

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Insecta Mundi

Center for Systematic Entomology, Gainesville,
Florida

March 1998

Biting midges from Dominican amber. III. Species of the tribes Culicoidini and Ceratopogonini (Diptera: Ceratopogonidae)

Ryszard Szadziewski

University of Gdansk, Pilsudskiego 46, 81-378 Gdynia, Poland

William L. Grogan Jr.

Salisbury State University, Salisbury, MD

Follow this and additional works at: <https://digitalcommons.unl.edu/insectamundi>



Part of the [Entomology Commons](#)

Szadziewski, Ryszard and Grogan, William L. Jr., "Biting midges from Dominican amber. III. Species of the tribes Culicoidini and Ceratopogonini (Diptera: Ceratopogonidae)" (1998). *Insecta Mundi*. 353.

<https://digitalcommons.unl.edu/insectamundi/353>

This Article is brought to you for free and open access by the Center for Systematic Entomology, Gainesville, Florida at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Insecta Mundi by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Biting midges from Dominican amber. III. Species of the tribes Culicoidini and Ceratopogonini (Diptera: Ceratopogonidae)

Ryszard Szadziewski

Department of Invertebrate Zoology,
University of Gdańsk, Pilsudskiego 46, 81-378 Gdynia, Poland

and

William L. Grogan, Jr.

Department of Biological Sciences, Salisbury State University,
Salisbury, MD 21801

Abstract: The following 10 new species of biting midges are described and illustrated from Dominican amber: *Culicoides (Oecacta) antilleanus*, *C. (O.) brodzinskyi*, *C. (O.) ambericus*, *C. (O.) hispanicolus*, *C. mammalicolus*, *Brachypogon (B.) americanus*, *B. (Isohelea) dominicanus*, *B. (Isohelea) prominuloides*, *Stilobezzia (S.) antilleana* and *S. (Acanthohelea) dominicana*. Two other species, in *Nannohelea* and *Stilobezzia*, are described but not named. *Stilobezzia (Acanthohelea) wirthicola* is a new name for *Stilobezzia (A.) succinea* Szadziewski from Miocene Saxonian amber, which is preoccupied by the extant *Stilobezzia succinea* Ingram and Macfie, from Argentina.

Introduction

This is the third in a series of reports in which we describe the biting midge fauna in Dominican amber. For a review of the literature and a discussion of our materials and methods, see our previous two publications (Szadziewski and Grogan 1994, 1996). In our first paper, we presented tables of numbers of species of Nematocera in Dominican amber in the U. S. National Museum of Natural History (USNM), Washington, as well as a list of genera and numbers of Ceratopogonidae in the five collections that we had studied up to that time.

In the present paper, we describe and illustrate 10 new species of biting midges in the tribes Culicoidini and Ceratopogonini as follows: *Culicoides*, 5 species; *Brachypogon*, 3 species; and *Stilobezzia*, 2 species. In addition, we provide a brief description of a poorly preserved specimen of *Nannohelea* as well as an unnamed species of *Stilobezzia*.

All pieces of amber in the USNM are labeled as follows: Smithsonian Institution, Entomology Department; Brodzinsky/Lopez-Penha collection. We have recently been informed by G. Hevel (personal communication) that the USNM amber collection has been transferred from the Department of Entomology to the Department of Paleobiology. Other collections studied are abbreviated as follows: American Museum of Natural History (AMNH), New York; Florida State Collection of Arthropods (FSCA), Gainesville; Ryszard

Szadziewski collection (RYSC), Gdansk, Poland.

For an explanation of general ceratopogonid morphological terminology, see Downes and Wirth (1981); for more detailed information on amber specimens, see Szadziewski (1988) for Baltic amber, and Borkent (1995) for Cretaceous amber of North America.

Subfamily Ceratopogoninae Tribe Culicoidini

Genus *Culicoides* Latreille

Reference: Blanton & Wirth (1979).

Key to species of *Culicoides* in Dominican amber (Males)

1. Wing pale, without pattern
..... *C. mammalicolus* n. sp.
—Wing dark, with pale spots 2
2. Shoulders of basal arch of aedeagus simple
..... *C. antilleanus* n. sp.
—Shoulders of basal arch of aedeagus with sublateral posteriorly directed processes 3
3. Parameres indistinct *C. hispanicolus* n. sp.
—Parameres distinct 4
4. Parameres with well developed ventral lobe
..... *C. ambericus* n. sp.
—Parameres without ventral lobe
..... *C. brodzinskyi* n. sp.

***Culicoides (Oecacta) antilleanus*, new species**
(Figs. 1-3)

Diagnosis: Males distinguished from other Dominican amber *Culicoides* in having an aedeagus with a simple basal arch, parameres without ventral lobe, and a single row of 3 large isolated pale spots on wing membrane at tip. Females unknown.

Description: Male. Body brown. Head, thorax and legs typical of members of the subgenus *Oecacta*. Wing length 0.61mm; pattern as in *C. ambericus* n. sp. (Fig. 11), but poorly developed, with three large isolated pale spots at wing tip (Fig. 1); membrane with only a few macrotrichia; basal radial cell without macrotrichia. Genitalia as in Fig. 2. Sternite 9 barely visible at lateral margins, central portion not discernible; tergite 9 nearly parallel sided, with short pointed apicolateral processes. Gonocoxite straight; gonostylus straight, tapering slightly distally to pointed, slightly outward curved tip. Gonostyli are probably inverted, presumably the result of preservation. Aedeagus simple, Y-shaped; basal arch extending 0.63 of total length; basal arm straight. Parameres (Fig. 3) separate, without ventral lobe; proximal portion slightly sinuate distally; distal portion tapering to fine point, without fringe of setae.

Female: Unknown.

Type: Holotype male, Dominican amber, USNM 9137.b (with *Brachypogon (Isohelea) dominicanus* n. sp., + Lepidoptera).

Etymology: This species is named for the Greater Antilles, the group of islands that includes Hispaniola, the type-locality of the species.

Discussion: The wing pattern of this species is similar to, but less developed than, in *C. ambericus* n. sp. The wing of the recent species, *C. goeldi* Wirth & Blanton (1973) of the *reticulatus* Group (Wirth *et al.* 1988), from Brazil is also similar to this new fossil species. However, the aedeagus of *C. goeldi* has sublateral projections on its basal arch, the apicolateral processes are larger, and the parameres are more slender and nearly straight.

***Culicoides (Oecacta) brodzinskyi*,
new species**
(Figs. 4-10)

Diagnosis: Males distinguished from other Dominican amber *Culicoides* by the aedeagus with sublateral projections on the shoulders of the basal arch, bare parameres without ventral lobes, and

apical portion of wing with two transverse rows of isolated pale spots.

Description: Male. A typical member of the subgenus *Oecacta*. Wing pattern (Fig. 9) similar to the recent *C. (Haematomyidium) paraensis* (Goeldi), as illustrated in Wirth *et al.* (1988); second radial cell dark; pale spot over r-m crossvein rather distinct; cell r5 with 4 round pale spots; cell m1 with 3 well separated pale spots; cell m2 with spot at wing margin; cell m4 with central round spot. Genitalia as in Figs. 4-7. Sternite 9 with deep caudomedian excavation; tergite 9 with long triangular apicolateral processes (Figs. 4-5). Gonocoxite quite long (Fig. 4); gonostylus (Fig. 6) slightly curved, tapered on distal 2/3, tip blunt. Aedeagus (Fig. 7) Y-shaped, with high basal arch; a pair of sublateral, pointed, triangular, posteriorly directed processes on shoulders of arch; distal portion straight, tip truncated. Parameres (Fig. 7) separate; midportion slender, straight; ventral lobe absent; distal portion tapering to moderately short, slender, laterally recurved bare tip.

