hairs swollen at base, at least on prothorax Subgenus *Lepidohelea*

KEY TO SPECIES GROUPS OF *LEPIDOHELEA* IN NORTH AMERICA

1. Palpus with four segments; one spermatheca; gonostylus more or less expanded distally *annulatipes* Group
- Palpus with five segments; two spermathecae; gonostylus straight or slightly curved, tapering to slender (*bicolor* Group) 2
2. Hind femur pale with narrow dark band just distad of midlength *seminole* Subgroup
- Hind femur dark, at least on distal half *bicolor* Subgroup

FORCIPOMYIA (*LEPIDOHELEA*) *BICOLOR* SUBGROUP

Diagnosis.—For complete diagnosis see Wirth (1991b). Wing length 0.7–1.5 mm. Palpus 5-segmented. Female with two spermathecae. Female genital sclerotization usually an arcuate transverse ribbon bearing small spines on posterior margin, especially at lateral ends. Male gonostylus not swollen or modified at tip, straight or gently curved. Aedeagus with low basal arch, more or less triangular in outline, and bearing 1–3 inconspicuous longitudinal ridges or sclerotized lines on ventral surface. Parameres usually separated, distal portions simple, long, nearly straight rods usually tapering to filiform tips.

Biology.—Adult habits of the *Forcipomyia bicolor* group are very poorly known. Adults of *F. winderi* Wirth are very numerous in cocoa (*Theobroma cacao* (L.) plantations in Brazil where they are of con-

siderable importance in pollination, along with many other *Forcipomyia* species. Larvae of the two North American species live under bark of dead or dying trees, and one species has been reared from rotting *Opuntia* cacti. The larvae are assumed to feed, like most other terrestrial *Forcipomyia* larvae, on various fungi associated with these habitats.

KEY TO NEARCTIC SPECIES OF THE
FORCIPOMYIA (LEPIDOHELEA) BICOLOR
SUBGROUP

(primarily for males)

- 1. Third palpal segment greatly swollen to apex; hind tibial spur straight, nearly 1/2 length of basitarsus; halter brown; spermathecae subequal; anterior arch of aedeagus poorly sclerotized *varipennis* Wirth and Williams
- Third palpal segment swollen at mid-portion, distal 1/4 slender; hind tibial spur short (long in *acinacis*, but deeply curved); halter pale or brown; spermathecae unequal; anterior arch of aedeagus well sclerotized 2
- 2. Male 9th sternite and gonocoxite entirely dark brown 3
- Male 9th sternite and gonocoxite yellowish with dark brown patches 6
- 3. Gonostylus dark brown; fore and mid legs primarily yellowish; halter brown *werneri* new species
- Gonostylus pale (sometimes tip dark); fore and mid legs primarily brown; halter pale or brown 4
- 4. Antennal segments 11-14 of female short, only slightly longer than proximal segments; proximal 1/2 of femora pale; mid tibia without subbasal pale ring; spermathecae without pale punctations; halter brown *eadsi* new species
- Antennal segments 11-14 of female much longer than proximal segments; proximal 1/2 of femora brown; mid tibia with subbasal pale ring; spermathecae with small, faint, pale punctations; halter pale 5
- 5. Mid tibia dark to tip; hind tibial spur of male short, slender, and nearly straight, 0.28-0.32 as long as basitarsus *christiansoni* Wirth and Hubert
- Mid tibia with broad apical pale band; hind tibial spur long, stout, and curved, 0.34 as long as basitarsus *usingeri* new species
- 6(2). Large species (wing length 1.38-1.73 mm); proximal flagellar segments of female elon-

- gate vasiform or bottle-shaped; legs dark brown, fore and mid tibiae without subbasal pale rings, apex of hind tibia dark; male 9th sternite yellowish, dark brown lateroposteriorly; proximal 2/3 of gonocoxite yellowish, distal 1/3 dark brown ... *dubiamima* new species
- Smaller species (wing length 1.00-1.27 mm); proximal flagellar segments stout with short distal necks; legs brown, fore and mid tibiae with subbasal pale rings, apex of hind tibia pale; male 9th sternite and gonocoxite not as above 7
- 7. Third palpal segment very slightly swollen in midportion (palpal ratio 3.40); mid femur pale, narrow apex brown; apex of hind femur brown; wing with conspicuous pattern of pale areas; spermathecae with faint pale punctations; male 9th sternite dark brown laterally, pale in middle; distal 2/3 of gonocoxite dark brown on inner side ... *cochisei* new species
- Third palpal segment moderately swollen in mid portion (palpal ratio 2.60-2.70); distal 2/3 of mid femur brown; apex of hind femur pale (variable); wing densely covered with appressed microtrichia; spermathecae without pale punctations; distal 1/2 of male 9th sternite dark brown; distal 1/3 of gonocoxite pale yellowish on inner side 8
- 8. Costal ratio 0.37; apex of hind femur dark brown; male hind tibial spur short, slightly curved; male 9th sternite dark brown lateroposteriorly; distal 1/2 of gonocoxite entirely dark brown *pricei* new species
- Costal ratio 0.46-0.49; apex of hind femur pale (variable); male hind tibial spur as above, or unusually long, hook-shaped; distal 1/2 of male 9th sternite dark brown; distal 1/3 of gonocoxite pale yellowish on inner side ... 9
- 9. Male hind tibial spur unusually long, hook-shaped *acinacis* new species
- Male hind tibial spur short, slightly curved *edmistoni* new species

Forcipomyia (Lepidohelea) acinacis
Wirth and Spinelli, NEW SPECIES
(Fig. 57)

Allotype female. — Wing length 1.20 mm; breadth 0.46 mm.

Head: Brown, with numerous strong, erect, bristly brown hairs. Antenna with lengths of flagellar segments in proportion of 23-20-22-22-22-22-22-22-29-29-31-34-40; antennal ratio 0.93; proximal segments moderately long, 11-14 vase-shaped with short distal necks. Palpus with lengths of

segments in proportion of 11-17-36-16-16; palpal ratio 2.60; 3rd segment moderately swollen in midportion, with an irregular deep pit opening by a small pore; distal $\frac{1}{4}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous, mixed brown and yellowish, bristly, erect setae and narrow, appressed, yellowish scales. Legs brown, with numerous, very long, brown and golden, erect setae, and elongate, broad, striated, brownish scales; femora pale at bases, hind femur also pale at tip; tibiae with subbasal and apical pale bands; hind tibial comb with eight spines, spur short, curved; tarsi brown with narrow segmental pale rings, hind tarsal ratio 0.85. Wing densely covered with appressed dark macrotrichia, a small, inconspicuous, yellowish spot just past end of costa; costal ratio 0.47. Halter slightly infuscated.

Abdomen: Dark brown, with numerous erect brown setae; tergites and pleura also with scattered, semi-appressed, 1-striated, scalelike, brown setae. Genital sclerotization as in *F. edmistoni* (Fig. 51). Spermathecae oval, unequal, measuring 0.095×0.062 mm and 0.084×0.056 mm.

Holotype male.—Wing length 1.40 mm; breadth 0.41 mm; costal ratio 0.42. Similar to female with usual sexual differences. Wing primarily pale, with macrotrichia concentrated on radial veins and in cells, along anterior margin beyond end of costa, and on vein CuA2. Hind tibial comb (Fig. 57) with nine spines; spur hook-like, unusually long, scaly at base, tip dark. Abdomen with extensive pale yellowish dorsal areas, especially on proximal segments; scales absent.

Genitalia: Similar to those of *F. edmistoni* (Fig. 53). Proximal $\frac{1}{2}$ of 9th sternite yellowish, distal $\frac{1}{2}$ dark brown; gonocoxite yellowish, variably dark brown posteriorly on external side; gonostylus slender, pale, tip slightly darkened. Aedeagus with basal arms directed laterally; main portion triangular, gradually tapering to blunt tip, ventral sur-

face with pair of widely separated, more strongly sclerotized, longitudinal lines. Parameres as usual.

Distribution.—Florida, Maryland, North Carolina, Virginia.

Types.—Holotype male, Maryland, Montgomery Co., Colesville, 13.ix.1977, W. W. Wirth; allotype female, same data except 15.v.1977. Paratypes, 18 males, 16 females, as follows:

FLORIDA: Alachua Co., Gainesville, Oak Crest, 8.iii.1992, WWW, 1 male.

MARYLAND: Same data as types except 9.viii.1975, 1 male; 8.v.1977, 2 males; 15.v.1977, 2 males; 9.vi.1977, 1 male.

NORTH CAROLINA: Macon Co., Highlands, Wightman Cottage, 10.vi.1986, WWW, 5 males. Transylvania Co., Lake Toxaway, 9-20.vii.1989, WWW, 16 females, 17 males.

VIRGINIA: Falls Church, 9.vi.1958, WWW, 1 male; same data except 20.vii.1958, 1 male.

Etymology.—The species name is from the Latin *acinaces* (a scimitar), referring to the large, curved, scimitar-shaped spur on the male hind tibia.

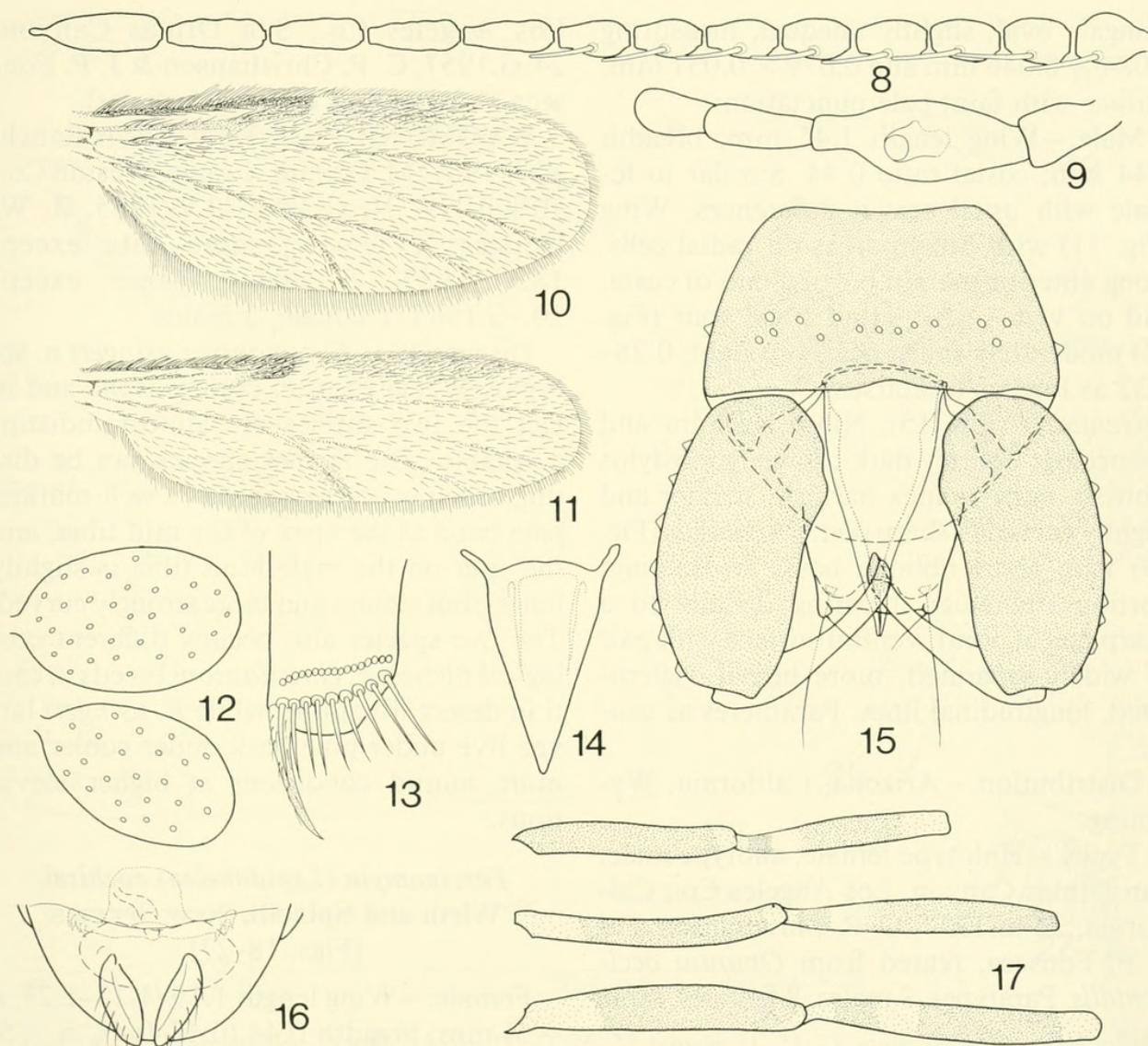
Discussion.—This species is nearly identical to *Forcipomyia edmistoni*, except for the male hind tibial spur which is unusually long and hook-shaped. As in *F. edmistoni*, the dark area on the hind femur is variable in extent, with the pale distal area broad to almost absent. The extent of the distal dark area on the male gonostylus is also variable.

