

**Biting midges of the subgenus *Trichohalea* of *Forcipomyia* in Poland,  
with keys for the determination of Polish subgenera  
(Diptera: Ceratopogonidae)**

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**ABSTRACT.** *Forcipomyia chaetoptera* REMM, 1962 of the subgenus *Trichohalea* is reported for the first time in the Polish fauna. As a result the total number of biting midges recorded in Poland has increased to 219. Three species of this subgenus present in Poland (*F. eques* JOHANNSEN, 1908, *F. tonnoiri* GOETGHEBUER, 1920 and *F. chaetoptera* REMM, 1962) are diagnosed and illustrated, and a key for the identification of adults is proposed. Illustrated keys for the identification of the 11 subgenera of *Forcipomyia* occurring in Poland are also provided.

**KEY WORDS:** Diptera, Ceratopogonidae, *Forcipomyia*, *Trichohalea*, keys, subgenera, Poland.

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INTRODUCTION

The biting midges of the genus *Forcipomyia* MEIGEN are distributed worldwide. 35 subgenera containing 1171 species have been recorded in the world fauna (BORKENT 2013). In Poland there are 11 subgenera with 36 species (SZADZIEWSKI 2007, DOMINIAK 2009a). The feeding habit of females is poorly known. They are known to be nectar feeders and pollinators, parasites feeding on vertebrate blood or insect haemolymph. Females of the subgenus *Trichohalea* GOETGHEBUER are parasites of other insects and suck haemolymph from adult butterflies, mosquitoes, net-winged insects and small crane flies (DE MEILLON & WIRTH 1991). Their larvae are aquatic and are found on mosses or between the closely appressed leaves of bromeliads (SAUNDERS 1925, DE MEILLON & WIRTH 1991).

To date two species – *Forcipomyia eques* and *F. tonnoiri* – in the subgenus *Trichohalea* have been reported in Poland. *Forcipomyia chaetoptera* is another species new to the Polish

fauna. As a result the total number of biting midges reported in Poland has risen to 219. The purpose of this paper is to present the diagnostic descriptions of the species and identification keys for adults of *Trichohelea* and the subgenera of the Polish *Forcipomyia*.

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### SYSTEMATICS

#### Genus *Forcipomyia* MEIGEN, 1818

Type species: *Tipula bipunctata* LINNAEUS, 1767.

#### Subgenus *Trichohelea* GOETGHEBUER, 1920

*Apelma* KIEFFER, 1919: 64. Type species: *Apelma auronitens* KIEFFER, 1919 (preoccupied).

*Trichohelea* GOETGHEBUER, 1920: 39. Type species: *Trichohelea tonnoiri* GOETGHEBUER, 1920 [= *Apelma auronitens* KIEFFER, 1919 (preoccupied)].

#### Diagnosis

Adults of the subgenus can be easily recognized by the high tarsal ratio of the hind leg (2.0-3.1), the totally reduced empodium in males, and the short discoidal proximal flagellomeres in females.

Small (wing length 1.1-1.3 mm), pale to dark brown midges. Palp 5-segmented, short and stout, third palpal segment slightly swollen, with sensory pit. Eyes bare. Female proximal flagellomeres discoidal and much shorter than distal flagellomeres (Fig. 1). Wing without pattern. Empodium well developed in female, absent in male. Two functional seminal capsules present (DE MEILLON & WIRTH 1991). Aedeagus in male genitalia with low basal arch and low rounded hyaline posterior lobe with a slender process; parameres U-shaped, without submedian processes.

#### *Forcipomyia chaetoptera* REMM, 1962

*Forcipomyia chaetoptera* REMM, 1962: 188 (female, male, Estonia).

#### Diagnosis

Scutellum dark brown. Fourth palpal segment short, 2.0-2.5 times shorter than third palpal segment. Seminal capsules with long and broad neck.

### Description

**Female.** Body uniformly brownish, legs brown, unmarked, tibia and femur slightly darker than tarsus. Palp short and stout, length 0.15 mm. Third palpal segment slightly swollen (length 0.05 mm, PR 1.8) with sensory pit (diameter about 15.5  $\mu$ m). Fourth palpal segment short, 2.0-2.5 times shorter than third one (Fig. 2). Flagellum length 0.32 mm, AR 1.75. Wing without colour pattern, with macrotrichia; length 1.11 mm, CR 0.55. Tarsal ratio (TR) of middle leg 2.50; of hind leg 2.78. Two functional subequal seminal capsules present measuring 0.065 x 0.057 mm and 0.057 x 0.048 mm, both with broad and quite long neck (Fig. 3).