Female: Similar to male with the usual sexual differences. Wing (Fig. 10) with smaller spots in 2nd transverse row and at wing tip. Two spermathecae (Fig. 8), each about 46 µm long, with very short necks.

Types: Holotype male, 10 paratypes (9 females, 1 male) in same amber piece, AMNH W-DR-50 (+Aranei), specific locality unknown, purchased from Jorge Wunderlich, June 1989. The holotype is the male with well preserved, transparent genitalia.

Etymology: This species is named for our good friend, Jacob Brodzinsky, an amber dealer and collector of amber inclusions in Santo Domingo, Dominican Republic.

Discussion: This new fossil species has a wing pattern similar to the recent *C. paraensis*, but this extant species has an aedeagus that lacks sublateral projections on its shoulders, the mid portion of the parameres has well developed ventral lobes, and the distal portion of the parameres bears a distinct fringe of setae.

***Culicoides (Oecacta) ambericus*,
new species**
(Figs. 11-13)

Diagnosis: Males distinguished from other species of *Culicoides* in Dominican amber by the following combination of characters: parameres with ventral lobe, basal arch of aedeagus with a pair of sublateral projections, radial cell r2+3 with

2 large pale spots.

Description: Male. Body brown; total length 0.9-1.1mm. Wing length 0.7-0.9mm. Wing pattern as in female (Fig. 11); basal radial cell without macrotrichia; macrotrichia on distal portion of wing less abundant than in female. Genitalia as in Figs. 12-13. Sternite 9 with deep caudomedian excavation; tergite 9 with pointed triangular apicolateral processes (not illustrated). Gonocoxite straight; gonostylus slightly curved distally. Aedeagus Y-shaped, with high basal arch; shoulders of basal arch with a pair of slender, sublateral, posteriorly directed triangular processes; distal portion, slender, tip truncate. Parameres (Fig. 13) separate; midportion with distinct small lobe at midportion; distal portion sinuate, apex recurved, apparently without fringe.

Female: Wing length 0.94 mm; costal ratio 0.63. Wing (Fig. 11) with pattern as illustrated; membrane with numerous macrotrichia; basal radial cell without macrotrichia. Third palpal segment with distinct sensory pit.

Types: Holotype male, USNM 2905 (+Psychodidae); Allotype female, AMNH DR-6/YD; 1 male paratype, USNM 8968a (+8968b, *Forcipomyia (Trichohelea)*, and Cecidomyiidae, Chironomidae, Trichoptera, Hymenoptera).

Etymology: This specific epithet is a reference to the amber which encloses this new fossil species.

Discussion: This new fossil species has a wing pattern similar to the recent *C. (Oecacta) furens* (Poey), which is common on the Atlantic coast of the Americas (Blanton & Wirth 1979; Wirth *et al.* 1988). However, *C. ambericus* has only two pale spots in cell r2+3, whereas *C. furens* has 4 pale spots in that cell.

Culicoides (Oecacta) hispanicolus,
new species
(Fig. 14)

Diagnosis: Males distinguished from other species of *Culicoides* in Dominican amber by short, straight, simple parameres; short apicolateral processes on tergite 9; wing pattern as in *C. ambericus* n. sp. Females unknown.

Description: Male. Body brown. Total length about 1.0mm. Wing length 0.78mm; costal ratio 0.54. Wing pattern as in *C. ambericus* (Fig. 11), but with more pale spots. Genitalia as in Fig. 14. Sternite 9 moderately long, medial caudal margin not visible; tergite 9 tapers slightly distally, apicolateral processes short. Aedeagus Y-shaped; basal

arch high, with slender sublateral projections on shoulders; distal portion slightly expanded apically, tip truncate. Parameres apparently poorly developed, visible only as simple straight rods.

Female: Unknown.

Type: Holotype male, FSCA 978/P.A.

Etymology: This new fossil species is named for the island of Hispaniola, the place of origin of the amber.

Discussion: The combination of simple, straight parameres and the distinct wing pattern are unique among recent and fossil species in the subgenus *Oecacta*.

Culicoides mammalicolus, new species
(Figs. 15-16)

Diagnosis: Males distinguished from other species of *Culicoides* in Dominican amber by its unpatterned wings. Females unknown.

Description: Male. Body dark brown. Total length 1.2mm. Palpus (Fig. 16) with slender third palpal segment, bearing a small sensory pit. Wing transparent, without pattern. Wing length 0.75 mm; costal ratio 0.65; basal radial cell without macrotrichia. Genitalia as in Fig. 16. Sternite 9 with shallow caudomedian excavation; tergite 9 long and slender, apicolateral processes long, broadly triangular with rounded apex. Gonocoxite slightly curved; gonostylus slightly curved, tapering gradually distally, with slender bent apical portion. Aedeagus with tip only visible, which is broad and pointed. Parameres probably separate; only apical portion visible, the distal portion of which is slender, slightly curved, apex pointed.

Female: Unknown.

Type: Holotype male, USNM 3742 (+mammal hair).

Etymology: The specific name meaning "mammal-loving", is a reference to the mammal hair enclosed in the amber with this species. It is worth noting that Poinar (1988, 1990) also recorded mammalian hairs in Dominican amber.

Discussion: This species differs from all other *Culicoides* in Dominican amber by its unpatterned wings and in not being a member of the subgenus *Oecacta*.

Undetermined *Culicoides*: The material that we have examined contains 18 specimens of *Culicoides* (5 males, 13 females), all of which apparently belong to the subgenus *Oecacta* Poey, and have a wing pattern similar to the type-species of the subgenus *C. furens* (Poey) and *C. ambericus* n. sp. We list these specimens below, but refrain from

describing this material because the recent species in the subgenus *Oecacta* in the Americas are extremely diverse, and species recognition requires careful detailed examination of female wing patterns, distribution of antennal sensilla, male genitalia, etc. One species of the subgenus *Oecacta* is known from older Baltic amber, *C. balticus* Szadziewski (1988), but it differs from specimens in Dominican amber in having macrotrichia in the basal radial cell and blunt apicolateral processes on tergite 9 of the male genitalia.

AMNH 11821A, 1 male, La Vega, La Vega Prov., purchased from J. Brodzinsky, Santo Domingo, 1987; DR-8-97, 1 female (+Coleoptera), purchased in Santo Domingo by D. Grimaldi; DR-8-113, 1 female, purchased in Santo Domingo by D. Grimaldi; DR-10-48, 1 male; DR-10-88, 1 female; PB-309, 1 female (+Cyclorrhapha and Thysanoptera), purchased in Santo Domingo by P. F. Burke.

FSCA 1573, 1 female (+*Brachypogon* (*B.*), *B. Isohelea*) and Homoptera); 1862a, 1 male, Santiago (+Chironomidae, and b. Blattaria, Chironomidae and Orthoptera); 2235, 1 female.

USNM 2771a, 1 female (at b. *Dasyhelea dominicana* and Chironomidae); 2852, 1 male; 2884, 1 female (+Chironomidae and Phoridae); 2903, 1 female; 5454a, 1 male (+Formicidae), at b. Sciariidae, Cecidomyiidae, and Hymenoptera); 7639, 1 female Homoptera); 8328, 1 female (+Heteroptera); 8707, 1 female (+Aranei, Psocoptera, Homoptera); 10900a, 1 female.

Tribe Ceratopogonini

Genus *Brachypogon* Kieffer

References: Wirth & Grogan (1988); Szadziewski (1988, 1993).

Key to species of *Brachypogon* in Dominican Amber (Males)

1. Wing without radial cells
..... *B. (B.) americanus* n. sp.
—Wing with two small radial cells 2
2. Antennal flagellum with 11 flagellomeres, only distal 2 flagellomeres separate
..... *B. (Isohelea) prominuloides* n. sp.
—Antennal flagellum with 13 flagellomere, distal 3 flagellomeres separate
..... *B. (Isohelea) dominicanus* n. sp.

