

Issued



by the

SMITHSONIAN INSTITUTION
U. S. NATIONAL MUSEUM

Vol. 103

Washington: 1953

No. 3320

AMERICAN BITING MIDGES OF THE HELEID GENUS
MONOHELEABy WILLIS W. WIRTH¹

The genus *Monohelea* was founded by Kieffer (1917) for a new species, *hieroglyphica*, from Paraguay, and three other American species were included: *Ceratopogon sequax* Williston, 1896; *C. maculipennis* Coquillett, 1905; and *C. nebulosa* Coquillett, 1901. Since then a number of species have been added to the genus, including representatives from each of the world's zoogeographic regions. However, with the exception of Lee's (1948) treatment of the eight Australasian species, no comprehensive paper on the genus has yet appeared.

A study of the American *Monohelea* has resulted in the recognition of 7 undescribed species, bringing the total for the hemisphere to 13. No doubt many more await discovery. These American species fall in four distinct groups, each with characteristic wing and leg markings. Within these groups the species are rather difficult to separate, for the characters which prove useful in one group may be valueless in others. These groups may also be recognized by characters of the male genitalia, which offer in addition good specific characters.

The generic position of *Ceratopogon sequax* Williston, based on a male from St. Vincent, cannot be determined with certainty until the male genitalia or the female are studied. According to the original description, *sequax* would probably fit as well in *Stilobezzia*. Similarly, the male recorded as *Monohelea* sp. by Floch and Abonnenc (1942) from French Guiana could be either *Monohelea* or *Stilobezzia*, since in their figure of the male genitalia the aedeagus is omitted.

The types of five of the new species, as well as most of the specimens studied, are in the U. S. National Museum. For the loan or donation

¹ Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture.

of other specimens examined I am deeply grateful to Paul Freeman, of the British Museum (Natural History), to Henry Dietrich, of Cornell University, and to John Lane, of the University of São Paulo. For the generous gift or loan of still other specimens I wish to thank Mrs. Elisabeth C. Beck and J. A. Mulrennan of Jacksonville, Florida, Bernard Brookman of San Francisco, California, Jean A. Laffoon of Ames, Iowa, and Henry K. Townes of Raleigh, North Carolina.

The figures of the wings and legs were made with the aid of a microprojector and those of the male genitalia with the aid of an ocular reticule disc and squared paper. No consistent scale was used.

Family HELEIDAE

Genus *Monohelea* Kieffer, 1917

Diagnosis.—Body short, not very hairy. Eyes bare. Mesonotal pits present but small. Forelegs and midlegs unmodified; fourth tarsal segments cylindrical and claws small and equal in both sexes; hind leg with femur and tibia more or less thickened, but without spines, basitarsus with a spine at tip, fourth segment cylindrical, fifth segment in female with one very long claw, the other absent or very short, male claws small and equal except hind claw as in female in *tessellata* group; empodium absent. Wings with fine microtrichiae, a few macrotrichiae at wing tip; costa extending well beyond middle of wing; two radial cells, second longer than first; intercalary fork fairly distinct; crossvein r-m vertical; median fork with short stem, M_2 sometimes interrupted at base; anal vein thickened in middle, but without fold at thickening. Male genitalia with ninth tergite tapered, the caudal margin truncate or broadly bilobed; aedeagus usually with a pair of sharp-pointed, tapered, lateral sclerites and an accessory, dorsomedian, posterior lobe; parameres consisting of paired, submedian sclerites of irregular shapes.

Key to the American species of *Monohelea*

1. Wings without markings; mesonotum shining black (subgenus *Schizohelea*).
 1. *leucopeza* (Meigen)
 Wings with pronounced dark markings; mesonotum pruinose, often with markings (subgenus *Monohelea*)..... 2
2. Hind femur and tibia yellow, with dark brown rings (*hieroglyphica* group)..... 3
 Hind femur and tibia shining black, only knee spot yellow..... 9
3. Forelegs and midlegs with distinct dark brown bands; wings often with extensive macrotrichiae..... 4
 Forelegs and midlegs yellowish, without distinct bands; wings with macrotrichiae only at extreme distal margin..... 6
4. Wings with macrotrichiae over distal third; wing markings extensive.... 5
 Wing without apparent macrotrichiae; wing markings reduced, X-shaped marking in cells M_1 and M_2 broken up into 3 discrete spots.

6. *texana*, new species

5. Wing with about 20 small, scattered, black dots in addition to the irregular, diffuse gray markings; fore tibia and midtibia dark only at apices; scutellum uniformly whitish..... 8. **brasiliensis** Lane
Wing with uniformly gray, irregular markings, without small, black dots; fore tibia and midtibia entirely dark; scutellum dark in middle.
7. **ornata**, new species
6. Hind femur brown on basal third; scutellum dark in middle; wing markings not whitish bordered..... 7
Hind femur with broad yellow band on sub-basal fourth; scutellum uniformly dull whitish; wing markings bordered with whitish pruinosity.
3. **maculipennis** (Coquillett)
7. Basal and median brown bands on hind tibia joined with brown, at least on ventral side; male parameres each with 2 or 3 distal lobes..... 8
Basal and median brown tibial bands separated by a broad yellow band; male parameres each with simple, bladeliike apex..... 5. **maefiei**, new species
8. Sinuate, dark, wing marking in cells M_1 and M_2 entire; male parameres with broad, rounded distal lobes..... 4. **lanci**, new species
Sinuate, dark, wing marking broken into 3 or 4 separate spots; male parameres with slender, pointed, distal lobes..... 2. **hieroglyphica** Kieffer
9. Scutellum yellow, brown in middle; wing with 2 prominent, small, black spots, spot absent in basal cell; hind basitarsus about 2.5 times as long as second segment; mesonotum yellowish, with tiny brown dots (*multilineata* group) 10
Scutellum entirely dark brown or yellow only in middle; wing with two prominent anterior spots plus a spot in basal cell; hind basitarsus 1.3 to 2.0 times as long as second segment (*tessellata* group)..... 12
10. Ninth sternite of male with 4 long hairs arising from tubercles in a row at base of median lobe..... 11
Ninth sternite of male with 2 long hairs arising from base of median lobe; parameres not connected, with irregular, twisted apices; female abdomen pruinose gray above, with small, lateral, shining brown spots.
9. **stonci**, new species
11. Male aedeagus with broad, bilobed apex; parameres not connected, recurved apices long and scimitar shaped; female abdomen pruinose gray above, with narrow, shining brown bands broadening at margins of segments.
10. **multilineata** (Lutz)
Male aedeagus cleft one-third way to base, with a pair of long, slender, apical points; parameres broadly connected at bases, recurved apices with broadly rounded lobes..... 11. **guanae**, new species
12. Mesonotum pruinose gray with dark-brown spots or irregular patches; scutellum yellow in middle, with about 8 marginal hairs; wing bands distinct to hind margin, usually strongly interconnected... 12. **nebulosa** (Coquillett)
Mesonotum dark brown with irregular, pruinose, gray spots; scutellum usually entirely black, with 4 marginal hairs; wing bands faint behind vein M_1 , usually rather well separated..... 13. **johannseni**, new species

Subgenus *Schizohalea* Kieffer, 1917

- Schizohalea* Kieffer, Ann. Mus Nat. Hungarici, vol. 15, p. 295, 1917, vol. 16, p. 57, 1918, and vol. 17, p. 89, 1919.—Goetghebuer, Mem. Mus. Hist. Nat. Belgique, vol. 8, p. 65, 1920.—Edwards, Trans. Ent. Soc. London, vol. 74, p. 411, 1926.—Johannsen, Ann. Ent. Soc. Amer., vol. 36, p. 782, 1943. (Genotype, *Ceratopogon copiosus* Winnertz; monobasic.)
Allohelea Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 364, 1917. (Genotype, *Sphaeromyas pulchripennis* Kieffer; original designation.)