Forcipomyia (Lepidohelea) christiansoni
Wirth and Hubert
(Figs. 8-17)

Forcipomyia christiansoni Wirth and Hubert, 1960: 640 (female, male; California; figs.).

Female.—Wing length 1.27 (1.12-1.35, $n = 5$) mm; breadth 0.51 (0.43-0.53, $n = 5$) mm.

Head: Antenna (Fig. 8) with lengths of flagellar segments in proportion of 22-20-



Figs. 8–17. *Forcipomyia christiansoni*; 8–10, 12, 13, 16, 17, female; 11, 14, 15, male: 8, antenna; 9, palpus; 10, 11, wing; 12, spermathecae; 13, hind tibial comb; 14, aedeagus; 15, genitalia, aedeagus omitted; 16, genital sclerotization; 17, femora and tibiae of (top to bottom) fore, mid, and hind legs.

19-19-19-19-19-25-25-25-25-35; antennal ratio 0.84 (0.77–0.90, $n = 4$); proximal segments short, stout, 11–14 vase-shaped with short distal necks. Palpus (Fig. 9) with lengths of segments in proportion of 12-20-41-22-16; palpal ratio 3.00 ($n = 3$); 3rd segment moderately swollen in mid-portion, with irregular pit opening by small pore; distal $\frac{1}{4}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous erect, dark brown, bristly setae and mixed whitish and dark brown appressed scales. Legs (Fig. 17) dark brown; small knee spots yellowish; bases of

mid and hind femora pale; tibiae with narrow subbasal pale rings; fore and hind tibiae with moderately broad apical, yellowish rings; mid tibia dark to tip; hind tibial comb with nine spines, spur slender and curved; tarsi with very narrow segmental pale rings; hind tarsal ratio 1.10 ($n = 4$). Wing (Fig. 10) with dense vestiture of narrow, dark macrotrichia, especially long and blackish along costa; costal ratio 0.44 (0.41–0.46, $n = 5$). Halter pale.

Abdomen: Dark brown, with numerous erect dark brown setae. Genital sclerotization as in Fig. 16. Spermathecae (Fig. 12)

elongate oval, slightly unequal, measuring 0.084×0.046 mm and 0.079×0.051 mm; surface with faint pale punctations.

Male.—Wing length 1.45 mm; breadth 0.44 mm; costal ratio 0.44. Similar to female with usual sexual differences. Wing (Fig. 11) with brown areas on radial cells, along anterior margin beyond end of costa, and on vein CuA2. Hind tibial spur (Fig. 13) moderately short, nearly straight, 0.28–0.32 as long as basitarsus.

Genitalia (Fig. 15): Ninth sternum and gonocoxite entirely dark brown; gonostylus whitish, narrow apex darkish, slender and slightly curved to sharp point. Aedeagus (Fig. 14) with short oblique basal arms, main portion triangular, tapering distally to a sharp apical point, ventral surface with pair of widely-separated, more heavily sclerotized, longitudinal lines. Parameres as usual.

Distribution.—Arizona, California, Wyoming.

Types.—Holotype female, allotype male, San Dimas Canyon, Los Angeles Co., California, 24.xi.1957, C. P. Christianson and J. P. Fonseca, reared from *Opuntia occidentalis*. Paratypes, 3 males, 8 females, same data.

Specimens examined.—ARIZONA: Brown Canyon, Baboquivari Mts., 4.viii.1961, F. Werner, 1 female, 2 males. Chiricahua Nat. Mon., 1.vi.1967, C. W. Sabrosky, 1 male. Cochise Co., Huachuca Mts., Ramsey Canyon, "Trout Pond," 1770 m, 28.viii.1980, J. H. Epler, 2 males; Cochise Stronghold, Dragoon Mts., 16.vii.1958, C. W. O'Brien, 8 males; same data except 13.viii.1958, 1 female; same data except 21.vii.1961, F. Werner, 1 female. Maricopa Co., Wickenburg, viii.1950, H. K. Gloyd, 1 female. Yavapai Co., Oak Creek Village, 2–5.viii.1982, M. W. Sanderson, 2 females; same data except 13–15.viii.1982, 3 females. Yuma Co., 19 km E Tacna, Mohawk Dunes, 6.iii.1988, R. E. Woodruff, 1 male.

CALIFORNIA: El Dorado Co., Snowline Camp, 13.vii.1948, W. W. Wirth, 1 male.

Los Angeles Co., San Dimas Canyon, 24.xi.1957, C. P. Christianson & J. P. Fonseca, 4 females, 2 males (paratypes).

WYOMING: Platte Co., Brown Ranch, 1.vii.1967, M. Griffith, 1 male. Weston Co., 10 km NW Newcastle, 23.vi.1965, R. W. Hodges, 1 female; same data except 18.vii.1965, 6 males; same except 20.vii.1965, 1 female, 2 males.

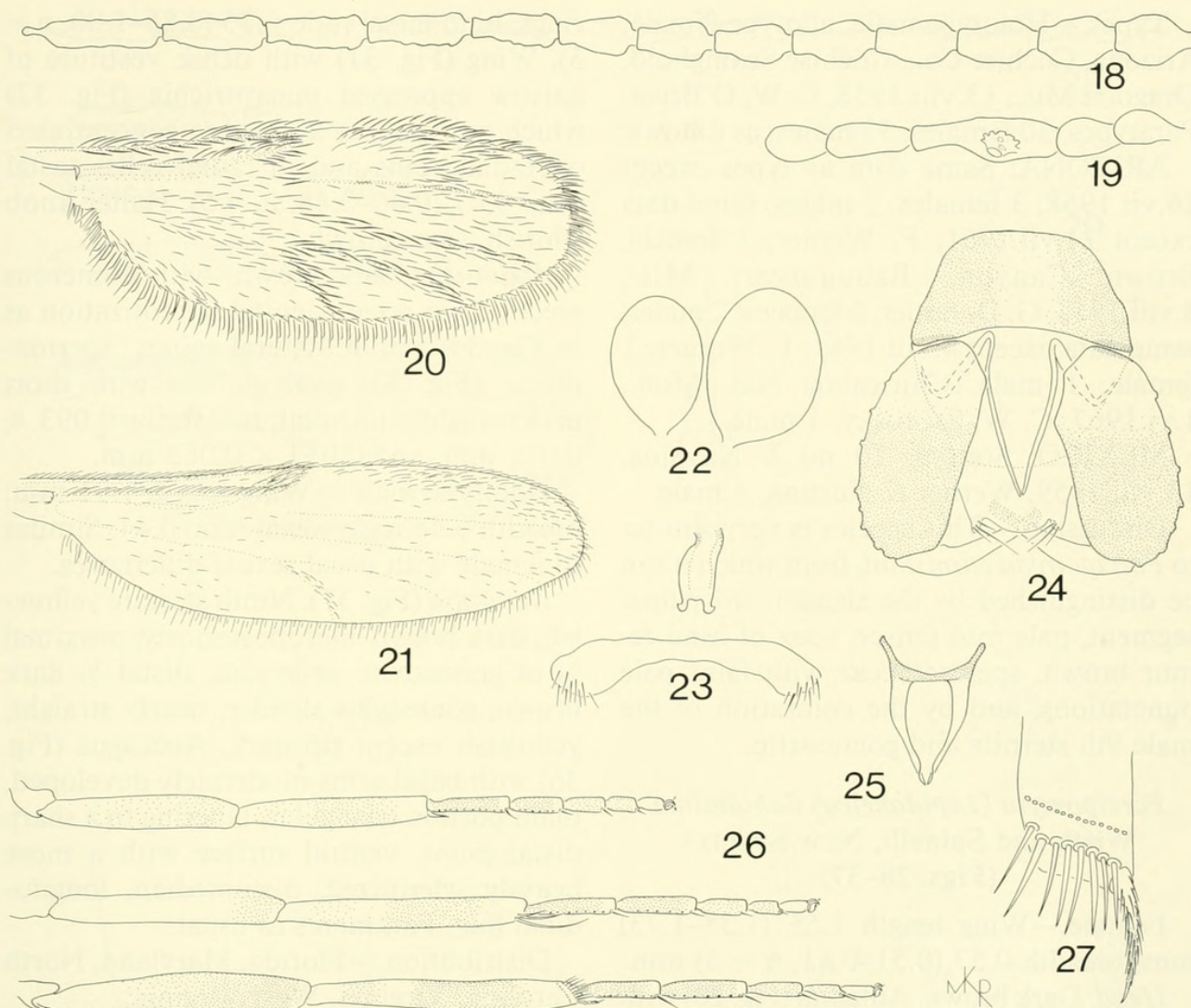
Discussion.—*Forcipomyia usingeri* n. sp. is closely related to *F. christiansoni*, and in fact the two species are almost indistinguishable. The former species can be distinguished by the presence of a well-marked pale band at the apex of the mid tibia, and the spur on the male hind tibia is slightly longer, but stouter and more strongly curved. The two species also occupy different ecological niches; *F. christiansoni* breeds in cacti in desert situations, while *F. usingeri* larvae live under pine bark under cooler and more humid conditions at higher elevations.

***Forcipomyia (Lepidohelea) cochisei*
Wirth and Spinelli, NEW SPECIES
(Figs. 18–27)**

Female.—Wing length 1.19 (1.17–1.27, $n = 5$) mm; breadth 0.44 (0.43–0.48, $n = 5$) mm.