Brachypogon (B.) americanus, new species (Figs. 17-20)

Diagnosis: Males distinguished from other species of *Brachypogon* in Dominican amber by its wing without radial cells and long, blunt apicolateral processes on tergite 9. Females unknown.

Description: Male. Body brown. Total length 0.8 mm. Antennal flagellum (Fig. 17) with 13 flagellomeres, distal 3 separated, 2-10 fused; total flagellum length 336 μ m. Palpus (Fig. 18) with small sensory pit on 3rd segment; fourth segment without setae. Fourth tarsomeres cylindrical, with recurved sensory setae; tibial spur of hind leg distinct; hind tarsal ratio 2.1. Wing transparent; length 525 μ m; costal ratio 0.53; wing membrane bare, microtrichia not visible; radial cells obsolete (Fig. 19); vein M2 not visible. Genitalia as in Fig. 20. Posterior margin of sternite 9 not visible; tergite 9 with very long, blunt apicolateral processes. Gonocoxite moderately short and stout; gonostylus very long, slightly curved, tapering distally to sharply pointed tip. Aedeagus, parameres, and proctiger barely visible; an interpretation is presented in Fig. 20.

Female: Unknown.

Type: Holotype male, FSCA 1794a (+b. female *Stilobezzia dominicana* and 1 female Chironomidae).

Etymology: The specific name is a reference to the Americas, the locality of this New World fossil species.

Discussion: The combination of a wing without radial cells (subgenus *Brachypogon*) and long apicolateral processes, are unique among recent and fossil *Brachypogon (B.)*. Only a few recent species of *Brachypogon (B.)* from the Western Hemisphere are known (Downes 1976; Wirth & Grogan 1988). Spinelli and Grogan (1998) describe several new recent Neotropical species in the subgenus *Brachypogon*.

Subgenus *Isohelea* Kieffer

Reference: Spinelli & Grogan (1994; Neotropical species)

Brachypogon (Isohelea) dominicanus, new species (Figs. 25-35)

Diagnosis: A small dark species of the subgenus *Isohelea* with dark radial cells. Males distinguished from other species of *Brachypogon* in Dominican amber by its wing with two radial cells,

antennal flagellum with 13 flagellomeres, genitalia with small apicolateral processes on tergite 9, aedeagus long and slender, and parameres stout with strongly diverging evenly pointed apices.

Description: Male. Body black. Total length 0.7-0.9 mm. Eyes pubescent. Antennal flagellum (Fig. 25) with 13 flagellomeres, flagellomeres 2-10 fused, 11-13 separate; flagellomere 1 with sensilla coeloconica; total flagellum length 330-450 μm . Palpus (Fig. 26); segment 3 slightly swollen, with shallow sensory pit at apex; segment 4 with one long seta; total palpus length 30-32 μm . Scutellum with 2 lateral and 2 submedian bristles. Legs slender with pale tarsi; hind tibia with distinct spur, comb composed of 7 spines, and well developed palisade setae; tarsal ratio I 2.0. Wing transparent except for small dark radial cells (Fig. 27); wing membrane bare, without macrotrichia; vein M2 not visible; wing length 0.54-0.67 mm; costal ratio 0.49-0.50. Genitalia as in Figs. 28-30. Sternite 9 with shallow caudomedian excavation (Fig. 30); tergite 9 gradually tapering distally, apicolateral processes well developed, cerci lobe shaped, extending beyond tergite 9 (Fig. 29). Gonocoxite straight, stout, without special modifications; gonostylus slightly curved distally, with moderately pointed tip, distal third variable, may be bent, flattened, or expanded (Fig. 28). Aedeagus slender, triangular, with very low basal arch; basal arm short, straight; distal portion with bifurcate or bifid tip. Parameres fused at bases; distal portions long and stout, gradually tapering to evenly pointed greatly diverging apices.

Female: Similar to male with the following notable sexual differences. Total length 0.9-1.0 mm. Antennal flagellum (Fig. 31) with proximal 8 flagellomeres slightly transverse to spherical, distal 5 flagellomeres more elongated; flagellomere 1 with sensilla coeloconica; total flagellum length 252-320 μm ; antennal ratio 1.10-1.19. Palpus (Fig. 32); segment 3 with moderately large sensory pit. Wing (Fig. 33) with a few macrotrichia present on margin in cell r2+3; radial cells small, slitlike; vein M2 discernible in some specimens; wing length 0.56-0.69 mm; costal ratio 0.60-0.62. Fourth tarsomeres (Fig. 34) cordiform with recurved sensory setae; claws of legs (Fig. 34) more or less unequal depending on angle of observation (Fig. 35); Tarsal ratios, I 2.0, II 2.3, III 2.7.

Types: Holotype male, AMNH-WV-3.a. Paratypes: AMNH DR-6-31, 9 males, 3 females; AMNH WV-3.b.c.d, 4 males (+ Cecidomyiidae, Sciaridae, Homoptera); AMNH WV-4, 26 males, 29 females; AMNH (without number), El Valle, purchased in

Santo Domingo from J. Brodzinsky, 1 male; USNM 2693, 1 male, 14 females (+Cecidomyiidae, Homoptera); USNM 7642, 1 male (+Homoptera); USNM 10729, 2 males, 2 females; USNM 10732, 1 male 1 female.

The following other specimens were examined, but are not designated as paratypes: AMNH 11829, 1 male 2 females (+*Dasyhelea*, Cecidomyiidae, Sciaridae, Psychodidae, Phoridae, Coleoptera, Hymenoptera, Acarina); AMNH DR-6-119, a,b,c, 1 male, 2 females (+ Cecidomyiidae, Sciaridae, Hymenoptera); FSCA 452, 3 males, 2 females; USNM 9137, 1 males; USNM 9137.a, 1 male (+Lepidoptera); USNM 9848, 1 male (+Cecidomyiidae, Coleoptera, Hymenoptera); USNM 10731, 1 male (+Cecidomyiidae, Homoptera, Hymenoptera); USNM 10734, 3 males, 3 females (+Cecidomyiidae, Chironomidae, Psychodidae, Homoptera).

Etymology: The specific name is a reference to the Dominican Republic, the country of origin on the island of Hispaniola.

Discussion: The combination of two radial cells and 13 flagellomeres is sufficient to distinguish males of this species from other species of *Brachypogon* in Dominican amber.

Discussion: Males of this new fossil species key to near couplet 7, near *B. (Isohelea) mapuche* Spinelli (1990) in the recent key to Neotropical species of the subgenus *Isohelea* in Spinelli & Grogan (1994). Males of this recent species differ from *B. (Isohelea) dominicanus* in having an aedeagus with a truncate tip, parameres fused on proximal half and 4th palpal segment with 2 large setae. Females of this new fossil species differ from all recent Neotropical species of the subgenus *Isohelea* by possessing only a single large seta on their 4th palpal segment (Spinelli 1990; Spinelli & Grogan 1994)

***Brachypogon (Isohelea) prominuloides*,
new species
(Figs. 21-24)**

Diagnosis: Males distinguished from other species of *Brachypogon* in Dominican amber in having a wing with two radial cells and an antennal flagellum with 11 flagellomeres. Females unknown.

Description: Male. Body brown. Total length 0.8 mm. Eyes pubescent. Antennal flagellum (Fig. 21) with 11 flagellomeres, flagellomeres 2-9 fused, 10-11 separate; total flagellum length 296 μm . Palpus 5-segmented; segment 4 with one long seta.