**Male.** Similar to female with usual sexual differences. Aedeagus broad with low, straight basal arch, triangular with rounded lobe and slender process. Parameres U-shaped (REMM 1962).

### Material examined

**Poland:** Kurze Grzędy Reserve, Mirachowo near Kartuzy, 18.07.2005, 1 female, leg. P. Dominiak. This specimen was misidentified and reported from Kurze Grzędy as *Forcipomyia tonnoiri* (DOMINIAK 2009b).

### Distribution

*Forcipomyia chaoptera* was reported from Estonia (REMM 1962) and Lithuania (REMM 1988). Recorded in Poland for the first time.

### *Forcipomyia eques* (JOHANNSEN, 1908)

*Ceratopogon eques* JOHANNSEN, 1908: 266 (female, USA).

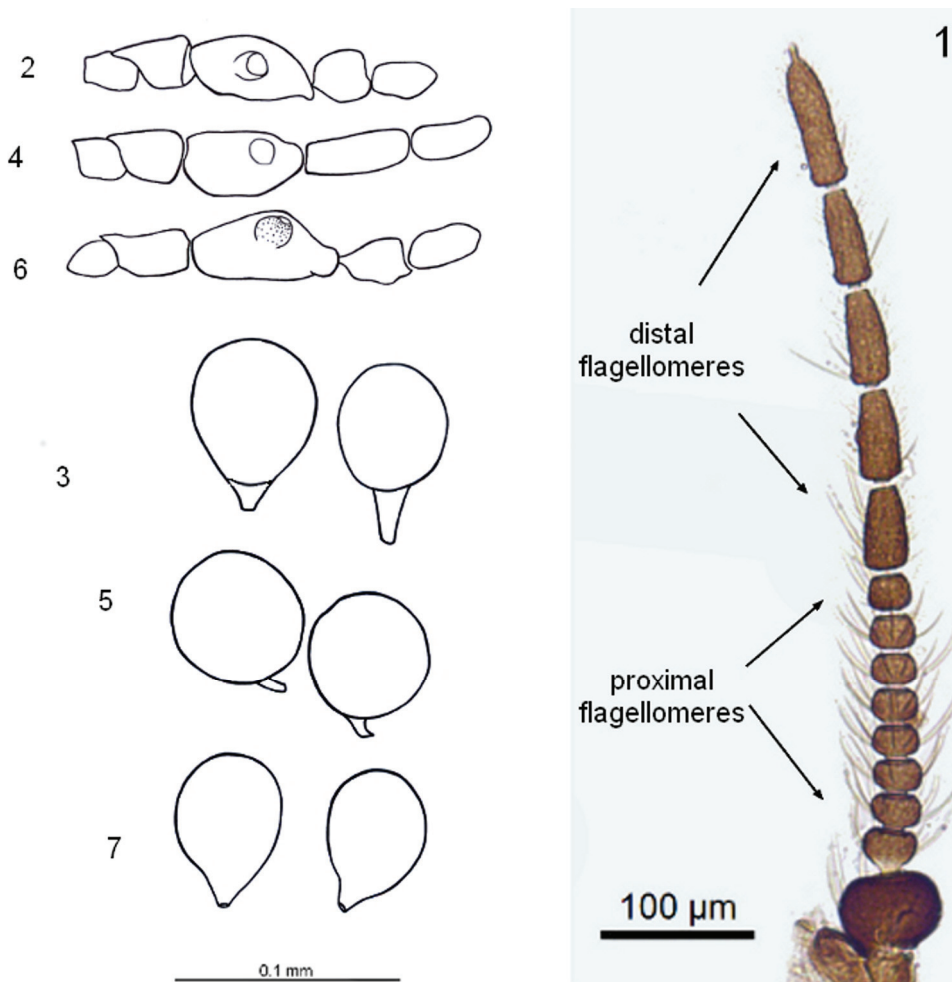
*Forcipomyia eques*: WIRTH & MESSERSMITH 1971: 19 (female, male, distribution, biology).

### Diagnosis

Scutellum dark brown, fourth palpal segment long in both sexes, of similar length as third palpal segment. Two seminal capsules with long slender neck.