Following Goetghebuer (1934), I regard *Schizohoelea* as a subgenus for *leucopeza* Meigen.

Diagnosis.—This species differs rather markedly from the other species of *Monohoelea* in having the second branch of the media broadly interrupted at the base, basitarsus without apical spine, and male genitalia with emarginate sternite and arched aedeagus.

1. *Monohoelea (Schizohoelea) leucopeza* (Meigen), 1804

FIGURE 18, *m*

Ceratopogon leucopeza Meigen, Klassifikation und Beschreibung . . . Insekten, vol. 1, p. 29, 1804.

Ceratolophus leucopeza, Kieffer, Genera insectorum, fasc. 42, p. 60, 1906.

Schizohoelea leucopeza, Edwards, Trans. Ent. Soc. London, vol. 74, p. 411, 1926.—Séguy, Faune de France, pt. 8, p. 70, 1937.

Monohoelea (Schizohoelea) leucopeza, Goetghebuer, in Lindner, Die Fliegen der Palaearktischen Region, Lief. 78, p. 53, 1934.

Ceratopogon albitarsis Wiedemann, Zool. Mag., vol. 1, p. 67, 1817.

Ceratopogon copiosus Winnertz, Linn. Ert., vol. 6, p. 56, 1852.

Ceratolophus copiosus, Kieffer, Genera insectorum, fasc. 42, p. 60, 1906.

Schizohoelea copiosa, Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 295, 1917; idem, vol. 16, p. 57, 1918; idem, vol. 17, p. 89, 1919.—Goetghebuer, Mem. Mus. Hist. Nat. Belgique, vol. 8, p. 66, 1920.—Kieffer, Faune de France, pt. 11, p. 116, 1925.

Ceratopogon politus Coquillett, Proc. U. S. Nat. Mus., vol. 23, p. 606, 1901 (♀, Massachusetts).

Ceratolophus politus, Kieffer, Genera insectorum, fasc. 42, p. 61, 1906.

Johannseniella polita, Malloch, Bull. Illinois State Lab. Nat. Hist., vol. 10, p. 227, 1914.

Johannsenomyia polita, Malloch, Bull. Illinois State Lab. Nat. Hist., vol. 10, p. 335, 1915 (New York).

Sphaeromyias polita, Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 364, 1917.

Allohelea polita, Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 364, 1917.

Schizohoelea polita, Johannsen, Ann. Ent. Soc. Amer., vol. 36, p. 782, 1943 (? = *leucopeza* Meigen).

Bezzia stecki Kieffer, Brotéria, Ser. Zool., vol. 13, p. 65, 1915.

Description.—FEMALE: Length 1.5 mm., wing 1.2 mm. by 0.5 mm. Entirely shining black, only the tarsi, wings, and halteres white. Antennae quite short, the distal segments scarcely elongated. Mesonotum with scattered, erect, long, black hairs; scutellum with six long marginal hairs. Second radial cell half again as long as the first, M_2 broadly interrupted at base. Spermathecae two, subequal, rather small and subspherical, the ducts sclerotized a short distance.

MALE (based on specimen from Suffolk, England): Ninth sternite about three times as broad as long, with a shallow, round emargination in middle of caudal margin, not spiculate; ninth tergite narrow, surpassing basistyles, distal half with margins subparallel, apex truncate with setose apicolateral corners, the inner surface coarsely spiculate. Basistyles broad at base, each with a distinct lobe bearing three setose tubercles on inner side; abruptly narrowed on distal half; dististyles

TABLE 1.—Proportions of segments of hind legs of female *Monohelea* species

Species	Cx	Tr	F	Ti	T ₁	T ₂	T ₃	T ₄	T ₅
1. <i>leucopeza</i>	25	10	65	65	30	12	10	8	12
2. <i>hieroglyphica</i>	30	10	80	72	40	16	9	8	8
3. <i>maculipennis</i>	20	10	55	50	24	11	8	6	4
4. <i>lanei</i>	25	10	65	60	35	17	10	8	8
5. <i>macfie</i>	20	10	60	55	30	15	10	7	7
7. <i>ornata</i>	24	8	72	68	33	16	9	7	7
9. <i>stonei</i>	30	10	80	70	50	20	12	8	10
10. <i>multilineata</i>	28	12	88	80	50	20	12	8	8
12. <i>nebulosa</i>	28	12	80	70	24	12	6	8	8
13. <i>johannseni</i>	25	10	70	65	25	12	8	10	10

nearly as long as basistyles, rather strongly curved. Aedeagus in form of a slender, rounded arch nearly as long as broad at base, with a pair of short, pointed, submedian plates projecting dorsocaudad at apex. Parameres with stout, lateral apodemes at bases; stems stout and gently curved, contiguous at midlength, their apices pointed and abruptly bent ventrocephalad on about distal fourth.

Type.—Presumably in the Meigen collection in the Muséum National d'Histoire Naturelle in Paris.

Material examined.—Massachusetts: N. Amherst, June 1940, 4 ♀♀.

New York: Mecklenburg, June 2, 1940, A. Stone, 10 ♀♀; North Ridgeway, June 22, 1940, S. C. Mendall, 1 ♀.

Michigan: St. Joseph, May 30, 1938, C. W. Sabrosky, 6 ♀♀.

England: Corriegills, Arran, June 2-4, 1919, F. W. Edwards, 2 ♀♀; Mildenhall, Suffolk, May 22, 1909, Yerbury, 1 ♂.

Remarks.—This species is found in Europe, West Africa, and northeastern North America.

Subgenus *Monohelea* Kieffer, 1917

Monohelea Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 295, 1917.—Goetghebuer, Mem. Mus. Hist. Nat. Belgique, vol. 8, p. 63, 1920.—Ingram and Macfie, Ann. Trop. Med. Parasit., vol. 15, p. 344, 1921.—Edwards, Trans. Ent. Soc. London, vol. 74, p. 410, 1926.—Tokunaga, Tenthredo, vol. 3, p. 156, 1940.—Johannsen, Ann. Ent. Soc. Amer., vol. 36, p. 781, 1943.—Lane, Arq. Fac. Hig. Saude Univ. São Paulo, vol. 1, p. 225, 1948.—Lee, Proc. Linn. Soc. New South Wales, vol. 72, p. 350, 1948. (Genotype, *Monohelea hieroglyphica* Kieffer; original designation.)

