

Diverse *Milichiella* Giglio-Tos (Diptera: Milichiidae) in Miocene Dominican amber

IRINA BRAKE

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Seven new species of *Milichiella* are described from Dominican amber: *M. archaia* n. sp., *M. dolichosurstyla* n. sp., *M. dominicana* n. sp., *M. hennigi* n. sp., *M. margaretae* n. sp., *M. quadrisetosa* n. sp., and *M. theodori* n. sp. These species represent the first record of the subfamily Milichiinae in amber and the first descriptions of the family in Dominican amber. The fossil species differ from extant species only in species-level details except *M. archaia*, which probably belongs to the stemline of *Milichiella* + *Ulia*.

Irina Brake, Department of Entomology, Smithsonian Institution, MRC-0169 NHB, PO Box 37012, Washington, DC 20013-701

Introduction

The Milichiidae are divided into three subfamilies (Brake 2000). Apart from extant species, the Phyllomyzinae are known from Baltic and Mexican amber (Hennig 1967, Sabrosky 1963) and the Madizinae from Baltic amber (Hennig 1971). This is the first time that fossil species of the third subfamily, the Milichiinae, are described in Dominican amber.

The new species are assigned to the genus *Milichiella* Giglio-Tos, 1895, which includes 41 extant species. Species of this genus have been reared from rotten plant material, with at least one species, *M. argyrogaster* (Perris, 1876), breeding in rotting bark of trees (Dodson & Daniels 1988, Hennig 1937, Roháček 1995). Males congregate in aerial swarms (Cuthbertson 1936, Deeming 1998, Hardy & Delfinado 1980), which are very eye-catching due to the shiny abdomen of males. Sunlight reflects off the tergites, creating minute flashes of light as the males fly back and forth in their swarm. Females are attracted to the defensive secretions of true bugs (Heteroptera) (Aldrich & Barros 1995, Eisner et al. 1991) and some feed on the prey of spiders (Landau & Gaylor 1987). The genus *Milichiella* has a worldwide distribution and most species are found in the tropics.

Characteristic for Milichiinae are enlarged eyes, an obsolescent vibrissal angle with the vibrissa above the ventral margin of the eye, frons in males narrower than in females, and the distal margin of the anal cell meeting the anal vein in a sharp angle. Species are mainly differentiated by the patterns of silvery microtomentum on the male abdomen, so females are difficult to separate.

Milichiella itself is characterized by a notch at the posterior eye margin and a triangular projection in the middle of the posterior margin of the first abdominal tergite. The fossil species differ from extant species only in species-level details, except for *M. archaia* n. sp. (see discussion in species description).

Dominican amber has an age of 15-20 million years (Miocene) (Iturralde-Vinent & MacPhee 1996) and this is therefore the minimum age of the described species. The amber-producing tree has been described as *Hymenaea protera* Poinar, 1991, which is a leguminous tree (Poinar 1991).

Materials and methods

The terminology essentially follows McAlpine (1981) with a few exceptions. For the vertical setae, I use the terms “medial” and “lateral”

(White *et al.* 2000) instead of the traditional "inner" and "outer," respectively. For the orbital and frontal setae I use the terms "posterior" and "anterior" instead of "upper" and "lower", and for the first flagellomere I use the term basoflagellomere. The terminology of the male genitalia follows Cumming *et al.* (1995). For the most part information given in the description of the genus is not repeated in the species descriptions.

The amber specimens were polished with silicon carbide grinding paper grits 320, 600, 2400, and 4000 consecutively. For study with a stereomicroscope a drop of glycerin was put on the upper side of the specimen and covered with a cover slip to achieve a plane horizontal surface.

Except for fig. 1, which was taken using a normal stereo-microscope, the photos were taken using a photomicrographic imaging system by Microptics, Inc.

Specimens are deposited in the following institutions:

AMNH	American Museum of Natural History, New York, USA
Coll. Poinar	presently housed at Oregon State University, Corvallis, Oregon, USA.
Coll. Thompson	presently housed at the USNM.
USNM	National Museum of Natural History, Washington, D.C., USA.

Further unidentified *Milichiella* specimens in Dominican amber:

AMNH: 11319, 1♂; 11322B, 1♀; 11700, 1♂; 11711, 1♀; 11764, 1♀; 11765, 1♀; 11766, 1♀; 11836, 1♂; DR-2-51, 1♂; DR-2-54, 1♂; DR-3-11, 1♂; DR-3-31, 1♂; DR-3-36, 1♂; DR-3-42, 1♂; DR-6-144, 1♀; DR-8-123, 1♂; DR-8-124, 1♂; DR-8-129, 1♀; DR-8-130, 1♀; DR-8-456, 2♂; DR-10-277, 1♀; DR-10-284, 1♀; DR-10-879, 1♀.

Coll. Poinar: D-7-46D, 1♂ (*Milichiella* sp. 6: Brake 2000: 79); D-7-47D, 1♀ (*Milichiella* sp. 7: Brake 2000: 79).

Coll. Thompson: Ent 00028673, 1♀; Ent 00028680, 1♂.