Legs barely visible; fourth tarsomeres sub-cylindrical. Wing transparent, veins pale; two small radial cells (Fig. 28); membrane without macrotrichia or microtrichia; wing length 0.48 mm; costal ratio 0.47. Genitalia as in Figs. 23-24. Sternite 9 with narrow shallow caudomedian excavation; tergite 9 tapering gradually distally with broad, long apicolateral processes, each with long apical seta. Gonocoxite short, straight; gonostylus moderately long, slender, curved and tapering distally to pointed apex. Aedeagus long, slender, with slightly bifid tip (Fig. 1). Parameres not visible.

Female: Unknown.

Type: Holotype male, USNM 9568.

Etymology: The specific name is a reference to the Baltic amber species *Brachypogon (Isohelea) prominulus* (Meunier), which superficially resembles this new species from Dominican amber.

Discussion: Males of most recent species of *Brachypogon* have antennal flagella composed of 13 flagellomeres (Wirth & Grogan 1988). Males of the fossil species, *B. (I.) prominulus*, from Baltic amber, also has an antennal flagellum with 11 flagellomeres (Szadziewski 1988). However, it differs from males of *B. (Isohelea) prominuloides* in its even longer, fingerlike apicolateral processes of tergite 9; tip of gonocoxite rounded; and well developed parameres with long divergent distal portions.

Undetermined *Brachypogon*: The following 112 specimens in Dominican amber were not determined to species. *Brachypogon (B.)*: FSCA 1573, one female (+*Brachypogon (Isohelea)*, *Culicoides*, and Homoptera). *Brachypogon (Isohelea)*: 111 specimens (45 males, 65 females, 1 intersex): AMNH DR-6-121, 1 female (+Chironomidae and Homoptera); DR-10-58, 1 female; DR-10-61, 1 female; DR-10-92, 1 female; DR-10-102, 1 female; W-DR-48, 1 female (+Cecidomyiidae).

FSCA 367, 1 female (+Psychodidae and Coleoptera); 371-E.V., 1 female; 1062-E.V., 1 male; 1078-E.V., 1 male (+Limoniidae, Chironomidae, and Formicidae); 1573, 1 female (+*Brachypogon (B.)*); 1304, 1 intersex, all characters typical of male but genitalia externally as in female.

RYSC 8 (from W. L. Grogan), 1 female.

USNM 2580, 3 males, 4 females (+Cecidomyiidae and Psocoptera); 2965, 5 males; 3751, 1 female (+Blattaria); 5346, 1 male (+Psychodidae, Cecidomyiidae, Homoptera and Hymenoptera); 5556, 3 males, 1 female (+Chironomidae and Hymenoptera); 5611 a,b,c,d,f, 2 males, 3 females (+*Dasyhelea* at 5611 e, Coleoptera at 5611 d); 7359, 2 males, 2 females (+Psychodidae, Limoniidae, Coleoptera and Hymenoptera); 7424a,b, 1 male (+Cecidomyiidae, Scatopsidae, Hymenoptera, Homoptera, Trichoptera and Collembola); 7685, 1 male, 1 female (+Orthoptera); 7691, 1 female (+Cecidomyiidae, Orthoptera and Hymenoptera); 7781, 1 female (+Acalyptrata, Isoptera, Homoptera, Hymenoptera and Acarina); 8618, 1 female (+Homoptera); 8618, 1 female (+Homoptera); 8666, a, b, 1 male (+Cecidomyiidae, Dolichopodidae, Homoptera and Hymenoptera); 8681, 1 female; 9301, 1 female (+Homoptera); 9501b, 2 males (at 9501a, *Stilobezzia antilleana*; at 9501 c, Cecidomyiidae, Psychodidae, Orthoptera, Coleoptera, Homoptera, Hymenoptera and Aranei); 9514, 2 females (+Cecidomyiidae and Aranei); 9712, 1 male, 4 females (+*Forcipomyia (Lasiohelea)*, Psychodidae, Chironomidae, Scatopsidae, Cecidomyiidae, Dolichopodidae and Coleoptera); 9735, 1 male (+Cecidomyiidae, Mycetophilidae, Psychodidae, Isoptera, Coleoptera, Hymenoptera and Homoptera); 9862, 1 male; 9947, 1 female (+Coleoptera); 9958, 1 female (+*Forcipomyia* sp., Cecidomyiidae, Mycetophilidae, Psychodidae, Homoptera, Psocoptera, Coleoptera and Hymenoptera); 10083, 1 male; 10180, 1 female (+Cecidomyiidae, Muscomorpha and Coleoptera); 10373, 1 male (+Coleoptera); 10529, 1 male, 1 female (+Hymenoptera); 10728, 2 females; 10730, 15 males, 23 females (+Cecidomyiidae, Dolichopodidae and Formicidae); 10771, 1 female (+*Dasyhelea*, Scatopsidae, Cecidomyiidae, Mycetophilidae, Psychodidae, Dolichopodidae and Hymenoptera); 10888, 1 male.

Genus *Nannohelea* Wirth & Grogan

References: Szadziewski (1988), Wirth & Grogan (1988).

This genus of minute biting midges includes 4 recent species from the tropics, subtropics in both the New and Old World and in the Palearctic, in addition to 2 fossil species from Baltic amber. Females of different species often resemble each other and are difficult to characterize. The single female described below is poorly preserved and is not named. In addition, 1 other female is identifiable as belonging to this genus but is not described.

Nannohelea sp. A

Description: Female. Antennal flagellum with flagellomeres more cylindrical than in the other undescribed female from Dominican amber; total flagellum length 360 μ m; antennal ratio

0.73. Wing length 0.76 mm. Male. unknown.

Material examined: USNM 9256, 1 female. *Nannohelea* sp., FSCA 853, 1 female.

Genus *Stilobezzia* Kieffer

References: Szadziewski (1988, 1993), Wirth & Grogan (1988).

Subgenus *Acanthohelea* Kieffer

Before his recent untimely death, Willis Wirth graciously informed us that the fossil species, *Stilobezzia* (*Acanthohelea*) *succinea* Szadziewski (1993), from Miocene Saxonian amber is a primary homonym of the recent *Stilobezzia succinea* Ingram & Macfie (1931), from Argentina. Therefore, for the junior homonym, we propose the new replacement name, *Stilobezzia* (*Acanthohelea*) *wirthicola*, in honor of our dear departed colleague.

Stilobezzia (*Acanthohelea*) *dominicana*, new species (Figs. 36-43)

Diagnosis: Distinguished from other species of *Stilobezzia* in Dominican amber by the presence of macrotrichia at wing tip; males with stout parameres with pointed, ventrally curving apices; females lacking enlarged setae on ventral surface of 5th tarsomeres.

Description: Male. Body dark. Total length 1.3 mm. Antennal flagellum with distal 4 flagellomeres elongated (Fig. 36); plume reaching tip of flagellomere 12; total flagellum length 735-745 μ m; antennal ratio 0.95. Palpal segment 3 relatively short, 32 μ m long. Scutellum with 4 long bristles. Fourth tarsomeres cordiform; hind tarsomere 4 with palisade setae; tarsal ratios, I 2.5-2.6, II 3.0-3.2, III 2.7. Wing length 0.80-0.92 mm; costal ratio 0.59-0.64; membrane with distinct microtrichia, macrotrichia present at wing tip; 2nd radial cell 1.5-1.9 times longer than first. Genitalia as in Figs. 42-43. Sternite 9 barely visible; tergite 9 tapering gradually to apex, cerci well developed, setose. Gonocoxite slender, straight; gonostylus slightly curved, tapered distally, proximal half setose, apex blunt. Aedeagus composed of 2 oblique sinuous sclerites as is typical of the subgenus. Parameres separate; distal portions long, stout and swollen at midportion, tapering gradually to pointed ventrally directed apices.