Diagnosis.—Wings with prominent markings; body with pruinose pattern; ninth sternite of male spiculate and transverse or lobed, not emarginate.

hieroglyphica—group

Diagnosis.—Hind legs conspicuously banded, not markedly swollen; hind tarsi slender; wings with extensive irregular markings; male aedeagus broad, with median, anterior notch and triangular, lateral sclerites with converging, sharp-pointed apices.

2. *Monohelea (Monohelea) hieroglyphica* Kieffer, 1917

FIGURE 19, *g*

Monohelea hieroglyphica Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 312, 1917 (♂, ♀, Paraguay).

Monohelea hieroglyphica, Lane, Arq. Fac. Hig. Saude Pub. Univ. São Paulo, vol. 1, p. 225, 1948 (Brazil).

Discussion.—This is the genotype of *Monohelea*. Macfie's (1937, 1940a) records of this species from Trinidad and British Guiana must, I believe, be referred to *macfiei*, new species, described (sec. p. 143), from Louisiana.

Through the kindness of John Lane I have examined a female from km. 47, estrada Rio-São Paulo, Rio de Janeiro, Brazil, collected in February 1945 by P. Wygodzinsky. This is from the same locality as the male described and figured by Lane. Externally this species is almost inseparable from *M. (M.) lanei*, new species (sec p. 142), from Florida, but the male genitalia are very close to those of *M. (M.) maculipennis*. A sketch of the male parameres (after Lane) is included here for comparison with those of *maculipennis*.

Types.—In the Musei Nationalis Hungarici in Budapest, ♂, ♀, Paraguay.

3. *Monohelea (Monohelea) maculipennis* (Coquillett), 1905

FIGURES 18, *a, i*; 19, *f*

Ceratopogon maculipennis Coquillett, Journ. New York Ent. Soc., vol. 13, p. 64, 1905 (♀, Florida).—Kieffer, Genera Insectorum, fasc. 42, p. 51, 1906.

Monohelea maculipennis, Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 312, 1917.—Johannsen, Ann. Ent. Soc. Amer. vol. 36, p. 781, 1943.

Diagnostic characters.—A yellowish gray, pruinose species with faint, brown, mesonotal dots, pale yellowish scutellum; hind legs with narrow, dark rings and wings with extensive, irregular, grayish maculations bordered with whitish pruinosity.

Description.—FEMALE: Length 1 mm., wing 1 mm. by 0.4 mm. Head pale yellowish, antennae and palpi brown; proportions of flagellar segments of antennae 12:10:10:12:12:12:12:12:16:16:18:18:24. Palpal segments in proportion of 5:7:10:5:10.

Mesonotum grayish pruinose, with many scattered, small, brown dots at the bases of the dark mesonotal hairs; humeri and sides extensively yellow. Scutellum pruinose, yellowish white, with four marginal hairs, the middle pair quite close together. Postscutellum and pleura pruinose brown, the latter with several indistinct, transverse, darker lines. Legs yellowish, coxae and trochanters brown, upper fourth of midcoxa and hind coxa yellowish; fore femur and midfemur and tibiae unbanded; hind femur (figure 18, *i*) brown at extreme base, two narrow oblique dark rings in middle and a dark, preapical, ventral spot; hind tibia with narrow sub-basal, median, and apical rings; tarsi narrowly

dark at apices of segments. Proportions of segments of hind legs as in table 1.

Wing whitish hyaline, with irregular maculations, grayish by transmitted light, yellowish brown with narrow, whitish pruinose borders by reflected light. Markings composed of a broad, irregular band across wing at level of first radial cell, filling basal half of medio-cubital fork, with a prominent, omega-shaped spur in base of cell R_5 ; a small spot before middle of second radial cell; a more or less quadrate to X-shaped mark across cell R_5 at apex of second radial cell; a sigmoid, subapical mark across cells M_1 and M_2 , often connected by very narrow lines in these cells to mesal band; small, irregular spots across wing near base and a small spot past middle of basal cell. First radial cell about half as long as second, a very few macrotrichiae at apices of cells R_5 and M_1 . Halteres dull white, a black dot on anterior side.

Abdomen dull whitish, sides with irregular, dark patches. Spermathecae two, very unequal, subspherical, each with short sclerotized duct.

MALE: Ninth sternite about twice as broad as long, spiculate, posterior margin transverse, abutting against base of aedeagus, with four long hairs arising from tubercles in a curved row; ninth tergite greatly constricted, with sides subparallel on distal half, apex truncate, apicolateral processes short. Basistyles narrowed on distal halves; dististyles curved to slender, pointed apices. Anterior margin of aedeagus broad, slightly concave, with a small median notch; aedeagus bearing a pair of triangular, submedian sclerites, the bladelike apices of which converge before level of the irregular bilobed apices of an accessory pair of dorsal sclerites. Parameres with flaring, winglike, bilobed, basal apodemes, more or less connected at midlength by a pair of stout mesal lobes, apices each with a straight, long, slender stem bearing a dorsolateral lobe about half as long and of same thickness, just beyond level of mesal bridge.

Type.—USNM 8366, ♀, Florida, Jacksonville.

Material examined.—Florida: Crystal River, Citrus County, July 17, 1950, Hudson, 4 ♀♀; Everglades City, Collier County, Feb. 7, 1950, Davidson, 1 ♂, 9 ♀♀; Fort Myers, Lee County, Feb. 2, 1949, Brechtel, 1 ♂; Islamorada, Monroe County, June 7, 1949, Smith, 1 ♂, 2 ♀♀; Jacksonville, date not given, Slosson, 1 ♀ (type).

México: Ciudad Monte, Tamaulipas, Nov. 22, 1943, Brookman, 1 ♂, 3 ♀♀.

Guatemala: Rio Dulce, Mar. 21, 1906, Schwarz and Barber, 1 ♀.

Panamá: Rio Trinidad, June 9, 1902, Busck, 1 ♀.

Remarks.—Formerly all the North American *Monohelea* with the type of wing pattern characteristic of *hieroglyphica* were called *maculipennis*. Thus in my (1952) paper on California Heleidae, I

erroneously included a California record of *maculipennis* and also cited several eastern records of this species in error. I have now studied the *hieroglyphica* group more intensively and believe I have correctly identified several component species on the basis of male genitalia supported by several rather difficult but constant external characters of the female. In addition to *hieroglyphica* and *maculipennis* there appear to be four or more undescribed species in this complex. Although my California specimen and that reported as *Monohalea* sp. by Johannsen (1943) do not fit any of those described below, probably falling closest to *hieroglyphica* in wing markings, a positive diagnosis of the species must await the collection of the male.