USNM: Pal 502233, 1♂; Pal 502453, 1♀; Pal 502845, 1♀; Pal 502904, 1♀; Pal 503474, 1♂.

Milichiella Giglio-Tos, 1895

Description. – Head: Anterior eye margins converging towards antenna in male, parallel in female. Eye large, vertical diameter of eye at least 1.5x the horizontal diameter, with a notch at posterior eye margin and sometimes with emargination below notch (Fig. 12). Emargination usually wider in female than in male (Fig. 10). Vibrissa well above ventral margin of eye. Palpus spatulate,

of normal length, usually with a few setulae at the tip. Proboscis small, geniculate; labellum with 4 pseudotracheae.

Chaetotaxy: Medial and lateral vertical setae, postocellar setae parallel, ocellar setae lateroproclinate, anterior orbital seta proclinate or lateroproclinate, middle orbital seta reclinate or lateroreclinate, posterior orbital seta medio-reclinate and usually shorter than other orbital setae, sometimes absent, two medio-clinate frontal setae. Frons with two rows of interfrontal setulae. Lunule with pair of setulae. Gena with row of setae, longest anteriorly and shortest posteriorly.

Thorax: Mesonotum covered by short acrostichal setulae. One to 4 dorsocentral setae, 1-2 prescutellar setae, 1 postpronotal, 1-3 presutural, 2 notopleural, 1 supraalar, 2 postalar, 1 proepisternal, 1-4 katepisternal, and 2 scutellar setae. Anepisternum bare. Basisternum basiform, having shape Gt of Speight (1969).

Legs: Midtibia with terminal spine.

Wing: Costa extending to M_1 ; R_{4+5} and M_1 parallel or converging. Notch at subcostal break extending about breadth of costa into wing plane. Anal lobe well developed. Anal vein absent, CuA_2 meets A_1 in an acute angle.

Abdomen: Males with triangular projection in the middle of the posterior margin of the first abdominal tergite. Male tergites often completely or partly silvery microtomentose on T2-5 (Figs 2-4). Shape and setation of sternite 5 species specific. Surstylus spatulate, usually about as long as epandrium high (Figs 14, 16), sometimes longer (Figs 13, 15). Distiphallus short and membranous.

Key to Species of *Milichiella* in Dominican Amber

1. Wing with ultimate section of M_1 about 1.5x the length of penultimate section. Female cercus about as long as wide *M. archaia* n. sp.
– Wing with ultimate section of M_1 more than 1.8x the length of penultimate section. Female cercus more than 2x as long as wide..... 2
2. Three or four dorsocentral setae..... 6
– Two dorsocentral setae 3
3. Medial base of basoflagellomere yellow.
Halter pale with darker base and distal tip.....
..... *M. dolichosurstyla* n. sp.
– Basoflagellomere black. Halter black 4
4. Basal and distal tip of tibiae yellow
..... *M. dominicana* n. sp.
– Tibiae black 5
5. Tarsi completely black..... *M. theodori* n. sp.
– Tarsi yellow ventrally *M. hennigi* n. sp.

- 6. Three dorsocentral setae, 2 prescutellar setae.
Wing hyaline *M. margaretae* n. sp.
- Four dorsocentral setae, 1 prescutellar seta.
Wing probably white *M. quadrisetosa* n. sp.

***Milichiella archaia* n. sp.**

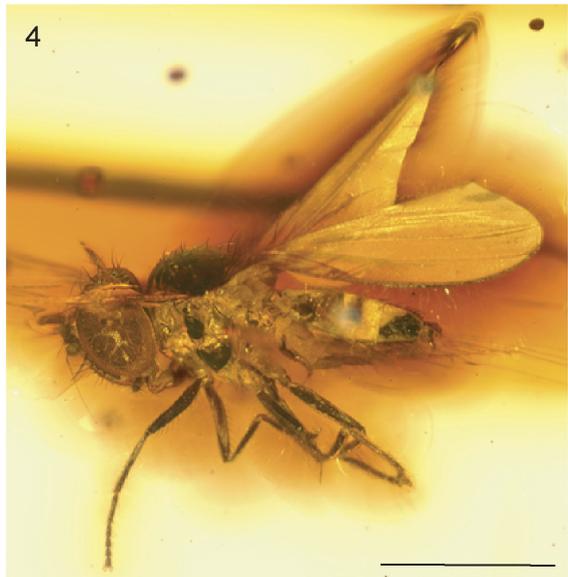
(Figs. 1, 8, 9)

?*Milichia* cf. *ludens*: Brake 2000: 79.