Head: Dark brown. Antenna (Fig. 18) with lengths of segments in proportion of 20-18-19-20-20-19-18-20-22-25-26-26-35; antennal ratio 0.88 (0.86–0.93, $n = 5$). Palpus (Fig. 19) with lengths of segments in proportion of 16-18-40-20-17; palpal ratio 3.40 (3.25–3.55, $n = 5$); 3rd segment slightly swollen in midportion, with irregular, moderately deep pit opening by a small rounded pore; distal $\frac{1}{3}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous erect, dark brown, bristly setae, scales missing in slide-mounted specimens. Legs (Fig. 26) brown, hind leg darkest; bases of fore and hind femora yellowish, mid femur broadly yellowish basally; knees pale; tibiae with subbasal and apical pale rings; hind tibial comb (Fig. 27)



Figs. 18–27. *Forcipomyia cochisei*; 18–20, 22, 23, 26, 27, female; 21, 24, 25, male: 18, antenna; 19, palpus; 20, 21, wing; 22, spermathecae; 23, genital sclerotization; 24, genitalia, aedeagus omitted; 25, aedeagus; 26, femora and tibiae of (top to bottom) fore, mid, and hind legs; 27, hind tibial comb.

with 7–8 spines, spur short; tarsi brown with very narrow segmental pale rings; hind tarsal ratio 1.12 (1.10–1.15, $n = 5$). Wing with vestiture of narrow macrotrichia, mixed whitish and dark, giving a pattern as illustrated in Fig. 20; costal ratio 0.46 (0.45–0.48, $n = 5$). Halter pale.

Abdomen: Dark brown, with numerous erect brown setae. Genital sclerotization as in Fig. 23. Spermathecae (Fig. 22) elongate oval, unequal, measuring 0.087×0.061 mm, and 0.077×0.051 mm.

Holotype male.—Wing length 1.43 mm; breadth 0.46 mm; costal ratio 0.43. Similar to female with usual sexual differences. Wing

(Fig. 21) primarily pale, dark macrotrichia restricted to radial veins and cells, along anterior margin beyond end of costa, and on vein CuA2.

Genitalia (Fig. 24): Ninth sternite dark brown laterally, yellowish on midportion; proximal $\frac{1}{3}$ of gonocoxite pale yellowish, distal $\frac{2}{3}$ dark brown; gonostylus slightly curved, whitish except tip dark. Aedeagus (Fig. 25) stout, basal arms short, lateral margins nearly parallel proximally, abruptly tapering distally to somewhat blunt tip. Parameres as usual.

Distribution.—Arizona, Mexico (Sonora).

Types.—Holotype male, allotype female, Arizona, Cochise Co., Cochise Stronghold, Dragoon Mts., 13.viii.1958, C. W. O'Brien. Paratypes, 30 females, 33 males, as follows:

ARIZONA: Same data as types except 16.vii.1958, 3 females, 2 males; same data except 21.vii.1961, F. Werner, 1 female. Brown Canyon, Baboquivari Mts., 8.viii.1953, G. D. Butler, 6 females, 2 males; same data except 4.viii.1961, F. Werner, 1 female, 1 male. Chiricahua Nat. Mon., 1.vi.1967, C. W. Sabrosky, 1 male.

MEXICO: Sonora, 10 mi E Navajoa, 13.viii.1959, Werner & Nutting, 1 male.

Discussion.—This species is very similar to *Forcipomyia edmistoni*, from which it can be distinguished by the slender 3rd palpal segment, pale mid femur, apex of hind femur brown, spermathecae with faint pale punctations, and by the coloration of the male 9th sternite and gonocoxite.

***Forcipomyia (Lepidohalea) dubiamima*
Wirth and Spinelli, NEW SPECIES
(Figs. 28–37)**

Female.—Wing length 1.56 (1.38–1.73) mm; breadth 0.57 (0.51–0.61, $n = 5$) mm.

Head: Dark brown. Antenna (Fig. 28) with lengths of flagellar segments in proportion of 36–33–35–35–37–34–33–33–40–40–44–46–55; antennal ratio 0.80 (0.74–0.88, $n = 5$); proximal segments elongated, vasiform, with short distal necks. Palpus (Fig. 29) slender, lengths of segments in proportion of 20–25–50–34–24; palpal ratio 3.30 (3.15–3.45, $n = 5$); 3rd segment slightly swollen in midportion, pit irregular, shallow, opening by small rounded pore; distal $\frac{1}{4}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous erect, dark brown, bristly setae. Legs (Fig. 30) dark brown, knees yellowish; hind tibia with subbasal yellowish ring, fore and hind tibiae with apical yellowish rings; femora and tibiae stout; hind tibial comb (Fig. 35) with 9–10 spines, spur moderately short, nearly straight; tarsi dark brown, with narrow segmental pale

rings; hind tarsal ratio 0.95 (0.85–1.00, $n = 5$). Wing (Fig. 31) with dense vestiture of narrow appressed macrotrichia (Fig. 32) which are broader and more concentrated on radial veins and in radial cells; costal ratio 0.47 (0.46–0.48, $n = 5$). Halter knob whitish, stem brown.

Abdomen: Dark brown, with numerous erect brown setae. Genital sclerotization as in Fig. 34, without lateral spines. Spermathecae (Fig. 33) oval globose with short necks; slightly unequal, measuring 0.093×0.071 mm, and 0.087×0.063 mm.

Holotype male.—Wing length 1.91 mm; breadth 0.48 mm; costal ratio 0.44. Similar to female with usual sexual differences.

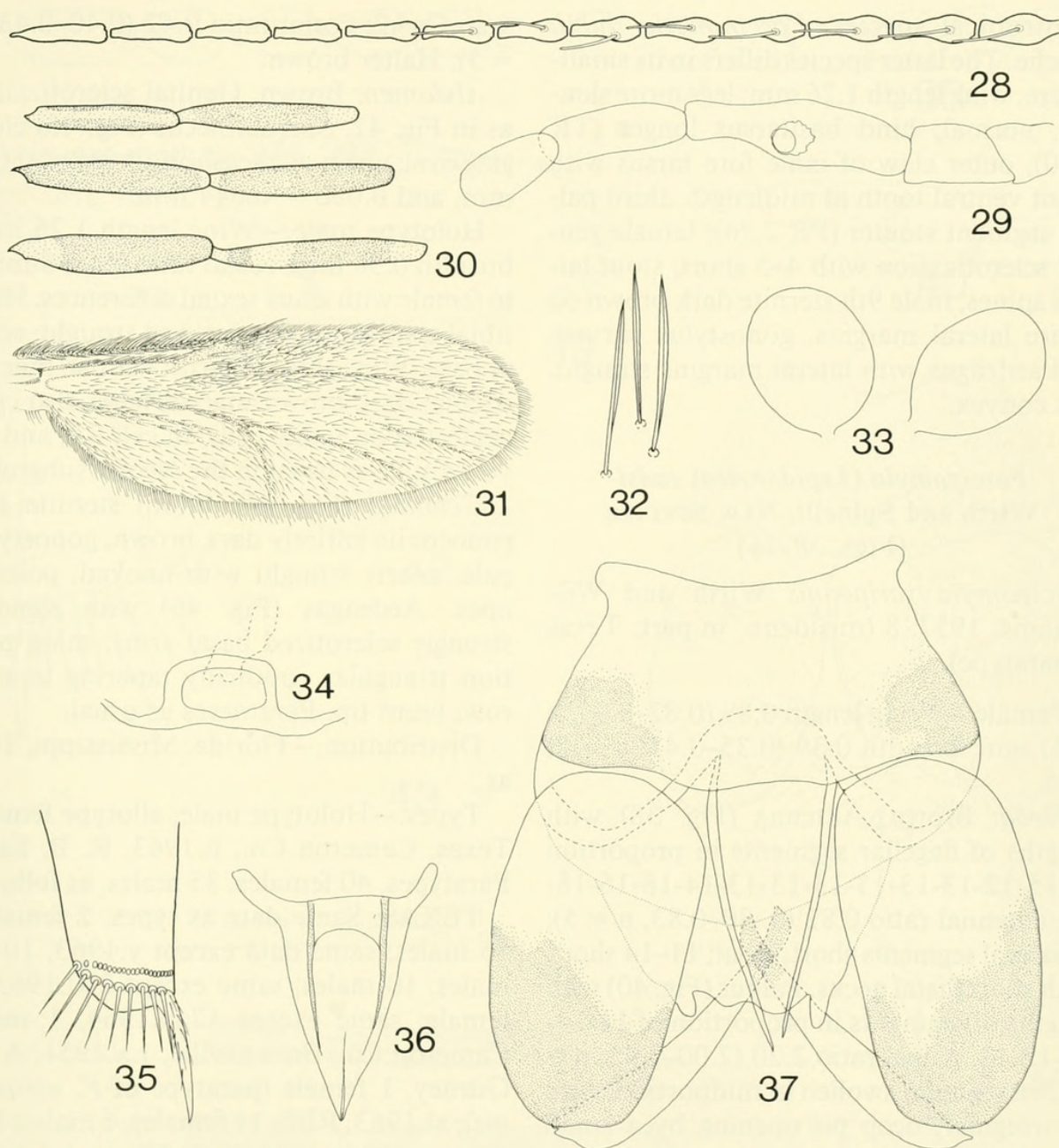
Genitalia (Fig. 37): Ninth sternite yellowish, dark brown lateroposteriorly; proximal $\frac{2}{3}$ of gonocoxite yellowish, distal $\frac{1}{3}$ dark brown; gonostylus slender, nearly straight, yellowish except tip dark. Aedeagus (Fig. 36) with basal arms moderately developed, main portion triangular, tapering to a sharp distal point, ventral surface with a more heavily sclerotized, distomedian, longitudinal line. Parameres as usual.

Distribution.—Florida, Maryland, North Carolina, Virginia, West Virginia.

Types.—Holotype male, Maryland, Montgomery Co., Colesville, 11.ix.1977, W. W. Wirth; allotype female, same data except 13.ix.1977. Paratypes, 16 females, 18 males, as follows:

FLORIDA: Alachua Co., Austen Carey St. Forest, Hatchet Creek, 13.v.1991, W. W. Wirth, 1 female. Highlands Co., Lake Placid, Archbold Biological Sta., 6.iv.1991, WWW, 6 females. Indian River Co., Vero Beach, Ent. Res. Cntr. iii.1953, (? collector), 1 male.

MARYLAND: Same data as holotype, 1 female, 4 males; same data as allotype, 2 females, 5 males; same data except 18.ix.1977, 2 males; same data except 22.vii.1975, 1 male. Wicomico Co., Salisbury, 13–20.vii.1992, W. L. Grogan, Jr., malaise trap, 1 female.



Figs. 28–37. *Forcipomyia dubiamima*; 28–35, female; 36, 37, male: 28, antenna; 29, palpus; 30, femora and tibiae of (top to bottom) fore, mid, and hind legs; 31, wing; 32, macrotrichia of wing, enlarged; 33, spermathecae; 34, genital sclerotization; 35, hind tibial comb; 36, aedeagus; 37, genitalia, aedeagus omitted.

NORTH CAROLINA: Macon Co., Highlands, Wightman Cottage, 10.vi.1986, WWW, 1 female. Transylvania Co., Lake Toxaway, 9–20.vii.1989, WWW, 2 females, 3 males.