4. *Monohalea (Monohalea) lanei*, new species

FIGURES 18, b, j; 19, e

Description.—FEMALE: Length 1.3 mm., wing 1.1 mm. by 0.4 mm. As in *M. (M.) maculipennis* (Coquillett), but darker and slightly larger. Mesonotum light brown pruinose with faint brown punctures; scutellum brownish in middle. Markings on hind legs stronger; basal third of hind femur brown, a narrow, diagonal band just past middle, then a small, brown, ventral spot and a strong preapical band; basal and median bands on hind tibia broad and joined on ventral side, the distal band broad. Proportions of segments of hind leg as in table 1.

Wing markings darker and more extensive than in *maculipennis*, the omega-shaped mark entirely closed behind by a broad extension of the mesal band, the X-shaped mark in cell R_5 greatly constricted in middle and much broader behind. Macrotrichiae sparse and confined to wing margin; first radial cell about two-thirds as long as second.

Abdomen brown above, yellowish on sides in front and on three distal segments. Spermathecae two, large, very unequal and subspherical.

MALE: Ninth sternite with posterior margin convex in middle, spiculate; ninth tergite tapered to a pair of blunt, triangular, submedian, caudal lobes. Basistyles narrow, nearly straight; dististyles slender, curved, with sharp, incurved points. Aedeagus with basal halves broadly separated by a deep notch in middle of anterior margin, lateral sclerites with broad, triangular bases, the slender, pointed, posterior portions directed caudomesad and meeting each other over tips of a pair of sharp-pointed, dorsal processes. Parameres a pair of irregular, sublateral sclerites joined by an indistinct transverse bridge at a third of the distance from bases; basal apodemes trilobed, directed laterocephalad to bases of basistyles; posterior portions with subparallel inner margins, tips each with apical, knoblike, sclerotized lobe with slightly longer, flattened, roundly flaring, ventral expansions.

Types.—Holotype, ♂, USNM 61091, Miami, Florida, Mar. 25, 1944, Wirth. Allotype with same data as type except date, October 1943. Paratypes: Florida: 2 ♂♂, 5 ♀♀, same, except date, October 1943 to April 1944; 1 ♀, Welaka, June 17, 1946, Bellamy; 1 ♀, Everglades City, Feb. 7, 1950, Davidson.

5. *Monohalea (Monohalea) macfie*, new species

FIGURES 18, c, h; 19, h

Monohalea hieroglyphica, Macfie, not Kieffer (misidentification), Ann. Mag. Nat. Hist., ser. 10, vol. 20, p. 18, 1937 (♀, Trinidad); Ent. Monthly Mag., vol. 76; p. 30, 1940 (♂, British Guiana, genitalia figured).

Description.—FEMALE: Length 1.2 mm., wing 1.4 mm. by 0.5 mm. As in *M. (M.) maculipennis* (Coquillett), but the mesonotum with a pronounced, broad, median, anterior band and a large area between wing bases in front of scutellum uniform brown, the scutellum with a more or less brownish median area. Abdomen suffused, grayish brown above. Legs as figured by Macfie (1937), brown bands on hind legs quite distinct; on hind femur a band on basal third, a diagonal band past middle, and a narrow band subapically; on hind tibia, narrow basal, median, and apical rings; all tarsal segments with narrow apical bands.

Wing as in figure 18, c, the dark areas in the first basal and anal cells quite extensive, the X-shaped mark in cell R_5 large, with the caudodistal arm more prolonged than shown by Macfie and the distal sigmoid mark in cells M_1 and M_2 connected by broad lines in these cells to the broad median crossband. All wing markings brown by reflected light, gray by transmitted light; a few macrotrichiae at apex of wing.

MALE: The resemblance of the Louisiana male to the male from British Guiana figured by Macfie (1940a) is remarkable. The slender, sinuate, bladelike parameres connected by a narrow bridge at midlength are the most distinctive difference.

Types.—Holotype, ♂, USNM 61092, allotype, Kilbourne, Louisiana, May 10, 1947, Wirth. Paratypes: Louisiana: 2 ♀♀, with same data as type; 1 ♀, Baton Rouge, May 16, 1947, Wirth.

6. *Monohalea (Monohalea) texana*, new species

FIGURE 19, d

Description.—MALE: Wing 1.1 mm. long. Badly damaged, antennae, all of legs but fore femur, midfemur, and tibiae gone. Mesonotum appears discolored, all dark except large quadrate yellow patches on humeri; scutellum light yellow, a minute brown spot in middle of anterior surface. Forelegs and midlegs yellow, narrow basal, median, and subapical faint brown rings on fore femur; narrow basal and

broader median and apical brown rings on fore tibia; broad basal and narrow median brown rings on midfemur and faint median and broad, dark-brown apical rings on midtibia. Wings marked as in *M. (M.) hieroglyphica* Kieffer, the median band broad, the omega-shaped spur distinct and open below, the spot in cell R_5 narrow with the right-hand arms of the X absent, the sinuate mark in cells M_1 and M_2 reduced to three discrete spots; macrotrichiae reduced to a few at wing margin. Halteres yellow with flat ends and a spot on anterior surfaces of knobs dark.

Ninth sternite spiculate, posterior margin broadly convex in middle, with four long hairs arising from bases in an arched row; ninth tergite tapered, with a pair of prominent, apicolateral processes. Aedeagus with basal halves narrowly separated by a deep notch in middle of anterior margin, lateral sclerites with broad, triangular bases, the slender, pointed posterior apices meeting each other at about level of tip of ninth tergite; the dorsal accessory structure bifid a third the way to base of aedeagus, with a pair of very slender lobes with pointed apices curved ventrad and surpassing apices of lateral sclerites. Parameres joined together broadly near middle, each with well-developed basal and lateral arms, stems abruptly bent laterad two-thirds the way to apices, then abruptly bent ventrad, with pointed apices directed mesocaudad.

Type.—Holotype, ♂, Cornell Univ. Type 2787, Limpia Canyon, Davis Mountains, Texas, July 7, 1917, Bradley.

Remarks.—The male genitalia are most distinctive, the simple apices of the parameres allying *M. (M.) texana* with *M. (M.) macfieii*, new species. However, the external features, as nearly as can be ascertained from the badly damaged specimen, are closer to other species, the wing markings being nearly like those of *M. (M.) hieroglyphica* Kieffer, while the front legs and midlegs are banded as in *M. (M.) ornata*, new species, and *M. (M.) brasiliensis* Lane.

7. *Monohelea (Monohelea) ornata*, new species

FIGURE 18, d

Description.—FEMALE: Length 1.2 mm., wing 1.2 mm. by 0.5 mm.