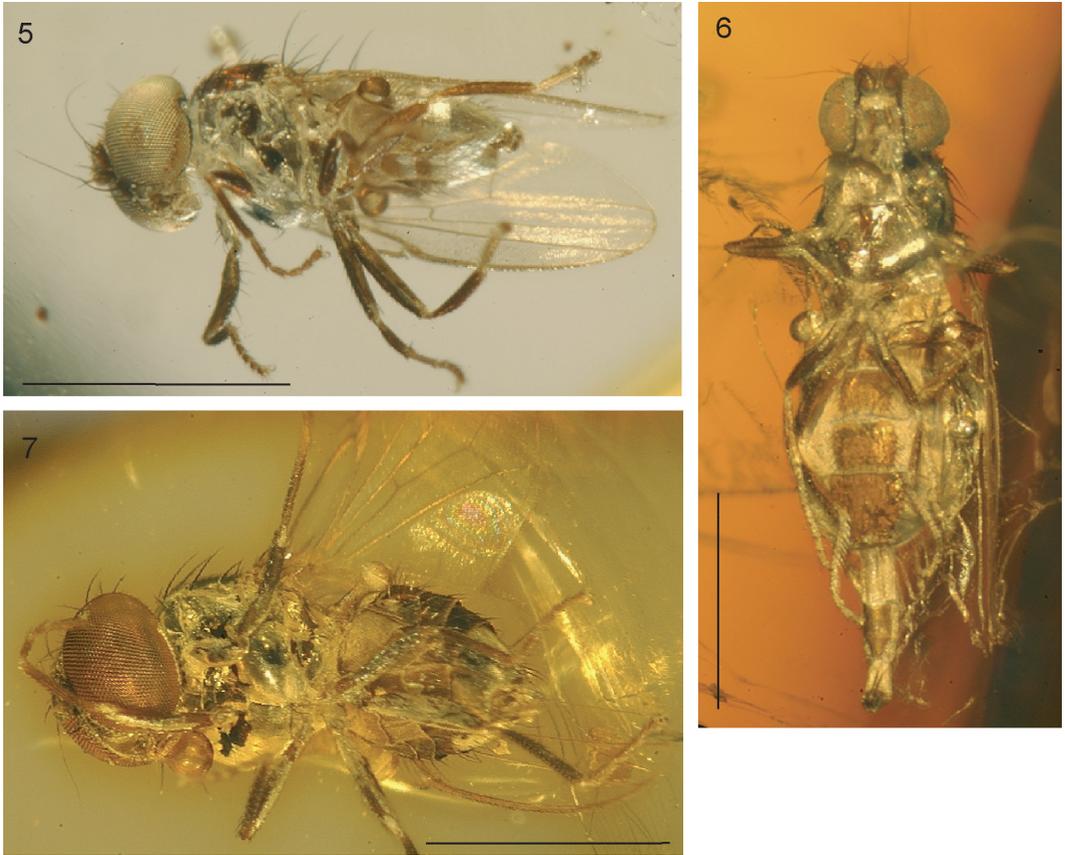
The specimen can be studied from frontal, dorsal and lateral views.

Description. – Female: Black except for yellow base and tip of fore and mid tibia, and all tarsi. Yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. Wing hyaline, veins yellow to light brown; halter black.

Head: Eye about 1.7x as high as long. Notch and emargination in posterior eye margin about 0.08x the length of eye (Fig. 8). Setae on middle and right lateral side of head reclinate, probably a preservational artefact. Posterior orbital seta pres-



Figs. 1-4. 1. *Milichiella archaia*, holotype, female. 2. *M. margaretae*, holotype, male. 3. *M. theodori*, holotype, male. 4. *M. quadrisetosa*, holotype, male. Scales: 1 mm.



Figs. 5-7. 5. *Milichiella hennigi*, holotype, male. 6. *M. dominicana*, holotype, female. 7. *M. dolichosurstyla*, holotype, male. Scales: 1 mm.

ent. Frons with interfrontal setulae on interfrontal stripes, foremost setulae longest, pair of setulae between these and frontal setae at anterior margin. Palpus with setulae on lateral side and tip.

Thorax: One long and 1 short dorsocentral, 1 prescutellar, 1 presutural, and 1 long and 1 short katepisternal setae.

Wing: R_{4+5} and M_1 slightly converging, costal section between R_{4+5} and M_1 0.7x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 1.5x length of penultimate section. Notch at subcostal break extending about breadth of costa into wing plane. Wing length: 2.1 mm.

Abdomen: Cercus short, about as long as wide (Fig. 9).

Body length: 2.4 mm.

Holotype. – female: Amber: Dominican Republic, coll. Poinar, no. D-7-47H.

Etymology. – The species name is an adjective derived from the Greek *archaios* = original, ancient, denoting the probable phylogenetic position of the species in the stemline of *Milichiella* + *Ulia* Becker, 1907 (see discussion).

Discussion. – There are three extant species of *Milichiella* with partly yellow or red tibiae: *M. dimidiata* Wiedemann, 1830, *M. hendeli* Brake, 2000, and *M. pseudodectes* (Séguy, 1933). *Milichiella dimidiata* differs from *M. archaia* n. sp. by the presence of parallel R_{4+5} and M_1 , from *M. hendeli* in the presence of red palpi with black tip, and from *M. pseudodectes* in the assumed presence of strongly converging R_{4+5} and M_1 (I assume that *M. pseudodectes* has strongly converging R_{4+5} and M_1 though the state of this character is not mentioned in the species description. Instead the similarity of *M. pseudodectes* to *M. lacteipennis* Loew,

1866 is mentioned, in which this character state is developed). Additionally *M. archaia* differs from all extant species of *Milichiella* studied by the author by the presence of short cerci, which is a plesiomorphic character for Milichiinae (Brake 2000). *Milichiella archaia* therefore probably belongs to the stemline of *Milichiella* + *Ulia*. Apomorphic characters for the stemspecies of *Milichiella* + *Ulia* are a notch in the posterior eye margin, a triangular projection in the middle of the posterior margin of the first tergite in males, and the reduction of the secondary ovipositor and long cerci in females. *Milichiella archaia* probably speciated after the development of a notch in the eye but before the development of long cerci. I refrain from establishing a new genus for this species because *Ulia* is probably a specialized group originating within *Milichiella*. In this case *Ulia* would be synonymized with *Milichiella*. However, the group needs to be revised and studied phylogenetically before any nomenclatural decisions.