### Description

**Female.** Body brown, katepisternum, scutum and scutellum darker than rest of thorax, legs pale brown, unmarked. Palp stout, length 0.15-0.18 mm. Third palpal segment slightly swollen (length 0.04-0.06 mm, PR 1.50-2.00) with sensory pit. Fourth palpal segment long in both sexes, of similar length as third palpal segment (Fig. 4). Flagellum length 0.49-0.54 mm, AR 1.43-1.75. Wing length about 1.0-1.2 mm, CR about 0.50-0.58. Legs unarmed, tarsal ratio of fore leg 2.0-2.6; tarsal ratio of middle leg 2.1-2.6; tarsal ratio of hind leg 2.3-2.6. Two functional seminal capsules present, almost the same size (measuring about 0.069 x 0.061 mm and 0.063 x 0.059 mm) both with slender and long neck (Fig. 5).



**Figs 1-7.** *Forcipomyia (Trichohelea)*, female: flagellum (1), palp (2, 4, 6) and seminal capsules (3, 5, 7). 1-3 – *F. chaetoptera*; 4, 5 – *F. eques*; 6, 7 – *F. tonnoiri*.

**Male.** Similar to female with usual sexual differences. Palp length 0.15-0.16 mm, third segment length 0.05 mm, PR 2.4-2.5. Flagellum length 0.65-0.77 mm, AR 0.91-0.94. Wing length 1.05-1.24 mm, CR 0.48-0.53. Tarsal ratio of fore leg 2.0-2.4, tarsal ratio of middle leg 2.0, tarsal ratio of hind leg 2.6-3.1. Aedeagus broad with low basal arch with recess in the middle, triangular with rounded lobe and slender processes (Fig. 10). Parameres U-shaped (Figs 8, 10).

**Material examined**

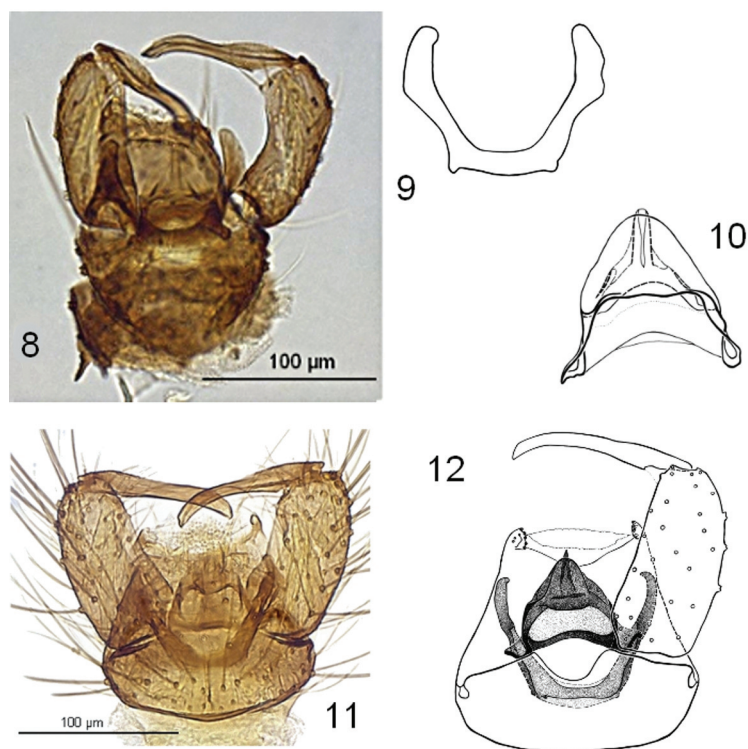
**Poland:** Babia Góra Mts., 12.07.1990, 9 females, leg. R. Dobosz (on fore wings of *Nineta vittata* (Chrysopidae)).

Other materials: **North Korea:** Miohang-San, 22.06.1981, 1 male, leg. Krzemiński;