VIRGINIA: Fairfax Co., Falls Church, 5.vii.1958, WWW, 1 male; Falls Church, Holmes Run, 5.ix.1961, WWW, 1 male; same data except 21.ix.1961, 1 female.

WEST VIRGINIA: Hardy Co., Lost River St. Park, 8–14.vii.1963, K. V. Krombein, 1 female.

Discussion.— This large, dark brown species can readily be distinguished from *F. acinacis*, *F. cochisei*, and *F. edmistonii* by the characters pointed out in the key.

The specific epithet, *dubiamima*, refers to the close similarity of this species to the

Neotropical species, *Forcipomyia dubia* Macfie. The latter species differs in its smaller size, wing length 1.26 mm; legs more slender, normal; hind basitarsus longer (TR 1.10); outer claw of male fore tarsus with blunt ventral tooth at midlength; third palpal segment stouter (PR 2.24); female genital sclerotization with 4–5 short, stout lateral spines; male 9th sternite dark brown on entire lateral margins, gonostylus curved, and aedeagus with lateral margins straight, not convex.

***Forcipomyia (Lepidohelea) eadsi*
Wirth and Spinelli, NEW SPECIES
(Figs. 38–46)**

Forcipomyia varipennis Wirth and Williams, 1957: 8 (misident., in part; Texas paratype).

Female.—Wing length 0.89 (0.82–0.99, $n = 5$) mm; breadth 0.39 (0.35–0.43, $n = 5$) mm.

Head: Brown. Antenna (Fig. 38) with lengths of flagellar segments in proportion of 15-12-13-13-13-13-13-14-16-16-16-26; antennal ratio 0.82 (0.80–0.83, $n = 5$); proximal segments short, stout; 11–14 short, with short distal necks. Palpus (Fig. 40) with lengths of segments in proportion of 11-14-29-12-12; palpal ratio 2.20 (2.00–2.45, $n = 5$); 3rd segment swollen in midportion, with an irregular, deep pit opening by a small rounded pore; distal $\frac{1}{4}$ moderately slender.

Thorax: Brown; scutum with dense, appressed, short, brassy scales. Legs (Fig. 45) brown; proximal $\frac{1}{2}$ of femora pale; knees pale; fore and hind tibiae with subbasal pale rings; all tibiae with distal pale rings, broader on fore and hind legs; hind tibial comb (Fig. 41) with nine spines; spur short, nearly straight; tarsi brown, with narrow segmental pale rings; hind tarsal ratio 1.00 ($n = 5$). Wing pale brown with prominent areas of narrow, dark brown, scalelike macrotrichia more concentrated on radial veins and in radial cells, in cell R5 beyond costa, and on

vein CuA2; costal ratio 0.42 (0.40–0.43, $n = 5$). Halter brown.

Abdomen: Brown. Genital sclerotization as in Fig. 42. Spermathecae (Fig. 43) elongate oval; unequal, measuring 0.068×0.046 mm, and 0.056×0.044 mm.

Holotype male.—Wing length 1.25 mm; breadth 0.38 mm; costal ratio 0.41. Similar to female with usual sexual differences. Hind tibial spur short, slender, and straight; scaly at base. Wing (Fig. 39) with whitish macrotrichia; dark brown macrotrichia also concentrated on radial cells, in cell R5, and on vein CuA2 as usual in the *bicolor* subgroup.

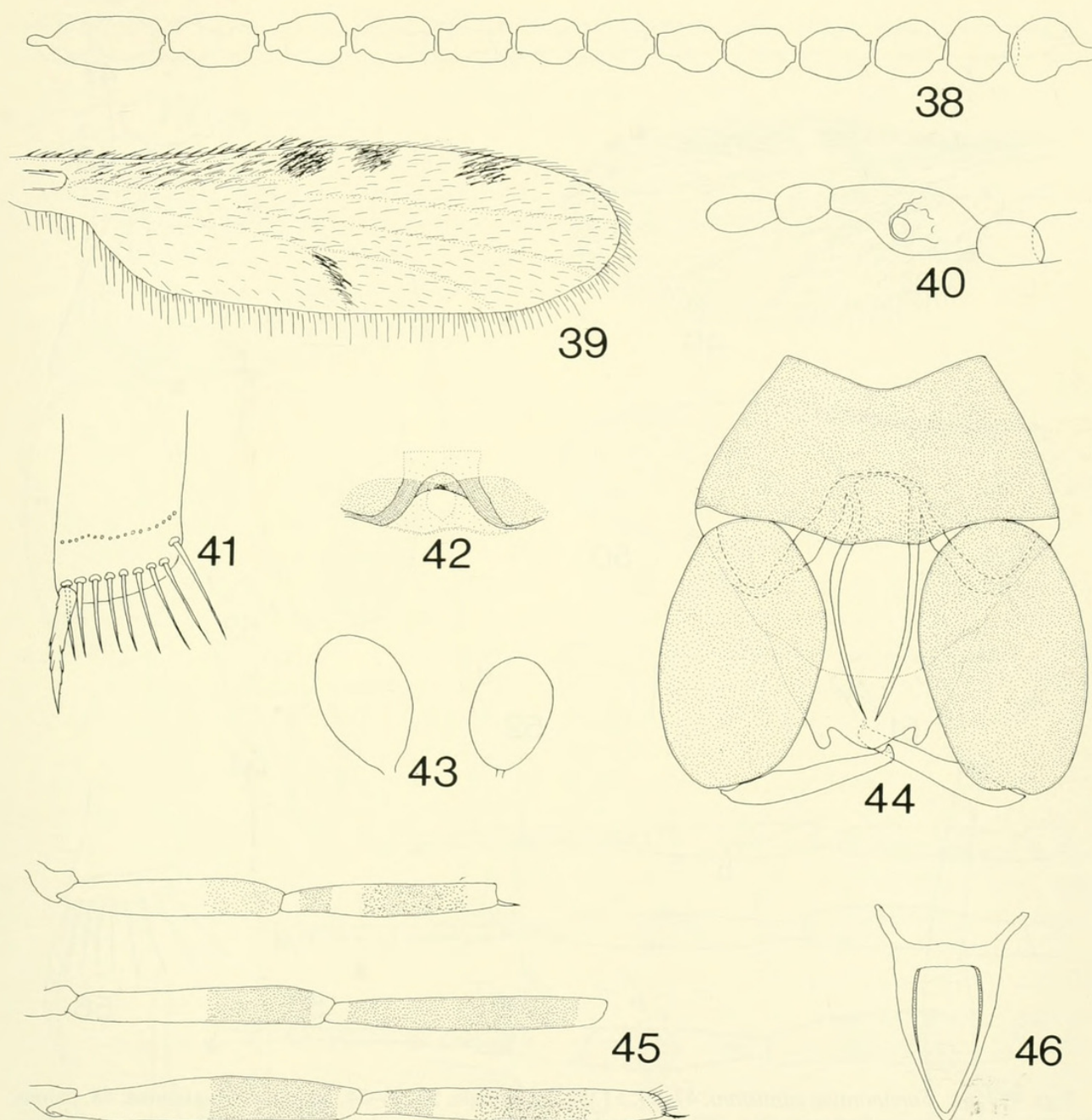
Genitalia (Fig. 44): Ninth sternite and gonocoxite entirely dark brown; gonostylus pale, nearly straight with hooked, pointed apex. Aedeagus (Fig. 46) with slender, strongly sclerotized basal arms; main portion triangular, gradually tapering to narrow, blunt tip. Parameres as usual.

Distribution.—Florida, Mississippi, Texas.

Types.—Holotype male, allotype female, Texas, Cameron Co., ii.1963, R. B. Eads. Paratypes, 40 females, 35 males, as follows:

TEXAS: Same data as types, 2 females, 15 males; same data except v.1963, 10 females, 10 males; same except 2.xi.1962, 1 female; same except 17.ix.1964, 1 male. Cameron Co., Brownsville, 1.x.1951, A. B. Gurney, 1 female (paratype of *F. varipennis*); xi.1963, RBE, 11 females, 6 males; Los Fresnos, 10.ix.1978, B. L. Davis, 1 female. Hildago Co., Weslaco, 15.viii.1963, J. W. Balock, 1 male; same data except 12.ix.1963, 1 male. Kerr Co., Kerrville, 1.iv.1955, W. W. Wirth, 1 female. Starr Co., Rio Grande City, 25.vi.1959, V. H. Lee, 12 females. Val Verde Co., Del Rio, 24.ix.1963, RBE, 1 female.

Other specimens examined (not designated paratypes).—FLORIDA: Alachua Co., Gainesville, Chantilly Acres, 8.v.1967, F. S. Blanton, 1 male; Gainesville, Oak Crest, vi,x,xi.1986, W. W. Wirth, UV light trap, 4 males. Dade Co., Homestead,



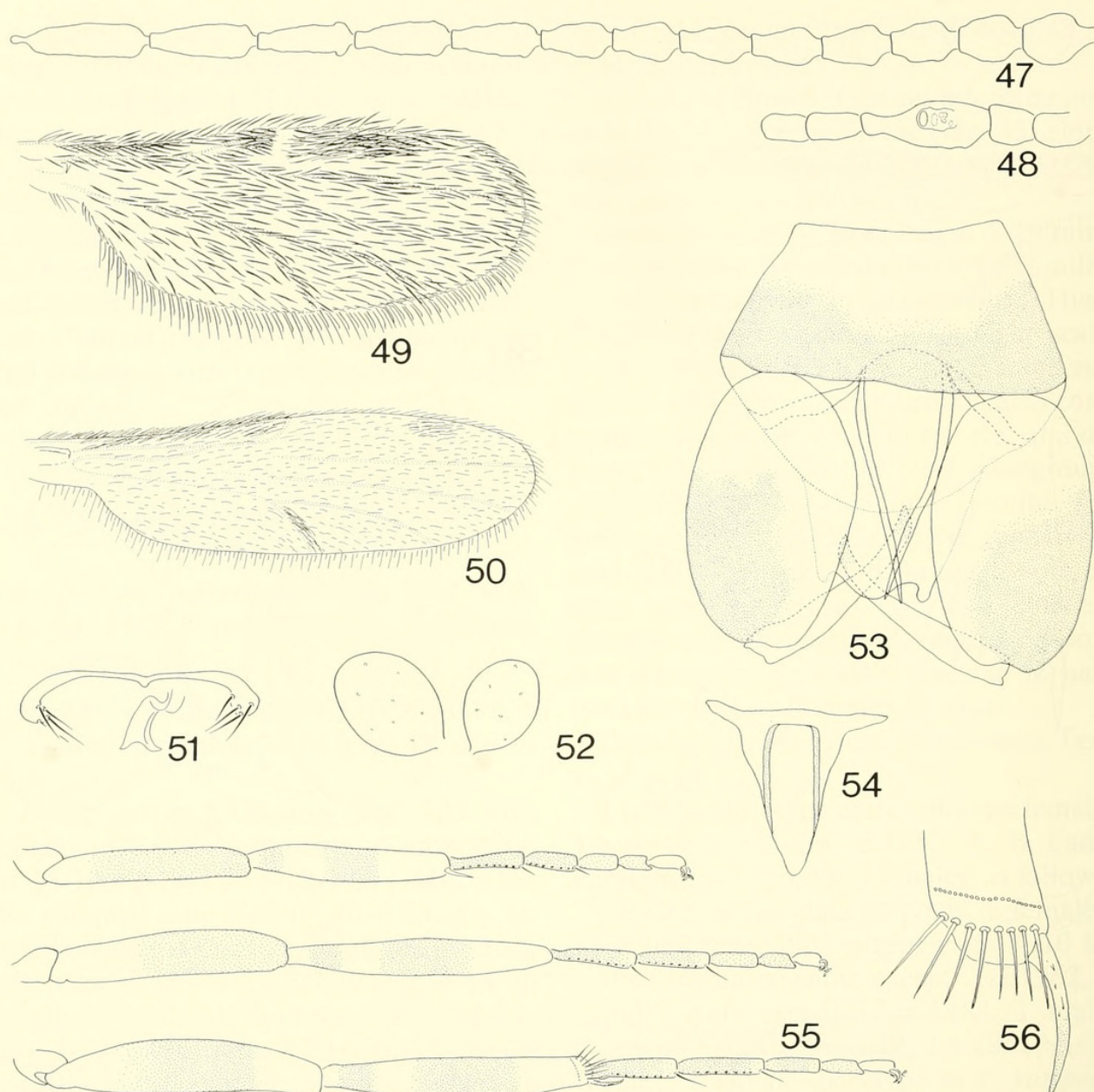
Figs. 38–46. *Forcipomyia eadsi*; 38, 40–43, 45, female; 39, 44, 46, male: 38, antenna; 39, wing; 40, palpus; 41, hind tibial comb; 42, genital sclerotization; 43, spermathecae; 44, genitalia, aedeagus omitted; 45, femora and tibia of (top to bottom) fore, mid, and hind legs; 46, aedeagus.