Milichiella dolichosurstyla n. sp.

(Figs. 7, 13)

The specimen can be studied from dorsal, ventral, and lateral views. It is partially covered by an air film.

Description. – Male: Black, except for yellow basomedial part of basoflagellomere, first three tarsomeres of all legs, which are dark dorsally and yellow ventrally, and yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. In paratype, palpus appears to be reddish and base and tip of tibiae are paler. Wing hyaline, veins light brown; halter stem brown, knob appears quite pale, only basally and distally darker.

Head: Eye 1.6x as high as long, notch in posterior eye margin about 0.08x the length of eye. Posterior orbital seta absent. Palpus with short setulae at tip and a few slightly longer setulae ventrally.

Thorax: Mesonotum appears to be dull. Two dorsocentral, 1 prescutellar, 1 presutural, and 1 long and 1 shorter (>0.5x) katapisternal setae.

Wing: R_{4+5} and M_1 converging, costal section between R_{4+5} and M_1 ~0.6x as long as section between R_{2+3} and R_{4+5} . Notch at subcostal break extending about breadth of costa into wing plane. Ultimate section of M_1 about 2.3x length of penultimate section. Wing length: >1.9 mm.

Abdomen: Tergites 2-5 black, but there may be a narrow silvery microtomentose line at the posterior margins. T5 is covered by an airfilm in holotype. Tergite and sternite 5 with sparse setulae. Male genitalia with surstylus longer than height of epandrium (Fig. 13).

Body length: >2.0 mm.

Holotype. – male: Amber: Dominican Republic, AMNH, no. DR-10-1681.

Paratype. – male: Amber: Dominican Republic, AMNH, no. DR-14-1136.

Etymology. – The species name is an adjective derived from the Greek *dolichos* = long and *surstylus*, the morphological term for an appendage of the male genitalia, denoting the long surstylus of this species.

Discussion. – This species is similar to *Milichiella hendeli* Brake, 2000, which occurs in California, and *M. tristis* Lamb, 1914, which occurs in Africa. Both have pale halteres, pale tarsi, and black tergites. *Milichiella hendeli* has red palpi with black tips and red tibiae, similar to the paratype of *M. dolichosurstyla* n. sp. *Milichiella tristis* has only 1 dorsocentral seta instead of 2 setae. The male genitalia of both species are undescribed.

Milichiella dominicana n. sp.

(Figs. 6, 10, 11)

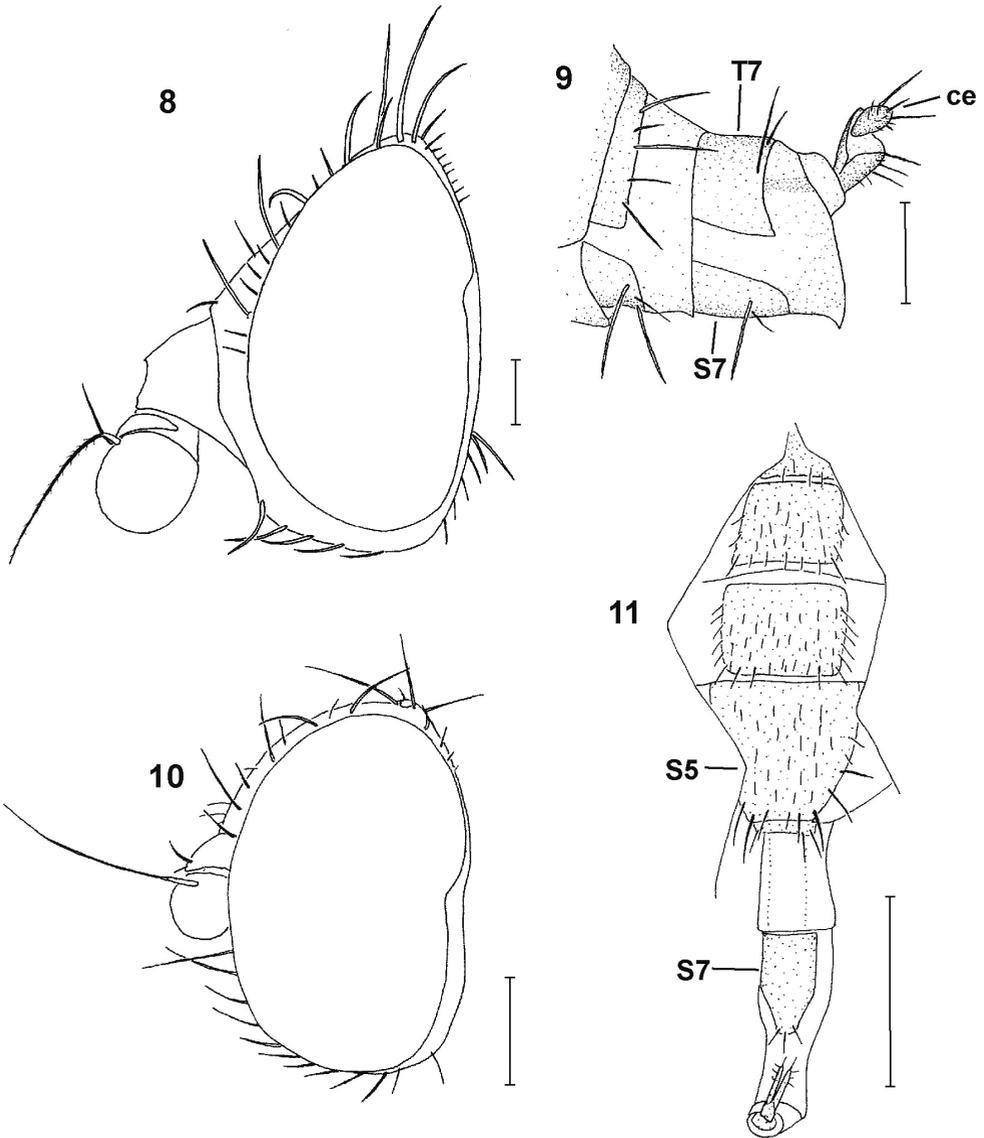
Milichiella sp. 5: Brake 2000: 79.