Female: Body dark brown. Total length 1.2-1.4 mm. Antennal flagellum (Fig. 37) with elon-

gate flagellomeres, distal 5 twice as long as proximal 8; total flagellum length 936 μ m; antennal ratio 1.25. Scutellum with 4 bristles. Tarsomere 1 of midleg with strong subbasal spine; 4th tarsomeres (Fig. 41) cordiform, with single apical curved seta; 5th tarsomeres (Fig. 41) without enlarged ventral setae, claws of all legs strongly unequal (Fig. 41); hind tarsomere 1 with two rows of palisade setae; hind tibial comb with 4 spines; tarsal ratios, II 3.0, III 2.4 (I not determinable). Wing transparent, 2nd radial cell (Fig. 40) 2.6-3.0 times longer than 1st; sparse macrotrichia at wing tip (Figs. 38-39); wing length 0.84-1.04 mm; costal ratio 0.72-0.75.

Types: Holotype male, RYSC, 7a (+b *Forcipomyia* and Psychodidae). Paratypes, AMNH DR-8-116, 1 male, purchased in Santo Domingo by D. Grimaldi (+Chironomidae); USNM 2932, 1 male, 2 females (+*Forcipomyia* (*Lepidohelea*), Chironomidae, Sciaridae and Psychodidae); USNM 7615b, (+a *Forcipomyia*, and Hymenoptera); USNM 8657, 1 female (+Homoptera); USNM 9425a, 1 female (+*Forcipomyia*); FSCA 1794b, 1 female; FSCA 1862c, 1 female (+a *Culicoides* and Chironomidae; b, Chironomidae, Acarina, Blattaria and Orthoptera).

Not included in the type series: USNM 3099a, 1 female.

Etymology: The specific name is a reference to the country of origin of the amber on the island of Hispaniola.

Discussion: Females of this new fossil species differ from the only other species of *Stilobezzia* (*Acanthohelea*) in Dominican amber with macrotrichia on its wing membrane (sp. A) in lacking a pair of large setae on its 5th tarsomeres. Males of sp. A are unknown.

Stilobezzia (*Acanthohelea*) sp. A (Fig. 44)

Diagnosis: Females distinguished from other species of *Stilobezzia* in Dominican amber by macrotrichia on the wing membrane and 5th tarsomeres with a pair of large ventral setae.

Description: Female. Body dark. Total length 0.9 mm. Scutellum with 4 bristles. Wing with a few macrotrichia at wing tip; wing length 0.7 mm. Tarsomere 1 of midleg without subbasal spine; tarsal ratios, I 2.5, II 2.6, III 2.6; 5th tarsomeres with two enlarged subbasal setae on a distinct tubercle situated on ventral surface, claws greatly unequal.

Male: Unknown.

Material examined: USNM 11320, one female (+ Scatopsidae, Limoniidae, Mycetophilidae, Orthoptera and Hymenoptera).

Discussion: Enlarged setae on 5th tarsomeres are present on many recent species of the subgenus *Acanthohelea* of the tropics and subtropics, especially of the New World. However, this character is recorded for the first time from extinct forms in this new fossil species.

Subgenus *Stilobezzia* Kieffer

Stilobezzia (*S.*) *antilleana*, new species (Figs. 45-49)

Diagnosis: Males distinguished from other species of *Stilobezzia* in Dominican amber by lacking macrotrichia on its wing membrane and having stout parameres with unique bicornate tips.

Description: Male. Body dark brown. Antennal flagellum with moderately elongated distal 3 flagellomeres (Fig. 45); total flagellum length 540 μ m. Scutellum with 4 bristles. Tarsomere 1 of hind leg with 2 rows of palisade setae, tarsomere 1 of midleg with strong subbasal spine; tarsal ratios II 2.7, III 2.2. Wing length about 0.74 mm; first radial cell very small. Genitalia as in Figs. 48-49. Gonocoxite short, stout; gonostylus nearly straight, apical portion tapering abruptly to slender, finger-like tip. Aedeagus weakly sclerotized. Parameres heavily sclerotized, separate; basal apodeme at 90° to main body of distal portion with a smaller posterior projection; distal portions slender, apical portions expanded distally with slightly divergent, bicornate tips.

Female: Body dark. Total length 1.3 mm. Antennal flagellum (Fig. 46) with more or less cylindrical flagellomeres; total flagellum length 728 μ m. Scutellum with 4 bristles. Tarsomere 1 of midleg with subbasal spine; tarsal ratios, I 2.8, II 3.3, III 2.9; 5th tarsomeres relatively short, without enlarged setae, claws greatly unequal. Wing transparent, membrane without macrotrichia; 2nd radial cell 6.5 times longer than 1st; wing length 0.86 mm; costal ratio 0.75.

Types: Holotype male, USNM 9501a; allotype female, USNM 10921 (+Hymenoptera). Paratype, one female, AMNH DR-14-242, north mines (+Scolytidae).

Etymology: The specific name is a reference to the Greater Antilles, the island group that includes Hispaniola, the place of origin of the amber.

Discussion: This is the first named fossil spe-

cies in the subgenus *Stilobezzia*. A single unnamed female devoid of diagnostic features is known from Baltic amber (Szadziewski 1988). Species of this subgenus are common in tropics and subtropics throughout the world, but are uncommon in temperate regions (Wirth & Grogan 1988).