17.x.1984, R. Woodruff & L. Stange, 1 female, 1 male. Hardee Co., Ona, vii.1970, E. Irons, 2 males. Highlands Co., Lake Placid, Archbold Biol. Sta., iv, ix.1989, ix.1990, 1.iv.1991, WWW, UV light trap, 3 females, 14 males. Indian River Co., Vero Beach, iii.1959, Ent. Res. Ctr. light trap, 1 male. Jackson Co., Florida Caverns St. Park,

26.v.1973, WWW, UV light trap, 1 male. Liberty Co., Torreya St. Park, 15.iv.1957, 7.iv.1958, FSB, 2 males. Orange Co., Maitland, Lake Hope, 25.viii.1986, UV light trap, 1 male.

MISSISSIPPI: Washington Co., vi.1962, R. H. Roberts, 1 male.

Discussion.—This species is dedicated to



Figs. 47-56. *Forcipomyia edmistoni*; 47-49, 51, 52, 55, female; 50, 53-54, 56, male: 47, antenna; 48, palpus; 49, 50, wing; 51, genital sclerotization; 52, spermathecae; 53, genitalia, aedeagus omitted; 54, aedeagus; 55, fore, mid, and hind legs (top to bottom); 56, hind tibial comb.

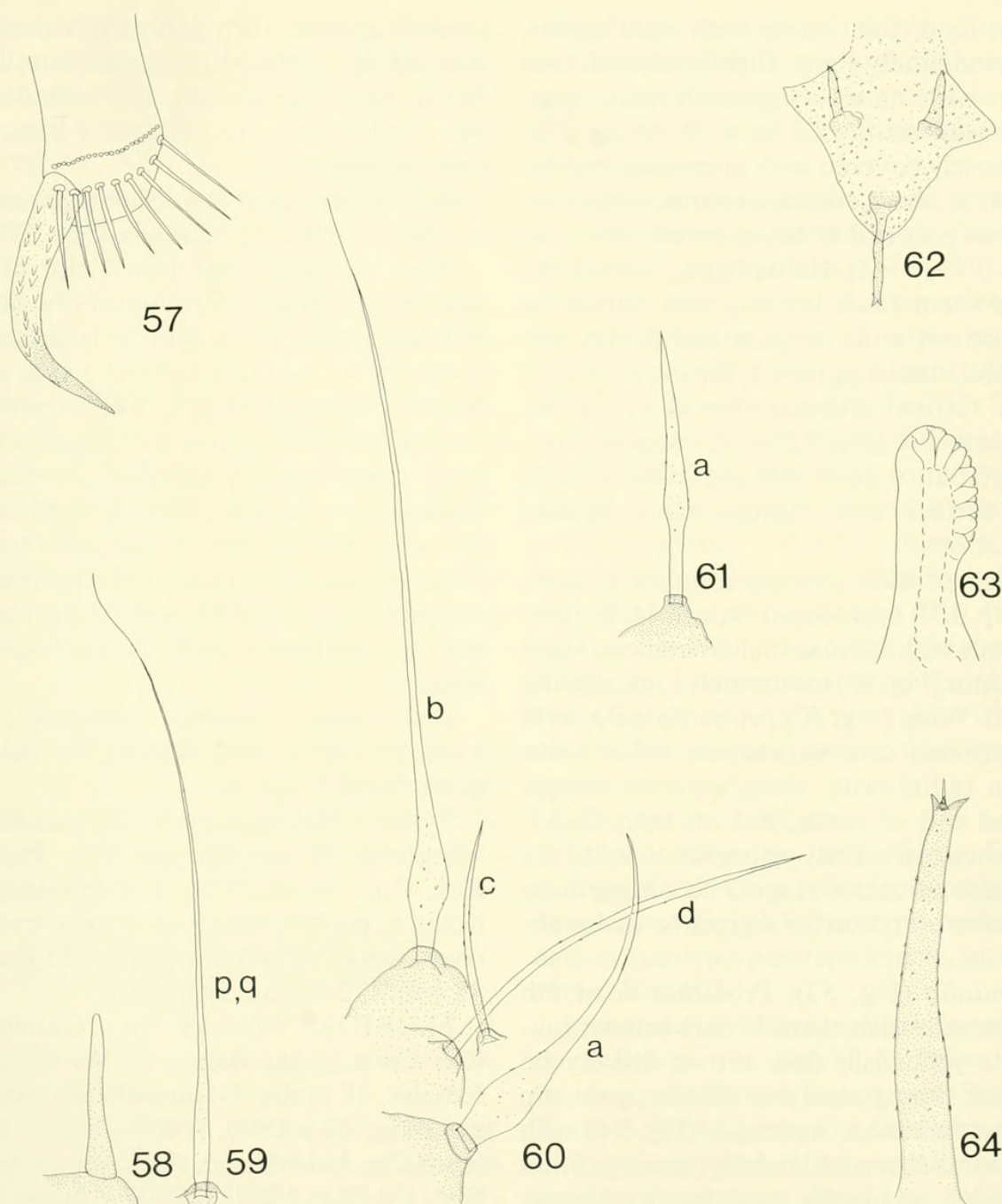
Richard B. Eads of the Texas Department of Health in recognition of his continued interest in the collection and study of Texas biting midges.

Forcipomyia eadsi is a small species, readily distinguished from related congeners except *F. varipennis* by the short flagellar segments 11-14, which are but slightly longer than the proximal segments; in *varipennis* the third palpal segment is swollen to the tip.

***Forcipomyia (Lepidohelea) edmistoni*
Wirth and Spinelli, NEW SPECIES
(Figs. 47-56, 58-64)**

Female.—Wing length 1.09 (1.00-1.17, $n = 5$) mm; breadth 0.43 (0.39-0.46, $n = 5$) mm.

Head: Dark brown; with numerous erect, bristly setae. Antenna (Fig. 47) with lengths of flagellar segments in proportion of 21-19-18-18-18-18-18-18-24-25-27-29-39;



Figs. 57-64. 57, *Forcipomyia acinacis*; 58-64, *F. edmistoni*; 57, male hind tibial comb; 58-61, larva; 62-64, pupa: 58, antenna; 59, head hair *p* (*q* hair similar); 60, body hairs of prothorax; 61, *a* hair of remaining body segments; 62, operculum; 63, respiratory horn; 64, cuticular process of cephalothorax.

antennal ratio 0.94 (0.88-0.97, $n = 5$); proximal segments short, 11-14 elongated, vase-shaped with short distal necks. Palpus (Fig. 48) with lengths of segments in proportion of 13-15-33-15-13; palpal ratio 2.70 (2.60-2.80, $n = 5$); 3rd segment moderately swollen in midportion, with a deep irregular pit opening by a small pore; distal $\frac{1}{4}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous, mixed brown and yellowish, bristly setae. Legs (Fig. 55) brown; with numerous, very long, brown and yellowish, erect, bristly setae, and elongate, appressed, brownish scales; femora pale at bases, hind femur also pale at apex (variable); tibiae with subbasal and apical pale

bands; hind tibial comb with eight spines, spur moderately short, slightly curved; tarsi brown with narrow segmental pale rings; hind tarsal ratio 1.00 ($n = 5$). Wing (Fig. 49) densely covered with appressed macrotrichia; a small, inconspicuous, yellowish spot just past end of costa; costal ratio 0.48 (0.46–0.49, $n = 5$). Halter lightly infuscated.

Abdomen: Dark brown, with numerous erect brown setae; tergites and pleura also with abundant, appressed, brown, 1-striated scales. Genital sclerotization as in Fig. 51. Spermathecae (Fig. 52) oval; unequal, measuring 0.086×0.058 mm and 0.068×0.053 mm, surface with minute, faint, hyaline punctations.

Holotype male.—Wing length 1.40 mm; breadth 0.38 mm; costal ratio 0.44. Similar to female with usual sexual differences. Hind tibial spur (Fig. 56) moderately long, slightly curved. Wing (Fig. 50) primarily pale, with macrotrichia concentrated on radial veins and in radial cells, along anterior margin beyond end of costa, and on vein CuA2. Abdomen extensively yellowish dorsally, the brownish apicolateral spots becoming more extensive on posterior segments; scales absent.

Genitalia (Fig. 53): Proximal $\frac{1}{2}$ of 9th sternite yellowish, distal $\frac{1}{2}$ dark brown; gonocoxite yellowish, dark brown distally on external side; gonostylus slender, pale, tip slightly darkened. Aedeagus (Fig. 54) with basal arms directed laterally; main portion triangular, gradually tapering to bluntly pointed tip, ventral surface with a pair of widely spaced, more heavily sclerotized, longitudinal lines. Parameres as usual.

Larva.—Length 2.40 mm. Color yellowish, including head capsule, which becomes conspicuously blackish toward oral margin; conical prominences at bases of dorsal body setae moderately brownish pigmented. Chaetotaxy:

Head: Antenna (Fig. 58) stout, pale, tip blunt. Setae *p* and *q* (Fig. 59) pale, large, slightly swollen at base, gradually tapering to filiform tips.

Prothorax (Fig. 60): *a* seta pale, greatly

swollen at base, then gradually tapering to pointed tip, surface lightly spiculate; *b* seta like *a*, but twice as long and with filiform tip; *c* pale, stout, tip pointed; *d* like *c*, but twice as long.

Remaining segments: As in prothorax except for *a*, which is petiolate (Fig. 61).

Pupa.—Length 2.60 mm. Color of exuviae pale yellowish. Respiratory horn (Fig. 63) short, dark brown, with 8–10 distolateral spiracular openings located on the external side. Operculum (Fig. 62) rhomboidal, surface covered by rounded tubercles (scattered in midportion); anterior tubercle long, bearing fine spicules, apex divided in two or three sharp points; *am* tubercles stouter. Thoracic and abdominal tubercles (Fig. 64) resembling anterior tubercle of operculum, with an additional pale, pointed spine at apex.