The holotype specimen can be studied from lateral and ventral views, the paratype from dorsal, ventral and lateral views.

Description. – Female: Dark, except for dorsomedial basal 2/3 of palpus, basal and distal end of tibiae, and basal four tarsomeres, which are pale, probably yellow. Yellow setulae ventrally on first two tarsomeres of hindleg. Wing hyaline; calypter light; halter dark.

Head: Frons dull, ocellar triangle and orbital plates rather shining. Frons nearly as wide as long, eye margins nearly parallel. Apex of ocellar triangle opposite anterior pair of orbital setae. Eye 1.4x as high as long; notch and emargination in posterior eye margin about 0.13x the length of eye (Fig. 10). Posterior orbital setae slightly shorter than anterior 2 orbital setae. Gena linear; pubescence on basoflagellomere as long as pubescence on arista; arista as long as eye height and slender, short pubescent. Palpus tip with several setulae.

Thorax: Two posterior dorsocentrals, anterior



Figs. 8-11. 8-9. *Milichiella archaia*, holotype, female. 1, head, lateral view. 2, tip of ovipositor, lateral view. 10-11. *M. dominicana*, holotype, female. 3, head, lateral view. 4, ovipositor, ventral view. Abbr.: ce – cercus, S – sternite, T – tergite. Scales: 0.1 mm.

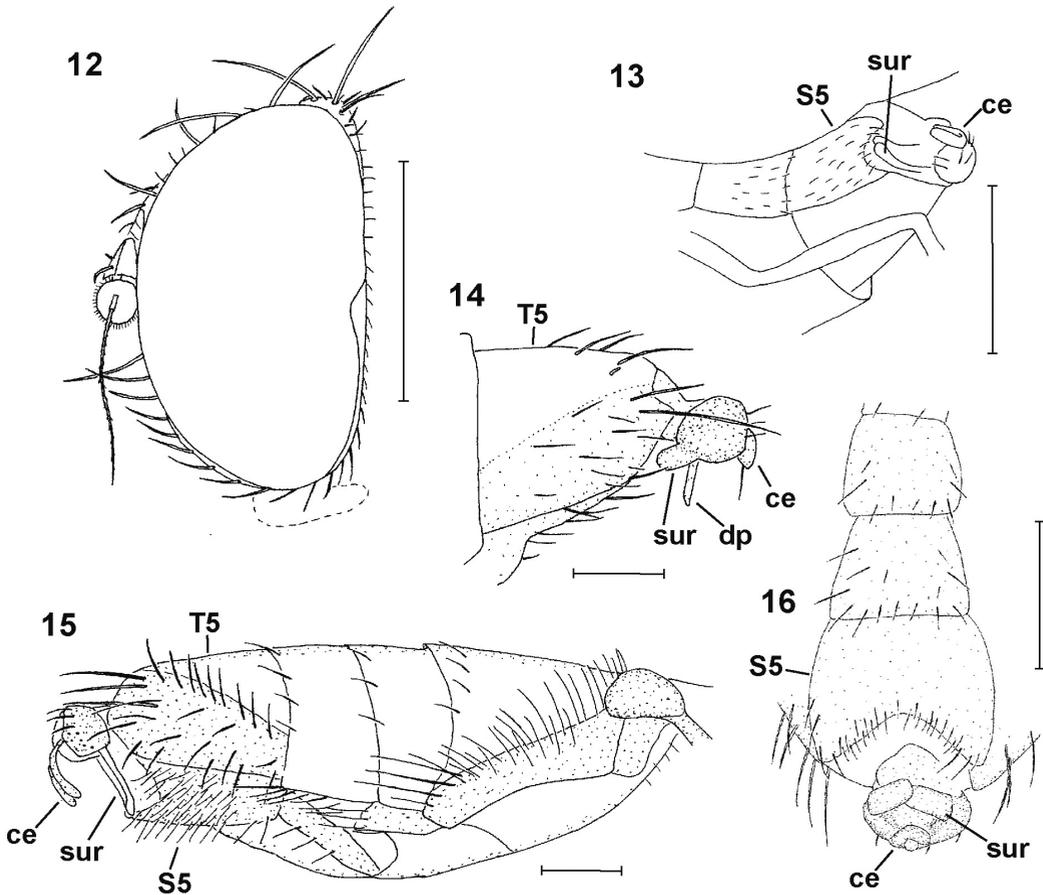
seta very short; 1 prescutellar acrostichal; 1 presutural, and 1 long and 1 short katapisternal.