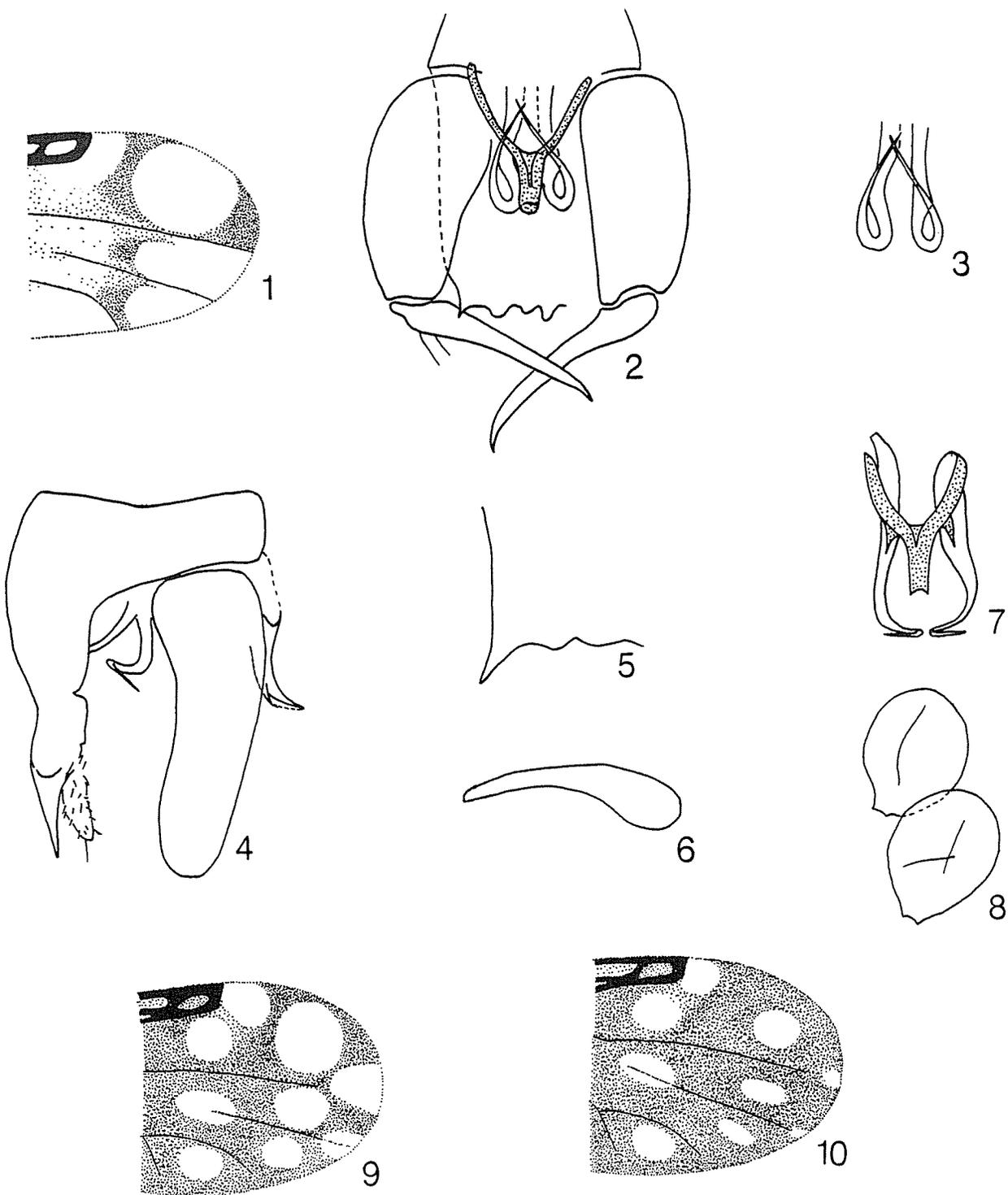
Acknowledgments

We extend thanks to the following curators for the loan of amber inclusions examined in this study: W. Mathis and W. Rowe (USNM), D. Grimaldi (AMNH), and R. Woodruff (FSCA). The senior author gratefully acknowledges a Short Term Visitor Grant from the Smithsonian Institution and grant no. 7-1431-9101 by the Polish Committee for Scientific Studies (KBN). We also thank A. Borkent and G. Spinelli for their generous reviews of an earlier draft of the manuscript.

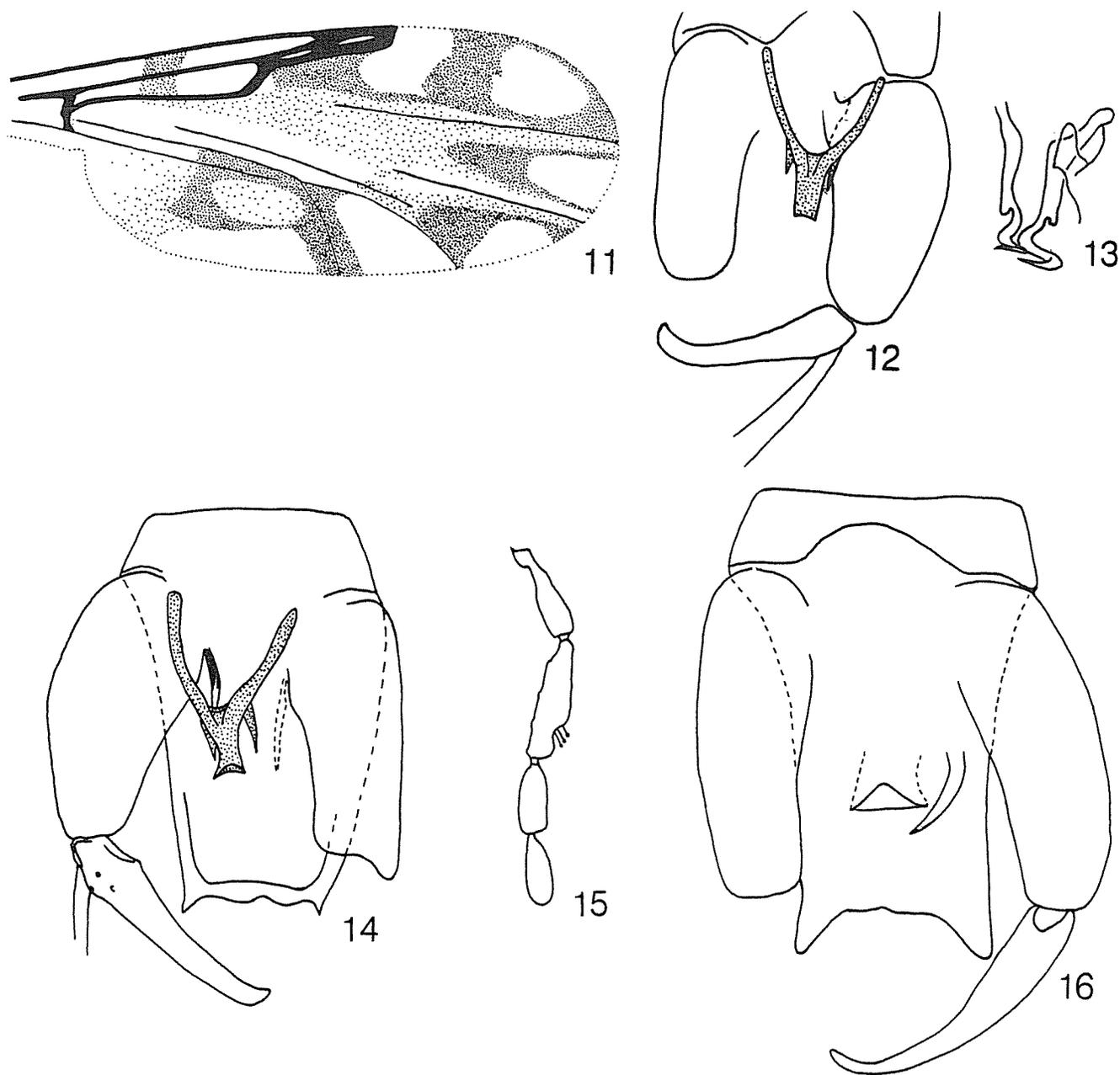
References

- Blanton F. S., and W. W. Wirth.** 1979. The sand flies (*Culicoides*) of Florida (Diptera: Ceratopogonidae). Arthropods of Florida and neighboring land areas. Florida Dept. Agr., Div. Plant Ind., Vol. 10. Gainesville, 204 p.
- Borkent, A.** 1995. Biting midges in the Cretaceous amber of North America (Diptera: Ceratopogonidae). Backhuys. Leiden, 237 p.
- Downes, J. A.** 1976. A new species of *Brachypogon* (Diptera: Ceratopogonidae), the first record of the genus in Canada. The Canadian Entomologist 108:1145-1151.
- Downes, J. A., and W. W. Wirth.** 1981. Chapter 28. Ceratopogonidae. pp. 393-421 *In: McAlpine, J. F., et al.* (eds.). Manual of Nearctic Diptera. Vol. 1, 674 pp. Agriculture Canada Monograph 27, Ottawa.
- Ingram, A., and J. W. S. Macfie.** 1931. Diptera of Patagonia and South Chile. Part II. Fascicle 4, pp. 155-232. British Museum (Nat. Hist.) London.
- Poinar, G. O., Jr.** 1988. Hair in Dominican amber: Evidence for Tertiary land mammals in the Antilles. *Experientia* 44:88-89.
- Poinar, G. O., Jr.** 1990. The presence of vertebrates and their remains in amber. *Prace Muzeum Ziemi* 41:164-165.
- Spinelli, G. R.** 1990. The genus *Brachypogon* in Argentina, with a key to the Neotropical species (Diptera, Ceratopogonidae). *Revista brasileira de Entomologia* 34:743-755.
- Spinelli, G. R., and W. L. Grogan, Jr.** 1994. Two