Distribution.—Florida, Maryland, New York, North Carolina, South Carolina, Virginia, West Virginia.

Types.—Holotype male, allotype female, Maryland, Prince Georges Co., Patuxent Res. Ctr., 28.vii.1979, J. Edmiston (collected as pupae under bark of dead tree near river, reared in lab). Paratypes, 25 females, 43 males, 2 larvae, as follows:

FLORIDA: Alachua Co., Gainesville, Oak Crest, many dates, W. W. Wirth, 10 females, 18 males; Gainesville, Doyle Conner Bldg., 12.v.1990, WWW, 1 male. Highlands Co., Lake Placid, Archbold Biological Sta., 13–19.iv.1989, WWW, 2 males; same data except 8.ix.1989, 1 male; same except 1.v.1991, 1 male. Jefferson Co., Monticello, v.1969, W. H. Whitcomb, 2 females. Levy Co., Yankeetown, 29.iii.1982, A. Wilkening, 1 male.

MARYLAND: Same data as types, 2 females, 6 females, 2 larvae. Garrett Co., Bittinger 4-H Camp, 5.v.1960, WWW, 4 females. Montgomery Co., Colesville, many dates, WWW, 9 males; Fairland, 12.v.1959, A. A. Hubert, 1 female.

NEW YORK: Cattaraugus Co., Allegany St. Park, 28.v–3.vi.1963, WWW, reared from larvae under bark of maple

stump in flood plain of Allegany River, 1 female, with pupal exuviae. Essex Co., Newcomb, Lake Harris, 19.viii.1972, L. Knutson, 1 female.

NORTH CAROLINA: Macon Co., Highlands, Wightman Cottage, 5.vii.1987, WWW, 1 female, 1 male; Highlands, vii.1965, P. M. Marsh, 1 female.

SOUTH CAROLINA: Georgetown Co., Hobcaw House, viii.1972, L. Henry, 1 female.

VIRGINIA: Fairfax Co., Falls Church, Holmes Run, 17.x.1960, WWW, 2 males; same data except 3.x.1961, 1 female.

WEST VIRGINIA: Hardy Co., Lost River St. Park, 10.vii.1977, WWW, 1 male.

Discussion.—This species is named for James Edmiston, former graduate student at the University of Maryland, College Park, in recognition of his interest in the collection and study of biting midges.

Forcipomyia edmiston is very similar to *F. acinacis* and *F. cochisei*. Characters for separating the three species are found in the key and in the discussions under the two related species.

***Forcipomyia (Lepidohelea) pricei*
Wirth and Spinelli, NEW SPECIES**
(Figs. 65–72)

Allotype female.—Wing length 1.06 mm; breadth 0.40 mm.

Head: Dark brown. Antenna (Fig. 65) with lengths of flagellar segments in proportion of 12-11-13-14-13-12-12-13-16-17-18-17-24; antennal ratio 0.92; proximal segments stout with short distal necks, 11–14 vase-shaped with short distal necks. Palpus (Fig. 66) with lengths of segments in proportion of 10-12-27-14-11; palpal ratio 2.70; 3rd segment swollen in midportion, with irregular deep pit opening by a small, round pore; distal ¼ slender.

Thorax: Dark brown. Legs dark brown, hind leg darker; knees pale; tibiae with sub-basal pale rings; hind tibial comb (Fig. 67) with 8 spines, spur moderately short. Tarsi dark brown with very narrow segmental pale rings; hind tarsal ratio 0.78. Wing (Fig. 68)

with dense vestiture of narrow appressed macrotrichia, which are broader and more concentrated on radial veins and in radial cells; costal ratio 0.37. Halter knob whitish, stem brown.

Abdomen: Dark brown, with numerous erect brown setae. Genital sclerotization as in Fig. 69. Spermathecae (Fig. 70) ovoid with short necks; unequal, measuring 0.076×0.045 mm and 0.061×0.041 mm.

Holotype male.—Wing length 1.02 mm; breadth 0.30 mm; costal ratio 0.38. Similar to female with usual sexual differences.

Genitalia (Fig. 71): Ninth sternite yellowish, dark brown lateroposteriorly; proximal ½ of gonocoxite yellowish, distal 1.2 dark brown; gonostylus nearly straight, pale with dark pointed apex. Aedeagus (Fig. 72) with basal arms well developed, main portion triangular, coming to a sharp distal point, ventral surface with a more heavily sclerotized, distomedian, longitudinal line. Parameres as usual.

Distribution.—Texas.

Types.—Holotype male, Texas, Sonora, ix.1954, D. A. Price; allotype female, same data except ix.1953. Paratype male, same data as holotype; paratype female, same data except 8.xi.1053.

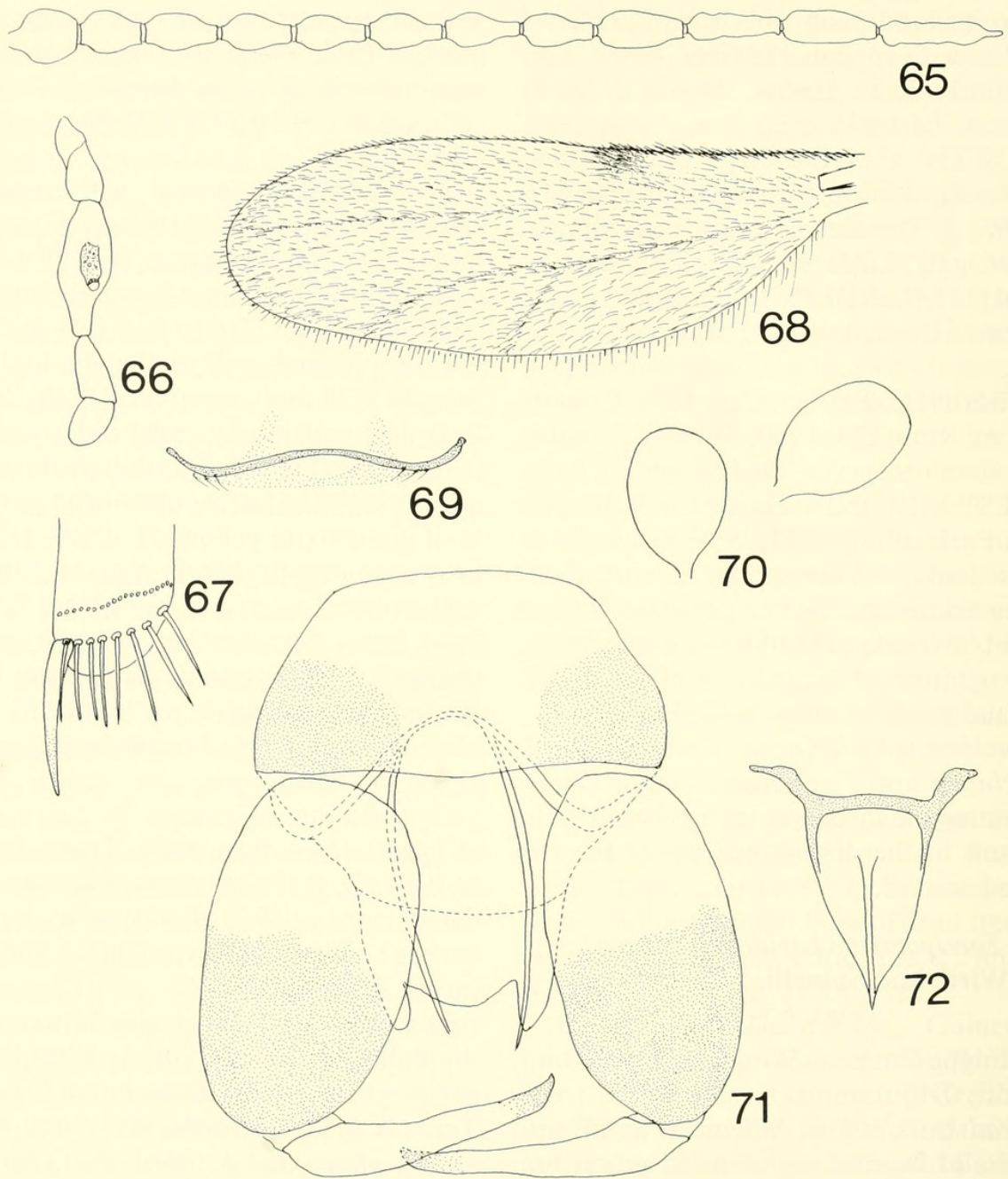
Discussion.—This species is named for the collector, Dr. David A. Price, veterinarian at the Sonora Experiment Station of Texas A & M University. It is very similar to *F. acinacis* and *F. edmiston*; characters to separate it from these two species are given in the key.

***Forcipomyia (Lepidohelea) usingeri*
Wirth and Spinelli, NEW SPECIES**
(Figs. 1–7, 73–81)

Forcipomyia cinctipes (Coquillett); Wirth, 1952: 128 (in part, California specimens).

Female.—Wing length 1.25 (1.03–1.38, $n = 5$) mm; breadth 0.49 (0.42–0.53, $n = 5$) mm.

Head: Dark brown. Antenna (Fig. 73) with lengths of flagellar segments in proportion of 22-18-18-18-20-20-20-20-26-26-26-26-