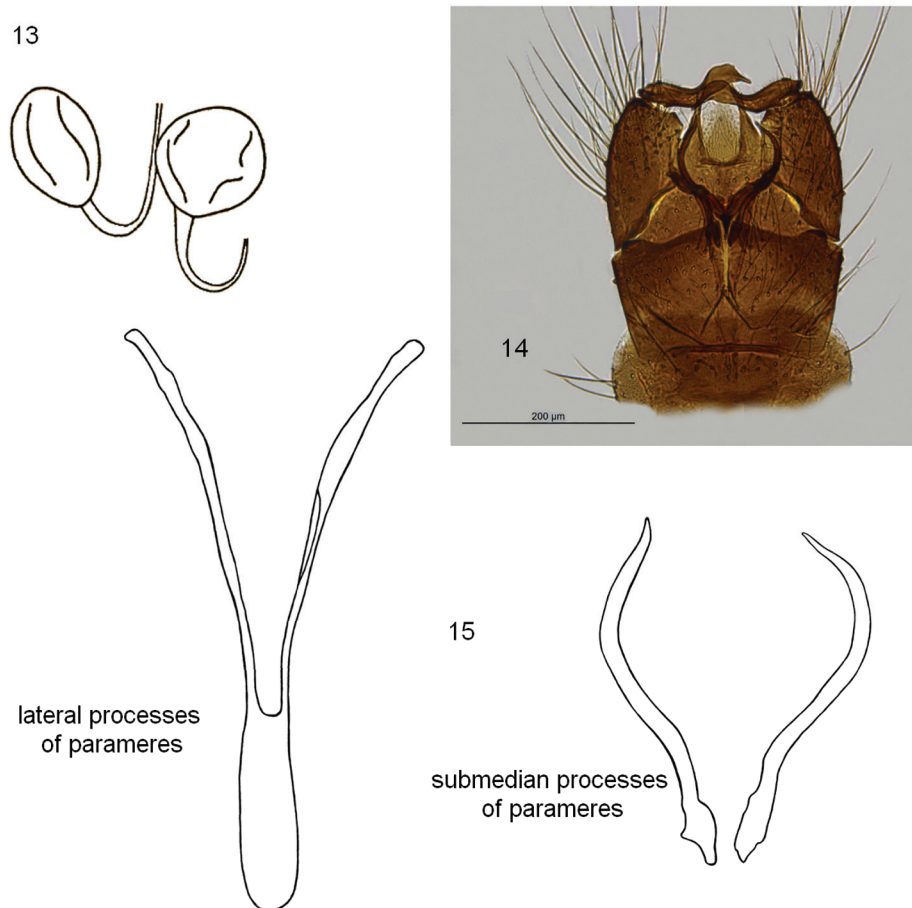
**USA:** Douglas Lake, 1.07.1954, 1 female, 1 male, leg. R.W. Wilhama, light trap.

**Biology, distribution**

This species is a parasite of net-winged insects (Neuroptera) and sucks haemolymph (WIRTH & MESSERSMITH 1971). In Poland females were collected from wings of *Chrysopa flavifrons* BRAUER and *Nineta vittata* WESMAEL (Chrysopidae) (DOBOSZ 1991). *Forcipomyia eques* has been reported from Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Great Britain, Latvia, Norway, Poland and Slovakia, also from Japan, North America and North Korea (WIRTH & MESSERSMITH 1971, REMM 1988, DOBOSZ 1991).



**Figs 8-12.** *Forcipomyia* (*Trichohelea*), male genitalia: 8-10 – *F. eques* (8 – ventral aspect, 9 – parameres, 10 – aedeagus); 11, 12 – *F. tonnoiri* (11 – ventral aspect, 12 – parameres and aedeagus).



**Figs 13-15.** *Forcipomyia (Panhelea) aristolochiae*: 13 – seminal capsules; 14 – ventral aspect of male genitalia; 15 – lateral (left) and submedian processes (right) of parameres.

***Forcipomyia tonnoiri* (GOETGHEBUER, 1920)**

*Trichohelea tonnoiri* GOETGHEBUER, 1920: 39 (male, description, Belgium).

*Forcipomyia tonnoiri* REMM 1988: 19 (distribution, synonymy).

*Apelma auronitens* KIEFFER, 1919: 65 (female, Slovak Republic), (preoccupied).

*Forcipomyia papilionivora* EDWARDS, 1923: 23 (female, Wales): WIRTH & MESSERSMITH 1971: 23 (female, male, distribution, biology).

*Forcipomyia umbellicola* REMM, 1971: 189 (male, female, Far East of Russia).

**Diagnosis**

Scutellum yellow. Fourth palpal segment in both sexes short, about 2 times shorter than third one. Seminal capsules pyriform.