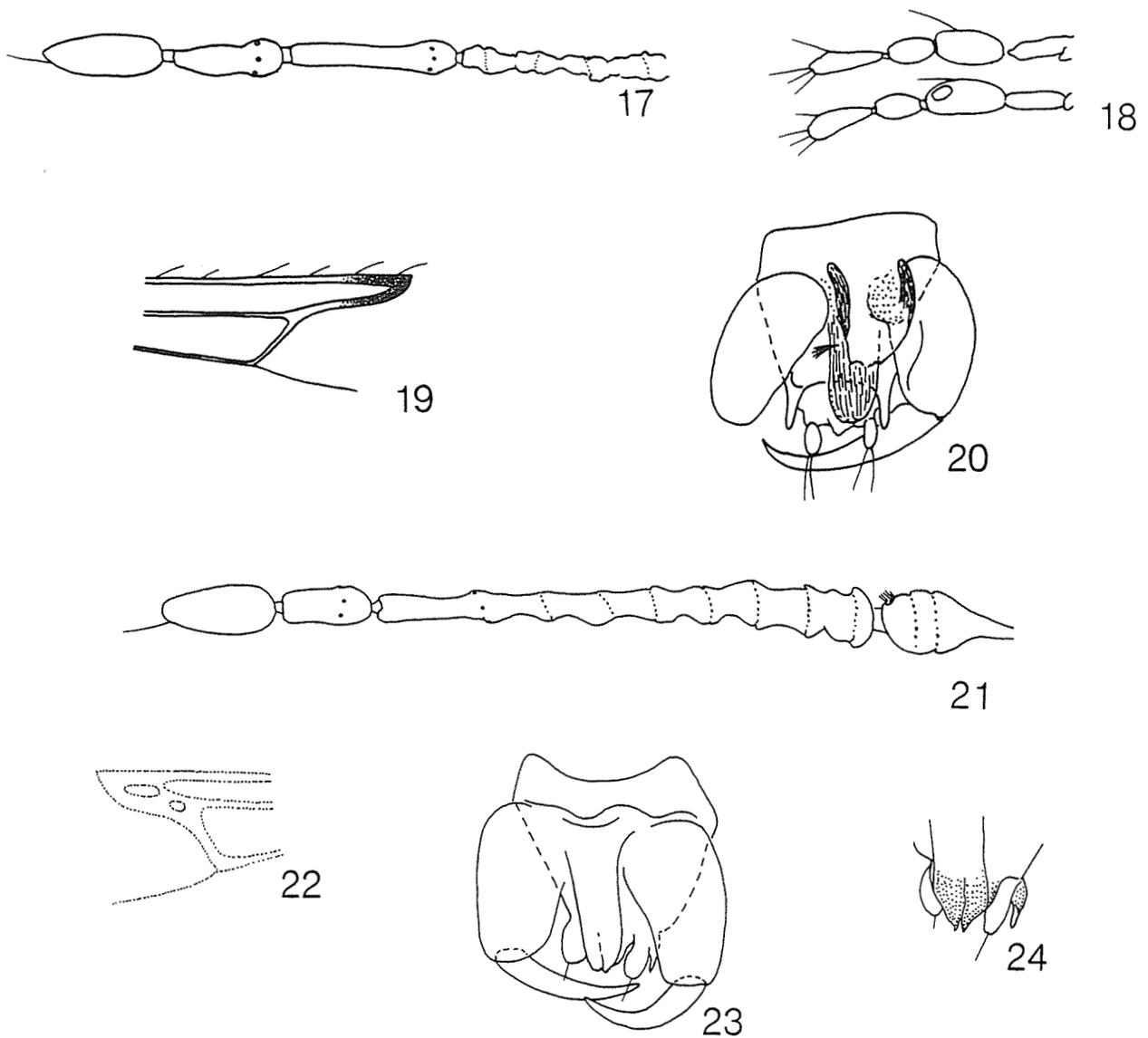
- new Neotropical species of the subgenus *Isohelea* of *Brachypogon*, with the description of the female of *B. (I.) misionensis* and key to the Neotropical species (Diptera: Ceratopogonidae). *Revista de la Sociedad Entomológica Argentina* 53:1-8.
- Spinelli, G. R., and W. L. Grogan, Jr.** 1998. A revision of the Neotropical predaceous midges of *Brachypogon* (*Brachypogon*) Kieffer (Diptera: Ceratopogonidae). *Insecta Mundi* 12:59-79.
- Szadziewski, R.** 1988. Biting midges (Diptera, Ceratopogonidae) from Baltic amber. *Polskie Pismo Entomologiczne* 58:3-283.
- Szadziewski, R.** 1993. Biting midges (Diptera, Ceratopogonidae) from Miocene Saxonian amber. *Acta zoologica cracoviensia* 35:603-656.
- Szadziewski, R., and W. L. Grogan, Jr.** 1994. Biting midges from Dominican amber. I. A new fossil species of *Baeodasymyia* (Diptera: Ceratopogonidae). *Proceedings of the Entomological Society of Washington* 96:219-229.
- Szadziewski, R., and W. L. Grogan, Jr.** 1996. Biting midges from Dominican amber. II. Species of the tribes Heteromyiini and Palpomyiini (Diptera: Ceratopogonidae). *Memoirs of the Entomological Society of Washington* 18:254-260.
- Wirth, W. W., and F. S. Blanton.** 1973. A review of the Maruins or biting midges of the genus *Culicoides* (Diptera: Ceratopogonidae) in the Amazon Basin. *Amazoniana* 4:405-470.
- Wirth, W. W., A. L. Dyce, and G. R. Spinelli.** 1988. An atlas of wing photographs, with a summary of the numerical characters of the Neotropical species of *Culicoides* (Diptera: Ceratopogonidae). *Contributions of the American Entomological Institute* 25(1):1-72.
- Wirth, W. W., and W. L. Grogan, Jr.** 1988. The predaceous midges of the World (Diptera: Ceratopogonidae; tribe Ceratopogonini). *Flora & Fauna Handbooks No. 4*, E. J. Brill, New York, 160 pp.



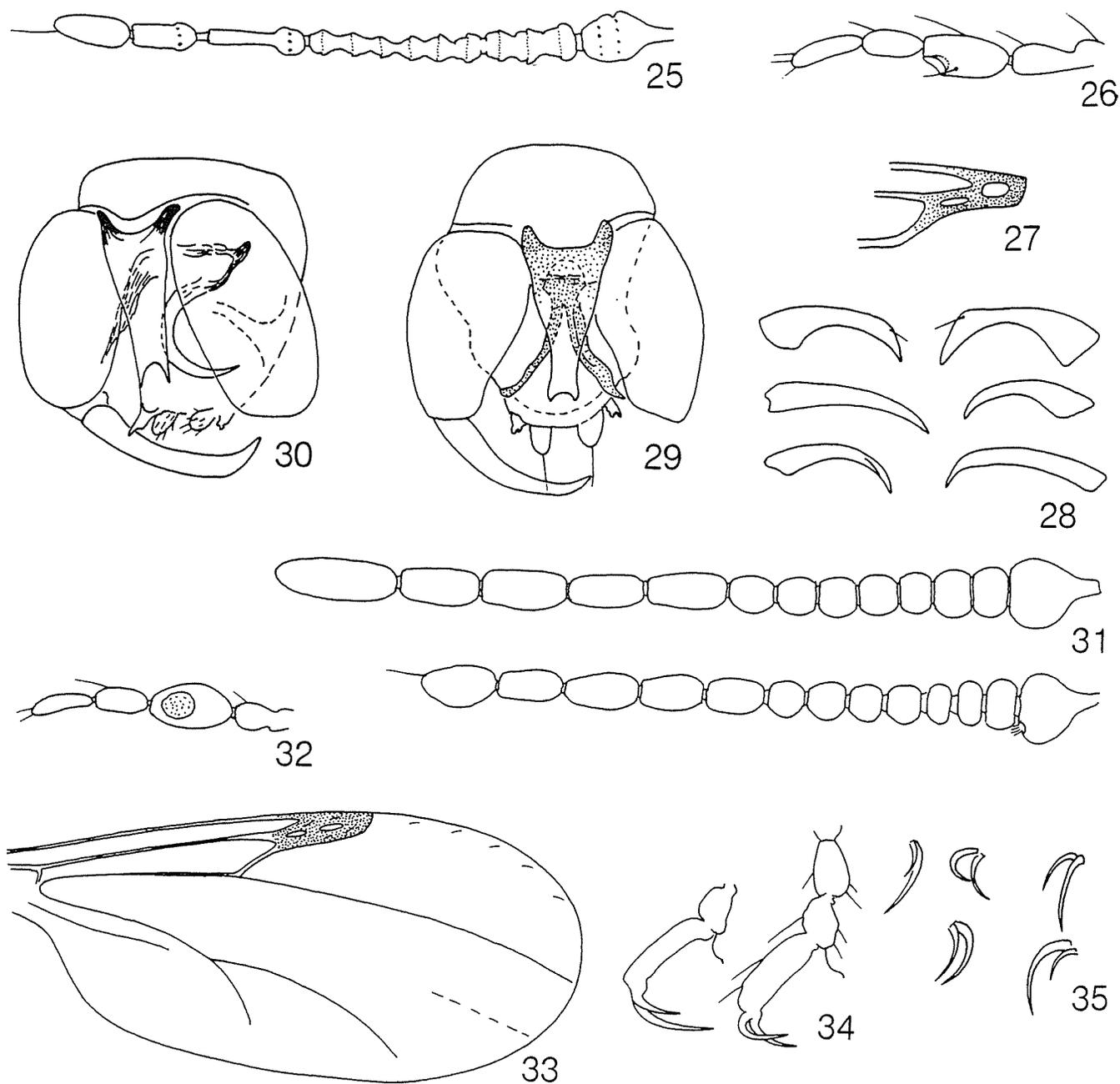
Figures 1-10: Figs. 1-3: *Culicoides antilleanus* male: 1, distal portion of wing; 2, genitalia; 3, parameres. Figs. 4-8: *Culicoides brodzinskyi*, 4-7, 9, male; 8, 10, female: lateral aspect of genitalia; 5, apicolateral process of tergite 9; 6, gonostylus; 7, aedeagus and parameres; 9-10, distal portion of wing.