Wing: R_{4+5} and M_1 slightly convergent, costal section between R_{4+5} and M_1 0.4x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 2.5-3x length of penultimate section. Notch at subcostal break extending less than half

breadth of costa into wing plane. Wing length: 1.8 mm.

Abdomen: Cercus relatively long and slender, about 4x as long as high in paratype, apparently longer in holotype, but this may be due to drying out (Fig. 11).

Body length: 2.3 mm.



Figs 12-16. 12-13. *Milichiella dolichosurstyla*, holotype, male. 1. head, lateral view. 2. tip of abdomen, lateroventral view. 14. *M. theodori*, holotype, male, tip of abdomen, lateral view. 15. *M. margaretae*, holotype, male, abdomen, lateral view. 16. *M. hennigi*, holotype, male, tip of abdomen, ventral view; setation on S5 obscured by leg, sternite probably covered with short setulae. Abbr.: ce – cercus, dp – distiphallus, S – sternite, sur – surstylus, T – tergite. Scales: 0.1 mm.

Holotype. – female: Amber: Dominican Republic, AMNH, no. DR-2-50. Paratype, female: Amber: Dominican Republic, coll. Poinar, no. D-7-60D.

Etymology. – The species name, *dominicana*, is an adjective derived from the type of the amber in which the specimen is enclosed, Dominican amber.

Discussion. – There is no extant species that combines the characteristics of partly yellow palpus and legs, 2 dorsocentral setae, and dark halter. There are five species with yellow palpi, of which *M. nitida* (Walker, 1836) from Brazil and *M. hendeli* Brake, 2000 from California have a black tip, but they differ in other respects. *Milichiella pseudoctes* (Séguy, 1933) from Africa has similar leg

coloration, but the male palpi are black (female unknown).

***Milichiella hennigi* n. sp.**

(Figs. 5, 16)

The specimen can be studied from dorsolateral, ventrolateral, and lateral views.

Description. – Male: Black, except for first three tarsomeres of all legs, which are dark dorsally and yellow ventrally, and yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. Tergites 2-5

appear silvery microtomentose dorsally. Wing hyaline, veins light brown; halter black.

Head: Eye 1.5x as high as long, notch in posterior eye margin about 0.1x the length of eye. Posterior orbital seta slightly shorter than anterior 2 orbital setae. Pubescence on basoflagellomere longer than on arista, slightly longer than width of basal joint of arista. Palpus with short setulae at tip and a few slightly longer setulae ventrally.

Thorax: Mesonotum appears to be dull. Two dorsocentral, 1 prescutellar; 1 presutural, and 1 long and 1 shorter (~0.5x) katepisternal.

Wing: R_{4+5} and M_1 converging, costal section between R_{4+5} and M_1 0.6x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 3x length of penultimate section. Wing length: ~1.5 mm.

Abdomen: Tergites 2-5 appear silvery microtomentose dorsally, the silvery area bare except for 1 row of short setulae at the posterior margin of T2-4 and scattered setulae on T5, a few long setae along lateral margins of silvery area. Sternite 5 with sparse setulae. Male genitalia with normal surstylus and cercus (Fig. 16).

Body length: ~1.6 mm.

Holotype. – Male: Amber: Dominican Republic, Coll. Thompson, no. Ent 00028676, to be donated to the Department of Entomology, USNM.

Etymology. – The species is named to honor Willi Hennig, who wrote the valuable chapter on Milichiidae in 'Die Fliegen der palaearktischen Region' (Hennig 1937) and who described milichiid species from Baltic amber (Hennig 1967, 1971).

Discussion. – This species is similar to *Milichiella lacteiventris* Malloch, 1931 from Australia and *M. javana* de Meijere, 1911 and *M. spinthera* Hendel, 1913 from the Oriental Region in having dark halteres, silvery microtomentose T2-5, and yellow tarsi. It differs from *M. spinthera* in the presence of a posterior orbital seta (character state not known for *M. lacteiventris* and *M. javana*). Due to insufficient species descriptions *Milichiella hennigi* is not differentiated from the other two species.

Milichiella margaretae n. sp.

(Figs. 2, 15)

The specimen can be studied from dorsal, ventral, lateral, and anterior views.