Head pruinose brown, vertex yellowish; antennae broken, pedicel brown; palpi brown. Mesonotum pruinose gray, humeri yellowish; a broad, median, longitudinal band and broad patches above wings rich, velvety brown. Scutellum pruinose, grayish yellow, brown in middle; postscutellum and pleura pruinose dark brown. Fore femur and midfemur dull yellow, with faint median brown bands; fore tibia and midtibia brown; hind femur dark brown on basal third, a broad, diagonal, brown ring past middle and a narrow preapical brown ring;

hind tibia with broad basal and apical rings, and a band just before middle, brown; tarsi dull yellowish. Proportions of segments of hind legs as in table 1; hind femur and tibia with rather long hairs; hind basitarsus with strong basal spine. Claws on forelegs long and equal, nearly as long as fourth and fifth segments combined; midtarsi broken; on hind leg a single long claw half again as long as fifth segment.

Wing grayish hyaline, with very extensive gray maculations as in figure; maculations of *hieroglyphica* type, but much more extensive, with an extra distal, separate spot narrowly connected to the X-shaped mark in cell R_5 , and the subapical mark in cells M_1 and M_2 quite broad. First radial cell about half as long as second; macrotrichiae very extensive, sparsely covering distal third of wing and including most of cell M_{3+4} and anal cell. Halteres not visible. Abdomen uniformly dark, pruinose brown, spermathecae not examined.

Types.—Holotype, ♀, USNM 61093, Santa Rosa Island, Escambia County, Florida, Oct. 10, 1949, Butler.

Remarks.—The wing, mesonotal, and leg markings are so distinctive that I do not hesitate to describe *M. (M.) ornata* from the single female.

8. *Monohelea (Monohelea) brasiliensis* Lane, 1948

Monohelea brasiliensis Lane, Arq. Fac. Hig. Saude Pub. Univ. São Paulo, vol. 1, p. 226, 1948 (♀, Brazil).

Description.—I have not seen this species, which is known only from the type female. Length 1.2 mm., wing 1.3 mm.; mesonotum chestnut, yellowish on sides and in prescutellar depression; scutellum whitish. Legs yellowish, fore femur dark at base, midfemur dark on basal half; fore tibia and midtibia dark at apices; hind femur with two dark rings, one at apex of basal third and one in middle, hind tibia dark at base and apex and indistinctly so in middle. Hind basitarsus 1.8 times as long as second segment. Wing with about 20 black dots in addition to irregular grayish markings; macrotrichiae numerous on distal third of wing; first radial cell slightly over half as long as second (from original description).

Type.—In collection of University of São Paulo, Brazil, No. 6781, ♀, Brazil, Rio de Janeiro, Estrada Rio-São Paulo, km. 47.

multilineata—group

Diagnosis.—Wings with two large anterior dark patches and other fainter irregular markings; scutellum dark in middle; legs dark with yellow knee spots; hind legs slender, the tarsi long and unspined; ninth sternite of male with median, convex lobe and several long hairs, aedeagus long and narrow, parameres very long, with sharp apices.

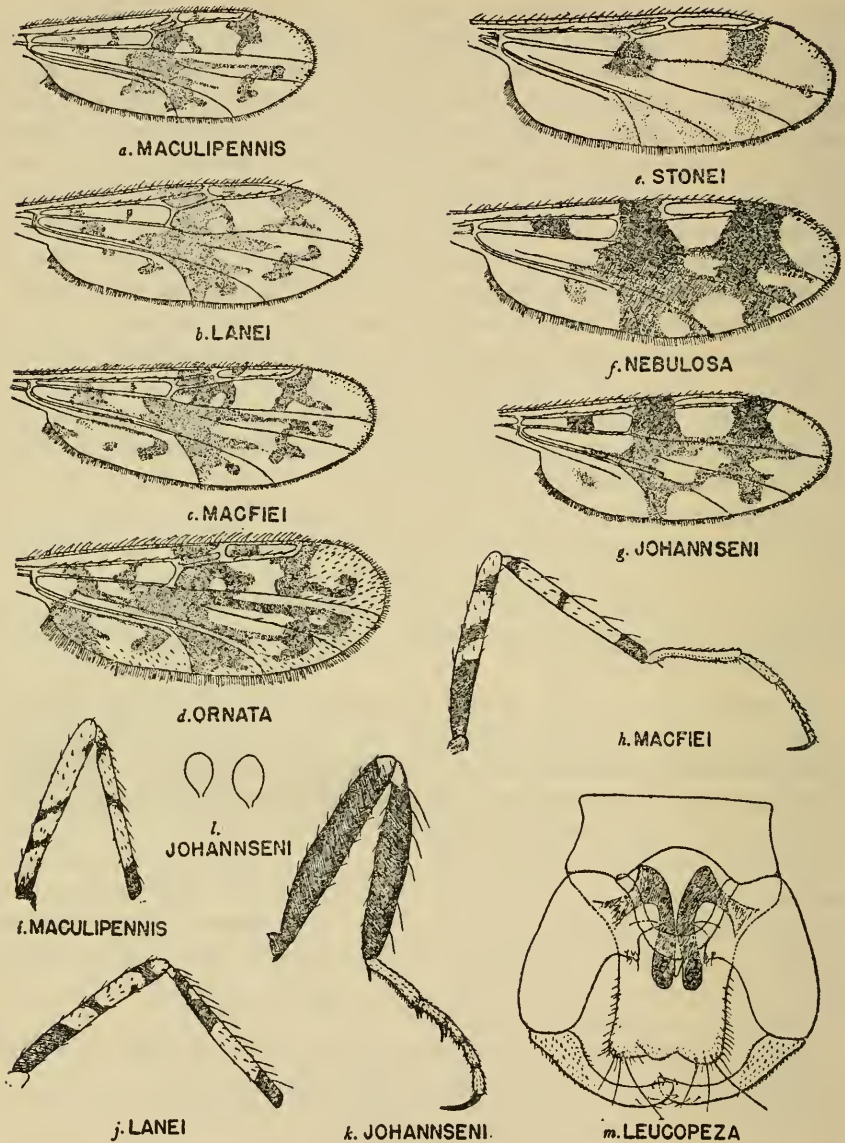


FIGURE 18.—Species of *Monohelea*: a-g, Wings: a, *maculipennis* (Coquillett); b, *lanei*, new species; c, *macfieii*, new species; d, *ornata*, new species; e, *stonei*, new species; f, *nebulosa* (Coquillett); g, *johannseni*, new species. h-k, Hind legs of females: h, *macfieii*, new species; i, *maculipennis* (Coquillett); j, *lanei*, new species; k, *johannseni*, new species. l, Spermathecae, *johannseni*, new species. m, Male genitalia, *leucopeza* (Meigen).