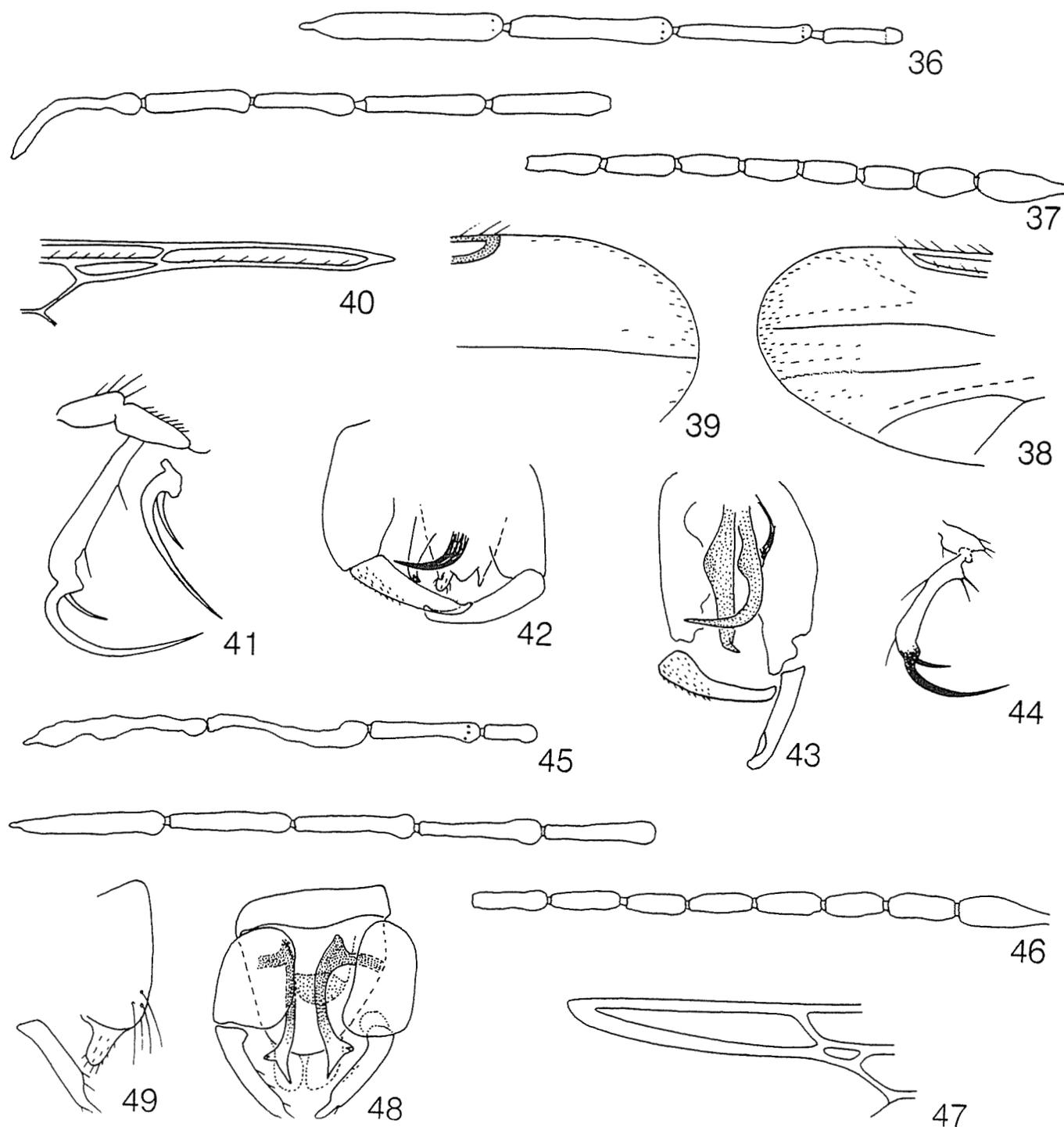
Figures 11-16: Figs.11-13: *Culicoides ambericus*: 11, female wing; 12, male genitalia; 13, parameres. Fig. 14: *Culicoides hispanicolus*, male genitalia; Figs. 15-16: *Culicoides mammalicolus*, male: 15, genitalia; 16, palpus.



Figures 17-24: Figs. 17-20: *Brachypogon (B.) americanus*, male: 17, distal flagellomeres; 18, palpi; 19, radial vein and costa of wing; 20, genitalia. Figs. 21-24: *Brachypogon (Isohelea) prominuloides*, male: 21, antennal flagellum; 22, radial cells of wing; 23, genitalia; 24, distal portion of tergite 9 and tip of aedeagus.



Figures 25-35: Figs. 25-30: *Brachypogon (Isohelea) dominicanus*, male: 25, antennal flagellum; 26, palpus; 27, radial cells of wing; 28, different shapes of gonostyli; 29-30, genitalia. Figs. 31-35: *Brachypogon (Isohelea) dominicanus*, female: 31, antennal flagella; 32, palpus; 33, wing; 34, distal tarsomeres and claws of fore and midleg; 35, various shapes of claws of fore, mid, and hind leg (from left to right).



Figures 36-49: Figs. 36-43: *Stilobezzia (Acanthohelea) dominicana*, 36, 42-43, male; 37-41, female: 36, distal antennal flagellomeres; 46, antennal flagellum; 38-39, distal portion of wing; 40, radial cells of wing; 41, distal tarsomeres and claws; 42-43, genitalia of paratype (42) and holotype (43). Fig. 44: *Stilobezzia (Acanthohelea)* sp. A, female fifth tarsomere and claws. Figs. 45-49: *Stilobezzia (S.) antilleana*, 45, 48-49, male, 46-47, female: 45, distal antennal flagellomeres; 46, antennal flagellum; 47, radial cells of wing; 48-49, genitalia in ventral (48) and lateral aspects (49).