Description. – Male: Brown black, except for pale joints between femora and tibiae, tibiae and tarsi,

and between tarsomeres. Yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. Basoflagellomere appears to be reddish in holotype, black in paratype. Tergites 2-5 silvery microtomentose dorsally. Wing hyaline, veins light brown, with a very slightly darker spot at end of R_1 ; calypter with light brown margin; halter black.

Head: Eye 1.9x as high as long, notch in posterior eye margin about 0.1x the length of eye. Very slight emargination below notch. Posterior orbital seta slightly shorter than other 2 orbital setae, 2 long medioclinate frontal setae and a third shorter one anteriorly, next to lunule. Pedicel with long seta, about 2x as long as basoflagellomere. Palpus with short setulae at tip and a few longer setulae ventrally.

Thorax: Three posterior dorsocentral with are progressively shorter anteriorly, 2 prescutellar and 1 elongate acrostichal seta between prescutellar and dorsocentral setae; 1 long and 1 shorter (>0.5x) presutural, and 1 long and 1 shorter (>0.5x) katepisternal setae.

Wing: R_{4+5} and M_1 converging, costal section between R_{4+5} and M_1 0.5-0.6x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 1.8-2.0x length of penultimate section. Notch at subcostal break extending about breadth of costa into wing plane. Wing length: ~2.6 mm.

Abdomen: Tergites 2-5 silvery microtomentose dorsally, the silvery area bare except for one row of setulae at the posterior margin, many setae along lateral and posterior margins of silvery area. Sternite 5 with many setulae, progressively getting more numerous posteriorly. Male genitalia with very long and thin surstylus and cercus (Fig. 15).

Body length: ~2.6 mm.

Holotype. – male: Amber: Dominican Republic, AMNH, no. DR-15-166. Paratype, male: Amber: Dominican Republic, AMNH, no. DR-5-20.

Etymology. – The species is named after my late grandmother, Margarete Peters.

Discussion. – There are at least two extant species, *M. argentea* (Fabricius, 1805) from the Australian Region and *M. smithi* Aldrich, 1931 from the Oriental Region, with a completely silvery abdomen and long surstyli (male genitalia not described for all species) *Milichiella smithi* differs in having 1 dorsocentral, 1 presutural, and 3 katepisternal setae and a posteriorly silvery microtomentose thorax. *Milichiella argentea* is very similar to *M. margaretae* and differs only in 1 presutural and

3 katepisternal setae and the presence of many setae on the dorsal side of the forefemur. *Milichiella margaretae* n. sp. differs from *M. theodori* n. sp. in the shape of the male genitalia and thoracic chaetotaxy.

***Milichiella quadrisetosa* n. sp.**

(Fig. 4)

The specimen can be studied from dorsal, ventral, and lateral views.

Description. – Male: Black, except for yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. Tergites 2-5 silvery microtomentose dorsally. Wing and calypter appear white, veins light brown, with a very slightly darker spot at end of R_1 ; halter black.

Head: Eye 1.6x as high as long, notch in posterior eye margin about 0.1x the length of eye. Posterior orbital seta slightly shorter than anterior 2 orbital setae. Palpus with short setulae at tip and a few slightly longer setulae ventrally.

Thorax: Mesonotum appears to be dull. Four dorsocentral setae (1 presutural, 3 postsutural), 2 prescutellar and 1 elongate acrostichal seta between prescutellar and dorsocentral setae; 1 presutural, and 2 katepisternal setae.

Wing: R_{4+5} and M_1 converging, costal section between R_{4+5} and M_1 0.5x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 3.2x length of penultimate section. Notch at subcostal break present. Wing length: ~1.9 mm.

Abdomen: Tergites 2-5 silvery microtomentose dorsally, the silvery area bare except for 2-3 rows of short setulae at the posterior margin of T2-4 and scattered setulae on T5, a few long setae along lateral and posterior margins of silvery area. Sternite 5 with sparse setulae. Male genitalia with normal surstylus and cercus.

Body length: ~2.1 mm.

Holotype. – Male: Amber: Dominican Republic, AMNH, no. DR-6-160.

Etymology. – The species name is an adjective derived from the Latin *quadr-* = four and *seta* = strong hair or bristle, denoting the 4 dorsocentral setae.

Discussion. – There are only 6 described *Milichiella* species with 4 dorsocentral setae and of these *M. quadrisetosa* is similar to *M. montanum* Becker, 1907 in the presence of a posterior orbital

seta and silvery microtomentose T2-5. However, *Milichiella montanum* differs in having parallel R_{4+5} and M_1 and a dark calypter. *M. montanum* is known from South America.

***Milichiella theodori* n. sp.**

(Figs. 3, 14)

The specimen can be studied from lateral, dorsal, dorsofrontal, and posteroventral views.

Description. – Male: Black, except for yellow setulae ventrally on distal tip of tibia and first tarsomere of foreleg and on first two tarsomeres of hindleg. Basoflagellomere black in holotype, but appears to be reddish in paratype. Tergites 2-5 silvery microtomentose dorsally. Wing hyaline, veins dark; calypter with dark margin; halter black.