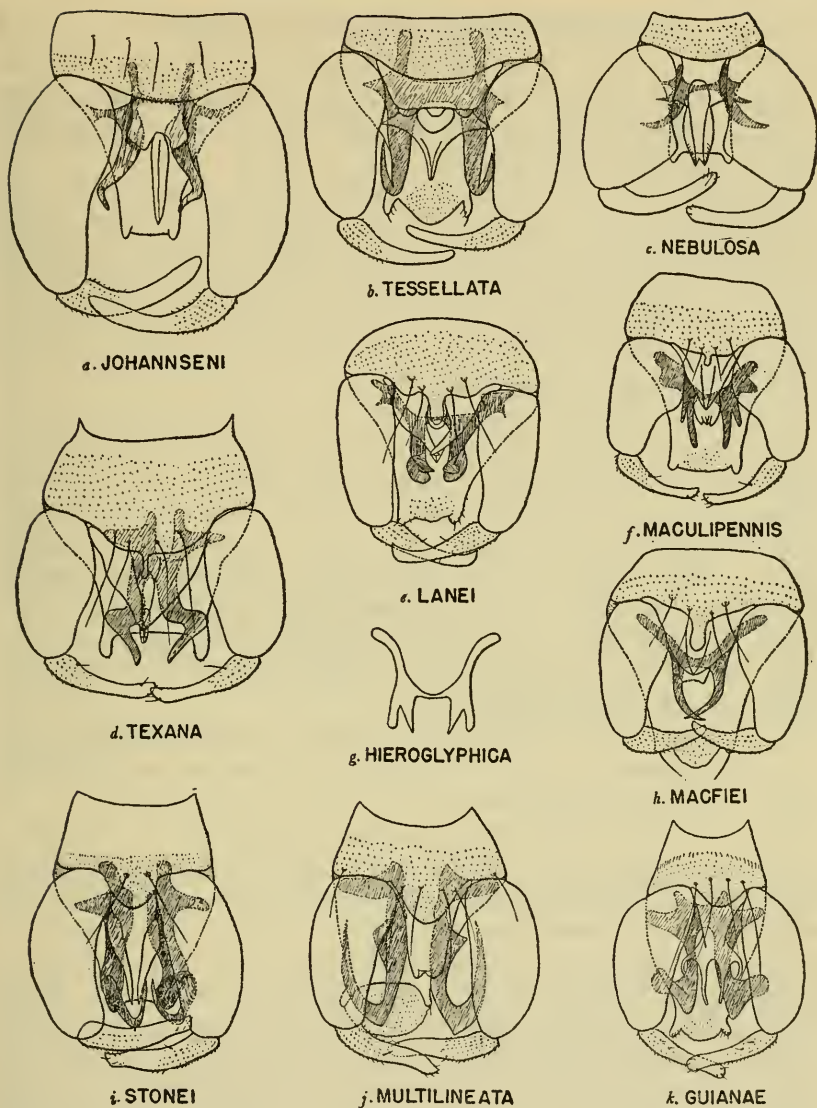


FIGURE 19.—Species of *Monohelea*, male genitalia: *a*, *johannseni*, new species; *b*, *tessellata* (Zetterstedt); *c*, *nebulosa* (Coquillett); *d*, *texana*, new species; *e*, *lanei*, new species; *f*, *maculipennis* (Coquillett); *g*, *hieroglyphica* Kieffer; male parameres (after Lane); *h*, *macfiei*, new species; *i*, *stonei*, new species; *j*, *multilineata* (Lutz); *k*, *guianae*, new species.

9. *Monohelea (Monohelea) stonei*, new species

FIGURES 18, e; 19, i

Diagnostic characters.—A yellowish gray, pruinose species with maculate wings; scutellum yellow with brown center; legs dark, abdomen dull gray pruinose above.

Description.—FEMALE: Length 2.0 mm., wing 1.5 mm. by 0.7 mm. Head yellowish, vertex pruinose, pale gray; antenna with pedicel and bases of flagellar segments yellow, apices of short segments and all of long distal segments and palpi brown; proportions of flagellar segments 15:10:10:10:10:10:12:12:18:18:18:18:24. Palpal segments in proportion of 5:8:15:10:15, third segment scarcely swollen, with a rather large sensory pit at midlength.

Mesonotum yellowish gray pruinose, with tiny brown dots at the bases of the brownish mesonotal hairs. Scutellum yellow, brown in middle, with four moderate marginal hairs and a few fine setae. Postscutellum and pleura pruinose dark brown. Coxae brown; trochanters, femora, and tibiae light brown on forelegs and midlegs, black on hind legs; all knees prominently yellowish, tarsi yellow. Hind femur and hind tibia moderately thickened; basitarsus with a slender spine at base, distal tarsal segments on hind legs each with a fine apical spine; a single long claw on each hind leg. Proportions of segments of hind leg as in table 1.

Wing grayish hyaline, with two prominent, black spots and fainter posterior infumation as figured; first radial cell about half as long as second. Halteres infuscated.

Abdomen dark brown, entire dorsum pruinose gray except for a pair of small lateral spots and a pair of submedian sensory dots on each segment, polished brown. Spermathecae two, subequal, ovoid, each with a very short sclerotized duct.

MALE: Similar to the female, with the usual sexual differences; antennal plume golden at base, dark brown toward apex. Ninth sternite three times as broad as long, with a narrow, median, posterior lobe bearing two long hairs extending into the concave base of the aedeagus; sternite spiculate on posterior half; ninth tergite as long as basistyles, tapered to the truncated apex, bearing a pair of short, rounded, apicolateral processes. Basistyles about twice as long as broad, simple, very convex on outer sides; dististyles about 0.7 as long as basistyles, nearly straight and stout to apices. Aedeagus with base as broad as the lobe of ninth sternite, a slight sub-basal swelling, a second swelling at midlength, with distal half cleft into a pair of attenuated, submedian, pointed blades attaining 0.8 length of basistyles. Parameres consisting of a pair of very irregular processes,

bases of each with a large anterior and lateral apodeme, stem rather stout and crooked, distal portion abruptly bent ventrocephalad, then greatly attenuated and bent ventrocaudad to a sharp point.

Types.—Holotype, ♀, USNM 61094, Baton Rouge, Louisiana, May 16, 1947, Wirth. Allotype with same data as type except date, May 3, 1947. Paratypes: Louisiana: 6 ♂♂, 3 ♀♀, with same data as type except date, May 6–20, 1947. Mississippi: 4 ♂♂, 10 ♀♀, Horn Island, June and July 1944, E. A. Richmond. Florida: 11 ♀♀, Grayton Beach, Walton County, May, Sept., 1949, Butler; 1 ♀, Santa Rosa, Walton County, July 19, 1949, Peterson; 8 ♂♂, 21 ♀♀, Innerarity Point, Escambia County, May, 1950, Rathert; 8 ♀♀, Santa Rosa Island, Escambia County, July 7, 1949, Butler; 5 ♀♀, Panama City Beach, Bay County, May 6, 1949, McElvey; 5 ♀♀, Crystal River, Citrus County, July 17, 1950, Hudson; 3 ♀♀, Fort Myers, Lee County, Oct. 8, 1948, Brechtel; 3 ♀♀, Everglades City, May, Oct., 1948, 1950, Huntoon; 1 ♂, 1 ♀, Big Pine Key, Monroe County, Apr. 1, 1950, Sermon. Georgia: 2 ♂♂, 4 ♀♀, Thomasville, May 15–30, 1949, Palmer. Tennessee: 1 ♀, Nashville, June 18, 1937, Adams. Iowa: 1 ♀, Sioux City, July 15, 1950, Laffoon. Virginia: 3 ♂♂, 6 ♀♀, Falls Church, July 8, 29, 1950, Wirth. Maryland: 4 ♀♀, Leeds, Dorchester County, July 10, 1907, Barber. New Jersey: 1 ♀, Newport, July 1, 1937 (light trap). Costa Rica: 1 ♂, Higuito, San Mateo, no date, Schild. Panamá: 1 ♀, Fort Kobbe, Canal Zone, Aug. 21, 1950, Carpenter.