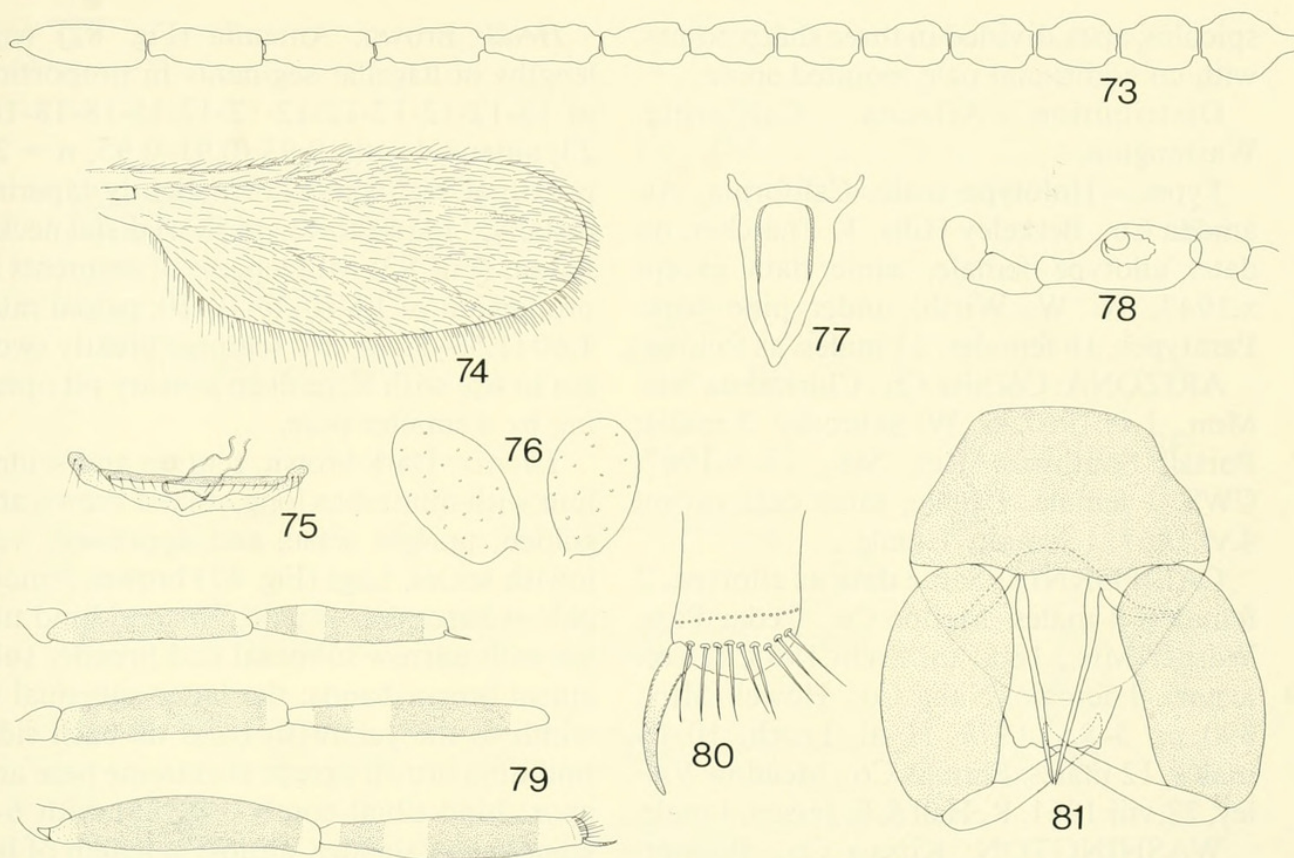
Figs. 65–72. *Forcipomyia pricei*; 65–70, female; 71, 72, male: 65, antenna; 66, palpus; 67, hind tibial comb; 68, wing; 69, genital sclerotization; 70, spermathecae; 71, genitalia, aedeagus omitted; 72, aedeagus.

32; antennal ratio 0.89 (0.84–0.92, $n = 5$); proximal segments stout with short distal necks, 11–14 vase-shaped with short distal necks. Palpus (Fig. 78) with lengths of segments in proportion of 10–13–40–15–14; palpal ratio 2.90 (2.70–3.10, $n = 4$); 3rd segment swollen in midportion, with irregular deep pit opening by a round pore; distal $\frac{1}{4}$ slender.

Thorax: Dark brown. Scutum and scutellum with numerous dark bristly setae.

Legs (Fig. 79) dark brown; narrow bases of femora slightly paler; knees pale; tibiae with subbasal and apical pale rings; hind tibial comb with nine spines, spur stout, curved; tarsi brown with narrow segmental pale rings; hind tarsal ratio 1.15 (1.05–1.20, $n = 5$). Wing (Fig. 74) densely covered with dark brown macrotrichia, a small pale spot past radius and costa; costal ratio 0.46 (0.44–0.48, $n = 5$). Halter pale.

Abdomen: Dark brown, with numerous



Figs. 73–81. *Forcipomyia usingeri*; 73–76, 78, 79, female; 77, 80, 81, male: 73, antenna; 74, wing; 75, genital sclerotization; 76, spermathecae; 77, aedeagus; 78, palpus; 79, femora and tibiae of (top to bottom) fore, mid, and hind legs; 80, hind tibial comb; 81, genitalia, aedeagus omitted.

erect brown setae. Genital sclerotization as in Fig. 75. Spermathecae (Fig. 76) oval with short slender necks; unequal, measuring 0.084×0.051 and 0.069×0.048 mm, surface with very small, faint, pale punctations.

Holotype male.—Wing length 1.48 mm; breadth 0.49 mm; costal ratio 0.48. Similar to female with usual sexual differences. Hind tibial spur (Fig. 80) stout, curved, 0.34 as long as basitarsus. Wing primarily pale, macrotrichia more concentrated on radial veins and in radial cells, along anterior margin beyond end of costa, and on vein CuA2.

Genitalia (Fig. 81): Ninth sternite and gonocoxite entirely dark brown; gonostylus entirely whitish, slender with curved, pointed tip. Aedeagus (Fig. 77) with slender, strongly sclerotized basal arms; main portion stout, triangular, gradually tapering to pointed tip. Parameres as usual.

Larva (Fig. 1).—Length 3.70 mm. Color pale brownish, head capsule conspicuously

blackish toward oral margin; conical prominences at bases of dorsal body hairs dark brown. Antenna stout, pale, tip blunt. Chaetotaxy:

Head (Fig. 7): Setae *p* and *q* pale, large, slightly swollen at base, tip filiform.

Prothorax (Fig. 5): Seta *a* pale, swollen at base, gradually tapering to pointed tip; *b* pale, twice as long as *a*, very slightly swollen at base, tip filiform; *c* pale, stout, curved, tip pointed; *d* pale, nearly straight, arising from same tubercle as *b*, nearly as long as *c*, tip pointed.

Remaining segments (Fig. 6): As on prothorax except for *a*, which is short-petiolate and slender.

Pupa (Fig. 2).—Length 2.55 mm. Color of exuviae brown. Respiratory horn (Fig. 4) short, bulbous at apex, with eight apicolateral spiracular openings. Thoracic and abdominal tubercles in form of dark brown elongate processes (Fig. 3), surface with fine

spicules; apex divided in three sharp points, with an additional pale, pointed spine.

Distribution.—Arizona, California, Washington.

Types.—Holotype male, California, Alameda Co., Berkeley Hills, T. Thatcher, no date; allotype female, same data except x.1947, W. W. Wirth, under pine bark. Paratypes, 16 females, 21 males, as follows:

ARIZONA: Cochise Co., Chiricahua Nat. Mon., 1.vi.1967, C. W. Sabrosky, 3 males; Portal, Southwest Res. Sta., 23.v.1967, CWS, 1 female, 1 male; same data except 4.vi.1967, 1 female, 1 male.

CALIFORNIA: Same data as allotype, 2 females, 2 males. Modoc Co., Cedar Pass, Warner Mts., 1800 m, 8.viii.1965, (? collector), 1 female. Napa Co., Howell Mtn., 390 m, 5–8.vi.1978, H. B. Leech, 10 females, 12 males. Plumas Co., Meadow Valley, 22.viii.1961, R. Hall & E. Jessen, 1 male.

WASHINGTON: Kitsap Co., Bremer-ton, 17.ii.1975, M. Deyrup, 1 female, 1 male.

Discussion.—This species is named in honor of Robert L. Usinger, Professor of Entomology at the University of California, Berkeley, who directed the senior author's graduate research on biting midges and inspired him and dozens of other students and other workers in systematic entomology. Professor Usinger's death from cancer at an early age was a tragic loss to the field of entomology worldwide.

Forcipomyia usingeri is nearly identical with *F. christiansoni*; the characters separating the two species are given in the key and in the discussion under *F. christiansoni*.

Forcipomyia (Lepidohelea) varipennis

Wirth and Williams

(Figs. 82–91)

Forcipomyia varipennis Wirth and Williams, 1957: 8 (female; Bermuda, Puerto Rico, Guatemala (misident.), Texas (misident.).

Female.—Wing length 0.74 (0.67–0.81, $n = 2$) mm.

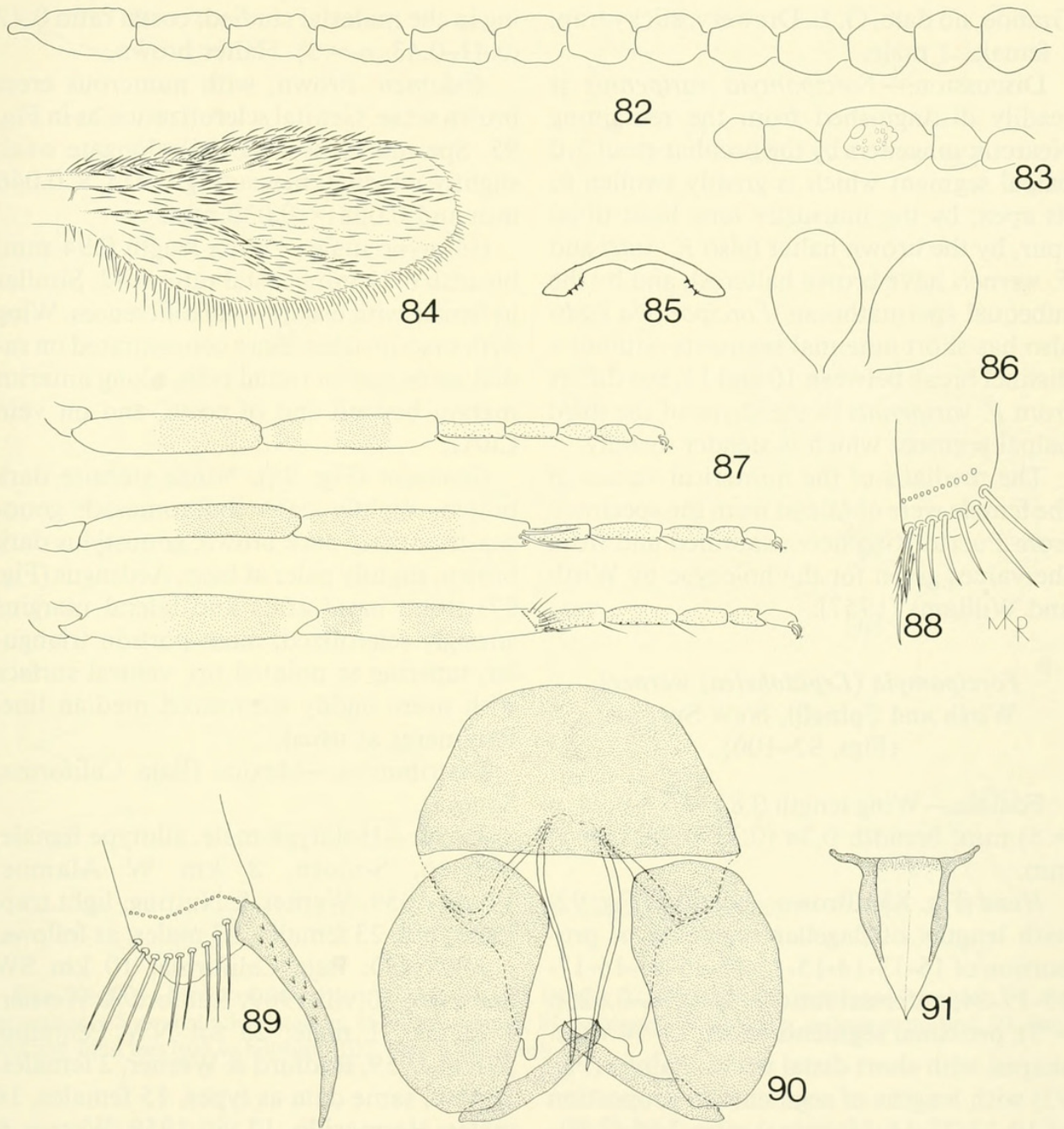
Head: Brown. Antenna (Fig. 82) with lengths of flagellar segments in proportion of 13-12-12-12-12-12-12-12-15-18-18-23; antennal ratio 0.93 (0.91–0.95, $n = 2$); proximal segments short, slightly tapering distally, 11–14 short with short distal necks. Palpus (Fig. 83) with lengths of segments in proportion of 10-10-20-10-10; palpal ratio 1.60 (1.50–1.70); 3rd segment greatly swollen to tip, with large deep sensory pit opening by a smaller pore.