Head: Eye about 1.6x as high as long, notch in posterior eye margin about 0.08x the length of eye. Very slight emargination below notch. Posterior orbital seta smaller than anterior 2 orbital setae. Palpus with short setulae at tip and a few longer setulae ventrally.

Thorax: Two posterior dorsocentral, 1 prescutellar, 1 presutural, and 2 katepisternal setae.

Legs: Femur dorsally with 3 long but weak setae.

Wing: R_{4+5} and M_1 converging, costal section between R_{4+5} and M_1 0.5x as long as section between R_{2+3} and R_{4+5} . Ultimate section of M_1 about 3.0-3.2x length of penultimate section. Notch at subcostal break extending about breadth of costa into wing plane. Wing length: ~2.6 mm

Abdomen: Tergite 2-5 silvery microtomentose dorsally, the silvery area bare except for one row of setulae at the posterior margin, many setae along lateral and a few at posterior margin of silvery area. Sternite 5 with a few setulae. Male genitalia with normal surstylus and cercus (Fig. 14).

Body length: 2.3 mm.

Holotype. – Male: Amber: Dominican Republic, AMNH, no. DR-2-65. Paratype, male: Amber: Dominican Republic, AMNH, no. DR-3-21.

Etymology. – The species is named after my late grandfather, Theodor Peters.

Discussion. – *Milichiella theodori* is most similar to *M. argyrogaster* Perris, 1876 from the Palaeartic Region and *M. lacteiventris* Malloch, 1931 from the Australian Region, but differs in the color of the tarsi.

Discussion

The diversity of *Milichiella* species in Dominican Amber might be due to the habit of breeding in rotting tree parts, though this has been shown only for one extant species, *M. argyrogaster*. The biology of most *Milichiella* species is unknown. The genus occurs mainly in tropical regions, which is probably the reason for its absence in Baltic amber. The available data do not suggest any biogeographic affinities of amber species with known living ones. But since there is no phylogeny available for the genus and many species await description, further research is necessary.

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References

- Aldrich, J. R. & Barros, T. M. (1995) Chemical attraction of male crab spiders (Araneae, Thomisidae) and kleptoparasitic flies (Diptera, Milichiidae and Chloropidae). *Journal of Arachnology* 23: 212-214.
- Brake, I. (2000) Phylogenetic systematics of the Milichiidae (Diptera, Schizophora). *Entomologica Scandinavica. Supplement* 57: 1-120.
- Cuthbertson, A. (1936) Biological notes on some Diptera of Southern Rhodesia. *Occasional Papers of the Rhodesian Museum* 5: 46-63.
- Deeming, J. C. (1998) Milichiidae and Carnidae (Diptera: Cyclorrhapha) from the Arabian Peninsula. *Fauna of Arabia* 17: 147-157.
- Dodson, G. & Daniels, G. (1988) Diptera reared from *Dysoxylum gaudichaudianum* [Juss.] Miq. at Iron Range, northern Queensland. *Australian entomological Magazin* 15: 77-79.
- Eisner, T., Eisner, M. & Deyrup, M. (1991) Chemical attraction of kleptoparasitic flies to heteropteran insects caught by orb-weaving spiders. *Proceedings of the National Academy of Sciences U.S.A.* 88: 8194-8197.
- Hardy, D. E. & Delfinado, M. D. (1980) Diptera Cyclorrhapha III, Series Schizophora, Section Acalyptera, exclusive of family Drosophilidae. *Insects of Hawaii* 13: vii + 451 pp.
- Hennig, W. (1937) 60a. Milichiidae et Carnidae. In Lindner, E. (ed.) Die Fliegen der palaearktischen Region. Vol. 6[1], 91 pp. Schweizerbart, Stuttgart.
- Hennig, W. (1967) Neue Acalypterae aus dem Baltischen Bernstein. *Stuttgarter Beiträge zur Naturkunde* 175: 1-27.
- Hennig, W. (1971) Die Familien Pseudopomyzidae und Milichiidae im Baltischen Bernstein. *Stuttgarter Beiträge zur Naturkunde* 233: 1-16.
- Iturralde-Vinent, M. A. & MacPhee, R. D. E. (1996) Age and paleogeographical origin of Dominican amber. *Science* 273: 1850-1852.
- Landau, G. D. & Gaylor, M. J. (1987) Observations on commensal diptera (Milichiidae and Chloropidae) associated with spiders in Alabama. *Journal of Arachnology* 15: 270-272.
- Poinar, G. O., Jr. (1991) *Hymenaea protera* sp. n. (Leguminosae, Caesalpinioideae) from Dominican amber has African affinities. *Experientia* 47: 1075-1082.
- Roháček, J. (1995) Habitat, biology and immature stages of *Milichiella argyrogaster* (Diptera, Milichiidae). *Entomological Problems* 26: 85-92.
- Sabrosky, C. W. (1963) A new acalypterate fly from the Tertiary amber of México (Diptera: Milichiidae). *Journal of Paleontology* 37: 119-120, pl. 16.
- Speight, M. C. D. (1969) The prothoracic morphology of acalyptrates (Diptera) and its use in systematics. *Transactions of the Royal entomological Society of London* 121: 325-421.

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