10. *Monohalea (Monohalea) multilineata* (Lutz), 1914

FIGURE 19, j

Palpomyia multilineata Lutz, Mem. Inst. Oswaldo Cruz, vol. 6, p. 93, 1914 (Brazil).
Monohalea multilineata, Johannsen, Ann. Ent. Soc. Amer., vol. 36, p. 781, 1943.—
 Lane, Rev. Ent., vol. 16, p. 368, 1945.

Lane (1945) has very adequately redescribed this Brazilian species. It resembles *M. (M.) stonei*, new species, in general coloration and structure, the mesonotum yellowish with brown dots, the scutellum yellow with median brown spot and four marginal bristles, forelegs and midlegs yellowish, the hind femur and tibia black and scarcely swollen and hind tarsi unspined. The wings, however, in addition to the two anterior black spots, have smaller, rather strong spots at the wing margin in cells R_5 and M_1 , and across the apex of cell M_2 . The polished, brown, lateral spots on the abdomen, which are small in *stonei*, are larger and narrowly connected across the anterior margin of each tergite in *multilineata*.

The male genitalia of *multilineata* are of the same type as those of *stonei*, but there are four rather than two bristles at the base of the

lobe of the ninth sternite, the aedeagus is broader at the apex and only slightly notched rather than deeply cleft, and the parameres are slender and nearly straight with the apices abruptly bent and scimitar-shaped.

Material examined.—Brazil: Km. 47, Estrada Rio-São Paulo, Rio de Janeiro, Brazil, February 1945, Wygodzinsky, 2 ♂♂, 2 ♀♀.

Remarks.—*Monohalea nigeriae* Ingram and Macfie, 1922, known from the female from West Africa, is closely related to *M. (M.) stonei* and to *M. (M.) multilineata*, but according to the original description, the tarsi bear ventral spines, as in the *tessellata* group, and the spermathecae are unequal in size.

11. *Monohalea (Monohalea) guianae*, new species

FIGURE 19, k

Monohalea multilineata, Macfie, not Lutz (misidentification), Proc. Ent. Soc. London, Ser. B, vol. 9, p. 187, 1940 (♂, British Guiana).

Macfie (1940) has given as satisfactory a description of this insect as was possible from the single male specimen available. This specimen was borrowed from the British Museum for study and externally cannot be separated from either *M. (M.) multilineata* (Lutz) or *M. (M.) stonei*, new species. However the male genitalia are quite distinct and may be characterized as follows: Ninth sternite very short, with a low median lobe on caudal margin fitting against base of aedeagus, spiculose, with four long hairs arising from tubercles in a line at base of median lobe; ninth sternite very narrow, tapered to tip, with a pair of short, nipplelike apicolateral processes. Basistyles about twice as long as broad; dististyles nearly straight, with blunt, scarcely narrowed apices. Aedeagus very narrow, about 2.5 times as long as broad at base, the anterior arch very low, apex cleft about a third way to base, with a pair of very slender, submedian processes, from the bases of which a pair of slender, lateral arms curve around stems of parameres. Parameres broadly joined together at bases, each with a short anterior and lateral arm, stems slender, apex of each thickened and abruptly bent laterocephalad in a broadly rounded lobe about half as long as dististyle.

Types.—Holotype, ♂, British Museum (Natural History) collection, Mazaruni, British Guiana, Aug. 21, 1937, second growth (low forest), Richards and Smart.

tessellata—group

Wings with three large dark anterior spots and irregular posterior infuscated areas; scutellum often with middle yellow; hind legs swollen and black, with yellow knees, the tarsi short and with strong ventral

spines; claw of hind leg of male long and single as in the female; male aedeagus with slender, pointed, posterior sclerite borne in a notch in the quadrate basal sclerite, parameres short, curved, and pointed.

12. *Monohelea (Monohelea) nebulosa* (Coquillett), 1901

FIGURES 18, *f*; 19, *c*

Ceratopogon nebulosus Coquillett, Proc. U. S. Nat. Mus., vol. 23, p. 606, 1901 (♂, New Jersey).

Ceratolophus nebulosus, Kieffer, Genera insectorum, fasc. 42, p. 60, 1906.

Johannseniella nebulosa, Malloch, Bull. Illinois State Lab. Nat. Hist., vol. 10, p. 226, 1914.

Hartomyia nebulosa, Malloch, Bull. Illinois State Lab. Nat. Hist., vol. 10, p. 340, 1915 (Indiana).

Monohelea nebulosa, Kieffer, Ann. Mus. Nat. Hungarici, vol. 15, p. 312, 1917.—Johannsen, Ann. Ent. Soc. Amer., vol. 36, p. 781, 1943 (Massachusetts, Idaho).

Description.—FEMALE: Length 2.1 mm., wing 1.7 mm. by 0.6 mm. Head dull, dark brown, with a few pruinose gray spots on vertex; antennae light brown, distal segments not darker. Palpi light brown.

Mesonotum pruinose gray, with scattered, small, dark-brown dots, each mesonotal hair arising from a dot, these dots more or less confluent, especially on posterior portion of mesonotum. Scutellum brown, middle third yellow, with about eight marginal bristles. Postscutellum and pleura dark brown. Legs shining dark brown, knees and tarsi yellowish. Posterior femora and tibiae greatly thickened; hind basitarsus with basal and distal spine; second segment with two distal spines, third segment with one distal spine; claws minute and equal on forelegs and midlegs, outer claw very long, four times the length of inner, on hind legs. Proportions of segments of hind leg as in table 1.

Wing grayish hyaline, a quadrate black patch across first basal cell at half its length; two broad, irregular, more or less interconnected, transverse bands across wing, the first at first radial cell, the second at apex of second; cell R_5 thus with a dark, a light, a dark and a light band, all of subequal breadth. First radial cell 0.4 times as long as second. Halteres pale yellow.

Abdomen uniform, pruinose, dark brown; anal segment yellow.

MALE: Ninth sternite transverse, without caudal lobe, posterior portion spiculate; ninth tergite very narrow, with sides subparallel on distal half, apicolateral processes short and rounded. Basistyles very stout and convex; dististyles slender and curved, 0.6 as long as basistyles. Aedeagus with two sections, basal part about as broad as long, anterior margin contiguous with sternite, posterior margin deeply emarginate, the slender, rodlike, distal sclerite with notched apex fit-

ting into the emargination. Parameres connected by a transverse bridge near bases, with slender anterior and lateral apodemes; each paramere with posterior portion narrowed and curved ventrolaterad to a bladellike apex, a small sub-basal tooth on ventral side.