Thorax: Dark brown, scutum and scutellum with numerous long, mixed brown and golden, upright setae, and appressed, yellowish scales. Legs (Fig. 87) brown; femora pale at bases, knees pale; fore and hind tibiae with narrow subbasal and broader subapical brown bands, the latter subequal in width to the yellowish band on each side; mid tibia brown except at extreme base and apex; hind tibial comb (Fig. 88) with 6–7 spines, spur slender, almost $\frac{1}{2}$ length of basitarsus, slightly curved, pigmented distally, scaly at base; tarsi brown with narrow segmental yellowish bands; hind tarsal ratio 1.00 ($n = 2$). Wing (Fig. 84) with abundant long, striated, blackish scale-like macrotrichia; with small, yellowish anterior spot past end of costa and irregular, diffuse, paler areas on distal and posterior portions; cosal ratio 0.41. Halter brown.

Abdomen: Dark brown, with numerous dark brown hairs and slender scales. Genital sclerotization as in Fig. 85. Spermathecae (Fig. 86) elongate oval; subequal, each measuring 0.055×0.035 mm.

Holotype male.—Wing length 1.14 mm; breadth 0.36 mm; costal ratio 0.43. Similar to female with usual sexual differences; hind tibial comb (Fig. 89) with nine spines; spur very long and curved distally.

Genitalia (Fig. 90): Ninth sternite dark brown, slightly paler anteriorly; gonocoxite and gonostylus entirely dark brown (gonostylus paler in the specimens from Vero Beach). Aedeagus (Fig. 91) with nearly horizontal basal arms; main portion triangular, lateral sides subparallel anteriorly, coming



Figs. 82–91. *Forcipomyia varipennis*; 82–88, female; 89–91, male: 82, antenna; 83, palpus; 84, wing; 85, genital sclerotization; 86, spermathecae; 87, fore, mid, and hind legs (top to bottom); 88, 89, hind tibial comb; 90, genitalia, aedeagus omitted; 91, aedeagus.

to a sharp distal point, ventral surface with a more heavily sclerotized, medial longitudinal line. Parameres as usual, but anterior arch poorly sclerotized.

Distribution.—Bermuda, Florida, Puerto Rico.

Type.—Holotype female, Bermuda, Warwick Pond, 4.vii.1955, R. W. Williams, recovery cage.

Specimens examined.—FLORIDA: Alachua Co., Austen Carey St. Forest, Hatchet Creek, 13.v.1991, W. W. Wirth, malaise trap, 5 females, 3 males. Dade Co., Orchid Jungle, v–vi.1969, R. M. Baranowski, UV light trap, 1 female. Indian River Co., Vero Beach, vii.x.1958, Ent. Res. Ctr. light trap, 1 female, 1 male.

PUERTO RICO: El Verde Barrio Rio

Grande, no date, G. E. Drewery, sticky trap, 1 female, 1 male.

Discussion.—*Forcipomyia varipennis* is readily distinguished from the remaining Nearctic congeners by the peculiar stout 3rd palpal segment which is greatly swollen to its apex, by the unusually long hind tibial spur, by the brown halter (also *F. eadsi* and *F. werner* have brown halteres), and by the subequal spermathecae. *Forcipomyia eadsi* also has short antennal segments without a distinct break between 10 and 11, but differs from *F. varipennis* in the shape of the third palpal segment which is slender distally.

The medians of the numerical values of the female were obtained from the specimen from Puerto Rico here examined and from the values given for the holotype by Wirth and Williams (1957).

***Forcipomyia (Lepidohelea) werner*
Wirth and Spinelli, NEW SPECIES
(Figs. 92–100)**

Female.—Wing length 0.83 (0.77–0.94, $n = 5$) mm; breadth 0.34 (0.31–0.36, $n = 5$) mm.

Head (Fig. 83): Brown. Antenna (Fig. 92) with lengths of flagellar segments in proportion of 15-13-14-15-15-15-15-16-17-17-17-24; antennal ratio 0.78 (0.74–0.82, $n = 5$); proximal segments short, 11-14 vase-shaped with short distal necks. Palpus (Fig. 93) with lengths of segments in proportion of 10-13-27-14-11; palpal ratio 2.65 (2.50–2.70, $n = 5$); 3rd segment slightly swollen in midportion, with irregular shallow pit opening by a small pore; distal $\frac{1}{4}$ moderately slender.

Thorax: Brown. Legs (Fig. 99) brown, hind legs darker; fore and mid femora and proximal $\frac{1}{2}$ of hind femur pale; knees pale; tibiae with subbasal and apical pale rings; hind tibial comb (Fig. 100) with seven spines, spur slender and curved; tarsi pale yellowish, tarsomeres 1–2 of hind leg slightly darker; hind tarsal ratio 1.15 (1.10–1.20, $n = 5$). Wing apparently densely covered by macrotrichia, but many macrotrichia miss-

ing in the material studied; costal ratio 0.42 (0.41–0.43, $n = 5$). Halter brown.

Abdomen: Brown, with numerous erect brown setae. Genital sclerotization as in Fig. 95. Spermathecae (Fig. 96) elongate oval; slightly unequal, measuring 0.074×0.046 mm and 0.068×0.030 mm.

Holotype male.—Wing length 0.94 mm; breadth 0.31 mm; costal ratio 0.42. Similar to female with usual sexual differences. Wing with macrotrichia more concentrated on radial veins and in radial cells, along anterior margin beyond end of costa, and on vein CuA2.

Genitalia (Fig. 98): Ninth sternite dark brown, slightly paler anteromesad; gonocoxite entirely dark brown; gonostylus dark brown, slightly paler at base. Aedeagus (Fig. 97) stout, basal arms and lateral margins strongly sclerotized, main portion triangular, tapering to pointed tip; ventral surface with more highly sclerotized median line. Parameres as usual.

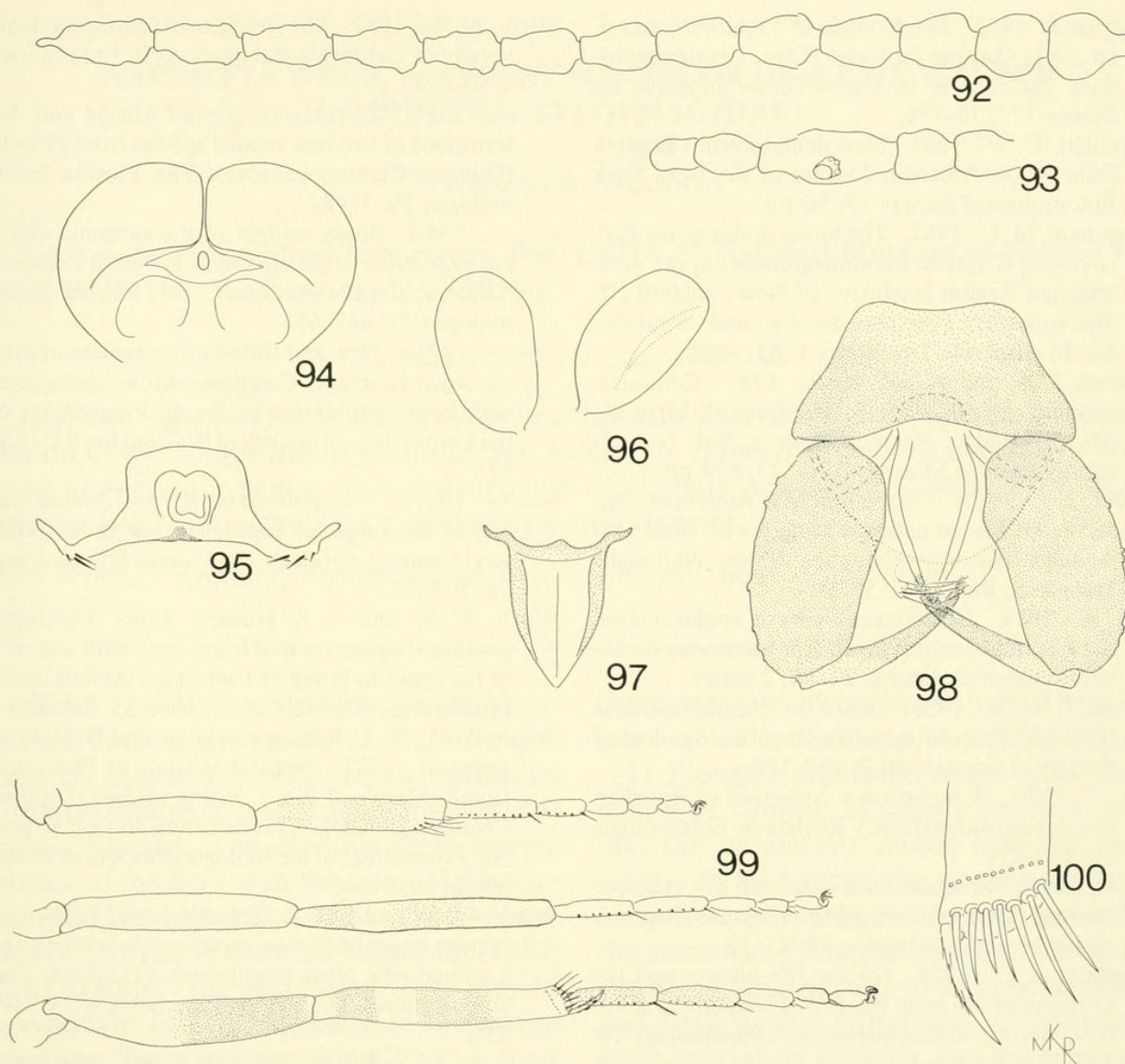
Distribution.—Mexico (Baja California, Sonora).

Types.—Holotype male, allotype female, Mexico, Sonora, 8 km W Alamos, 14.viii.1959, Werner & Nutting, light trap. Paratypes, 23 females, 27 males, as follows:

MEXICO: Baja California, 10 km SW Santiago, 30.viii.1989, Radford & Werner, 1 female, 1 male; 25 mi NW Penjamo, 29.viii.1959, Radford & Werner, 2 females. Sonora, same data as types, 15 females, 16 males; Hermosillo, 12.viii.1959, Werner & Nutting, 1 male; 16 km E Navajoa, 13.viii.1959, Werner & Nutting, 5 females, 9 males.

Discussion.—This species is dedicated to Floyd Werner of Arizona State University in appreciation of his long and continued interest in the collection and study of biting midges of the desert southwest.

Forcipomyia werner can be distinguished from its Nearctic congeners (except *F. varipennis*) by its brown halter. It differs from *F. varipennis* in the slender 3rd palpal segment and shorter hind tibial spur, and from *F. eadsi* by the dark brown gonocoxite.



Figs. 92–100. *Forcipomyia wernerī*; 92–96, 99, 100, female; 97, 98, male: 92, antenna; 93, palpus; 94, eye separation; 95, genital sclerotization; 96, spermathecae; 97, aedeagus; 98, genitalia, aedeagus omitted; 99, fore, mid and hind legs (top to bottom); 100, hind tibial comb.

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