Material examined.—New York: Farmingdale, July 9, 1938, H. and M. Townes, 1 ♂; Millwood, June 21, 1936, H. Townes, 1 ♀.

New Jersey: Atsion, June 17, 1949, H. Townes, 1 ♀; Medford Lakes, June 17, 1939, H. Townes, 1 ♂; Riverside, June 18, 1939, H. Townes, 1 ♀; Riverton, June 19, Johnson, 1 ♂ (type).

Georgia: Thomasville, May 15–30, Palmer, 1 ♀.

Arkansas: Pike County, June 12, 1938, Turner, 1 ♀.

Remarks.—This species is very similar to the Palearctic species *M. (M.) tessellata* (Zetterstedt), 1850, which, however, has on the scutellum four marginal bristles, the ends of which are yellowish, as is the median area. The wing markings of *tessellata* are much more nearly as in *M. (M.) johannseni*, new species.

A male of *tessellata* from Norfolk, Hatfield, England, was examined through the kindness of Paul Freeman of the British Museum (Natural History). The specimen is unsatisfactory for a description of external characters, as it was glued to a card when wet. It is noted, however, that both the first and second segments of the hind tarsi bear a distal pair of spines. The aedeagus of the genitalia consists of a heavily sclerotized basal plate about three times as broad as long, bearing a small, crescentic, median sclerite on the ventroposterior margin and bearing dorsoposteriorly a large, triangular structure with sharp-pointed, median apex, and widely flaring, lateral arms articulating with inner margins of basistyles. Parameres with slender anterior arms connected by a broad, median bridge, the posterior portions simple, the basal halves stout, the distal halves very slender and curved ventrocephalad.

According to Tokunaga's (1940) description, his record of *tessellata* from Japan probably refers to an as yet unnamed species. This Japanese species has the scutellum yellow only in the middle, as in *nebulosa*, which it also closely resembles in wing markings; but the mesonotum has distinct yellow spots, the antennae have the distal segments and the apices of the basal segments brownish, the legs are yellowish brown with dark brown markings, and the dorsum of the abdomen is pale, yellowish brown.

The West African species *M. (M.) litoraurea* Ingram and Macfie, 1921, (female) and *M. (M.) mimas* de Meillon, 1939, (male) are very similar to *M. (M.) nebulosa* (Coquillett). The genitalia of *mimas* are the same as those of *nebulosa* except that the dististyles are abruptly bent near the base.

13. *Monohalea (Monohalea) johannseni*, new speciesFIGURES 18, *g, k, l*; 19, *a*

Monohalea tessellata, Johannsen, not Zetterstedt (misidentification), Ann. Ent. Soc. Amer., vol. 36, p. 781, 1943 (Alabama).

Diagnostic characters.—A dark brown species with large pruinose gray mesonotal markings, black scutellum and legs, and maculate wings.

Description.—FEMALE: Length 1.5 mm., wing 1.2 mm. by 0.5 mm. Closely resembling *M. (M.) nebulosa* (Coquillett) but smaller, the mesonotum dark brown with large, irregular, pruinose gray areas, the scutellum entirely blackish and with four long and several shorter marginal hairs. Proportions of hind leg of female as in table 1, hind tarsi with one basal and two distal spines on first segment, two spines at tip of second and occasionally two spines at apices of third and fourth segments; inner claw on hind leg of female about a third as long as outer. Wing as in *nebulosa*, but the markings behind vein M_1 much fainter than those on anterior part of wing. Spermathecae two, subequal, oval, each with very short, sclerotized duct.

Male genitalia as in *nebulosa*, but the parameres simple, without the sub-basal ventral tooth, and distinctly and abruptly bent mesad at distal fifth.

Types.—Holotype, ♀, USNM 61095, Falls Church, Virginia, July 8, 1950, Wirth. Allotype, Innerarity Point, Escambia County, Florida, Apr. 29, 1949, Rathert. Paratypes: Virginia: 2 ♀♀, Mountain Lake, July 15, 1938, July 21, 1940, L. and M. Milne. Florida: 4 ♂♂, 5 ♀♀, same data as allotype except date April and May 1949; 1 ♀, Santa Rosa, Walton County, May 5, 1950, Peterson. Alabama: 1 ♀, LaPlace, June 9, 1917, Bradley. Michigan: 1 ♀, Cheboygan County, July 17, 1942, Sabrosky. Iowa: 1 ♀, Pikes Peak State Park, Clayton County, July 4, 1949, Laffoon.

References

- FLOCH, H., and ABONNENC, E.
1942. Cératopogonidés divers de la Guyane Française III. Inst. Pasteur Guyane Terr. L'Inini Publ. 55, 6 pp., 2 figs.
- GOETGHEBUER, M.
1934. Heleidae (Ceratopogonidae), *In* Lindner, Die Fliegen der Palaearktischen Region, Lief. 78, pp. 49-94.
- JOHANNSEN, O. A.
1943. A generic synopsis of the Ceratopogonidae (Heleidae) of the Americas, a bibliography, and a list of the North American species. Ann. Ent. Soc. Amer., vol. 36; pp. 763-791.
- KIEFFER, J. J.
1917. Chironomides d'Amérique conservés au Musée National Hongrois de Budapest. Ann. Mus. Nat. Hungarici, vol. 15, pp. 292-364, 43 figs.
- LANE, J.
1945. Redescrção de Ceratopogonideos Neotrópicos (Diptera: Ceratopogonidae). Rev. Ent., vol. 16, pp. 357-372, 19 figs.
- LEE, D. J.
1948. Australasian Ceratopogonidae (Diptera, Nematocera). Part 4. The *Stilobezzia* group of genera. Proc. Linn. Soc. New South Wales, vol. 72, pp. 345-356, 1 pl., 23 figs.
- MACFIE, J. W. S.
1937. Ceratopogonidae from Trinidad. Ann. Mag. Nat. Hist., ser. 10, vol. 20, pp. 1-18, 6 figs.
1940a. A report on a collection of Ceratopogonidae (Diptera) from British Guiana. Ent. Monthly Mag., vol. 76, pp. 23-32, 4 figs.
1940b. Ceratopogonidae (Diptera) from British Guiana and Trinidad. Proc. Ent. Soc. London, ser. B, vol. 9, pp. 179-195, 4 figs.
- TOKUNAGA, M.
1940. Chironomoidea from Japan (Diptera), XII. New or little-known Ceratopogonidae and Chironomidae. Philippine Journ. Sci., vol. 72, pp. 255-311, 4 pl.
- WIRTH, W. W.
1952. The Heleidae of California. Univ. California Publ. Ent., vol. 9, pp. 95-266, 33 figs.