**Description**

**Female.** Body brown. Katepisternum and scutum slightly darker than rest of thorax, scutellum yellow, legs pale brown, unmarked, tibia and femur the same colour as tarsus, hind tibia with long setae. Palp length 0.18 mm; third palpal segment slightly swollen (length 0.06 mm, PR 2.00); fourth palpal segment short, about 2.0 times shorter than third one (Fig. 9). Flagellum length 0.57 mm, AR 1.87. Wing length about 1.16 mm, CR 0.50. Tarsal ratio of fore leg 2.20; of middle leg 2.20; of hind leg 2.15. Two functional pyriform seminal capsules present, of the same size (0.070 x 0.045 mm) (Fig. 7).

**Male.** Similar to female with usual sexual differences. Palp length 0.18-0.21 mm; third segment 0.065-0.076 mm, PR 3.2-3.7. Flagellum length 0.80-0.84 mm, AR 0.80-0.95. Wing length 1.25-1.34 mm, CR 0.46-0.47. Tarsal ratio of fore leg 1.7-2.1; of middle leg 1.8-2.0; of hind leg 2.0-2.4. Aedeagus as in *F. eques* (Fig. 12); parameres straight and U-shaped (Figs 11, 12).

**Material examined**

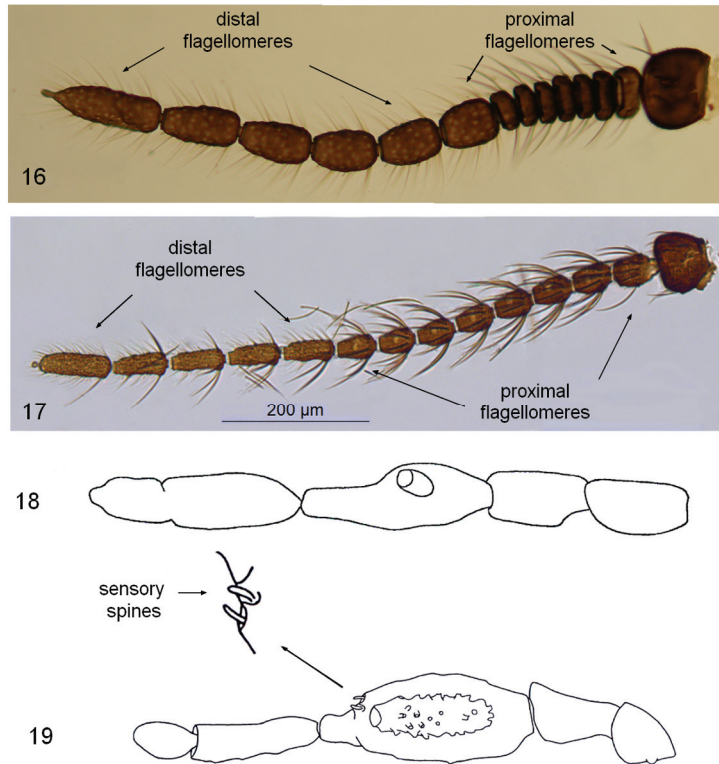
Babi Dół near Gdańsk, 16.07.1980, 1 male; Ojców near Kraków, 19.05.1989, 1 female; Babia Góra Mts., Zawoja-Czatoża, 03.07.1989, 1 male; Karkonosze Mts., Sosnówka, 12.08.1982, 2 males, all leg. R. Szadziewski.

**Biology, distribution**

*Forcipomyia tonnoiri* is a parasite of butterflies and was collected from wings of *Pieris napi* Linnaeus (Pieridae) (WIRTH & MESSERSMITH 1971), *Ectropis crepuscularia* DENIS & SCHIFFERMÜLLER, *Alcis bastelbergeri* HIRSCHKE (Geometridae) (EDWARDS 1925) and *Plebejus idas* LINNAEUS (Lycaenidae) (VENTURA & MURRIA 2009). This species is reported from Andorra, Belgium, the Czech Republic, Estonia, Georgia, Germany, Great Britain, Hungary, Lithuania, Poland, Russia, Slovakia, Spain and Switzerland, also from North America (REMM 1988, VENTURA & MURRIA 2009, SZADZIEWSKI et al. 2012).

**Identification key for Polish species of *Trichohelea***

1. Scutellum in both sexes yellow ..... *F. (T.) tonnoiri* GOETGHEBUER
- Scutellum in both sexes dark brown ..... 2
2. Fourth palpal segment in both sexes long (Fig. 4). Seminal capsules with narrow neck (Fig. 5) ..... *F. (T.) eques* JOHANNSEN
- Fourth palpal segment in both sexes short (Fig. 2). Seminal capsules with broad neck (Fig. 3) ..... *F. (T.) chaetoptera* REMM



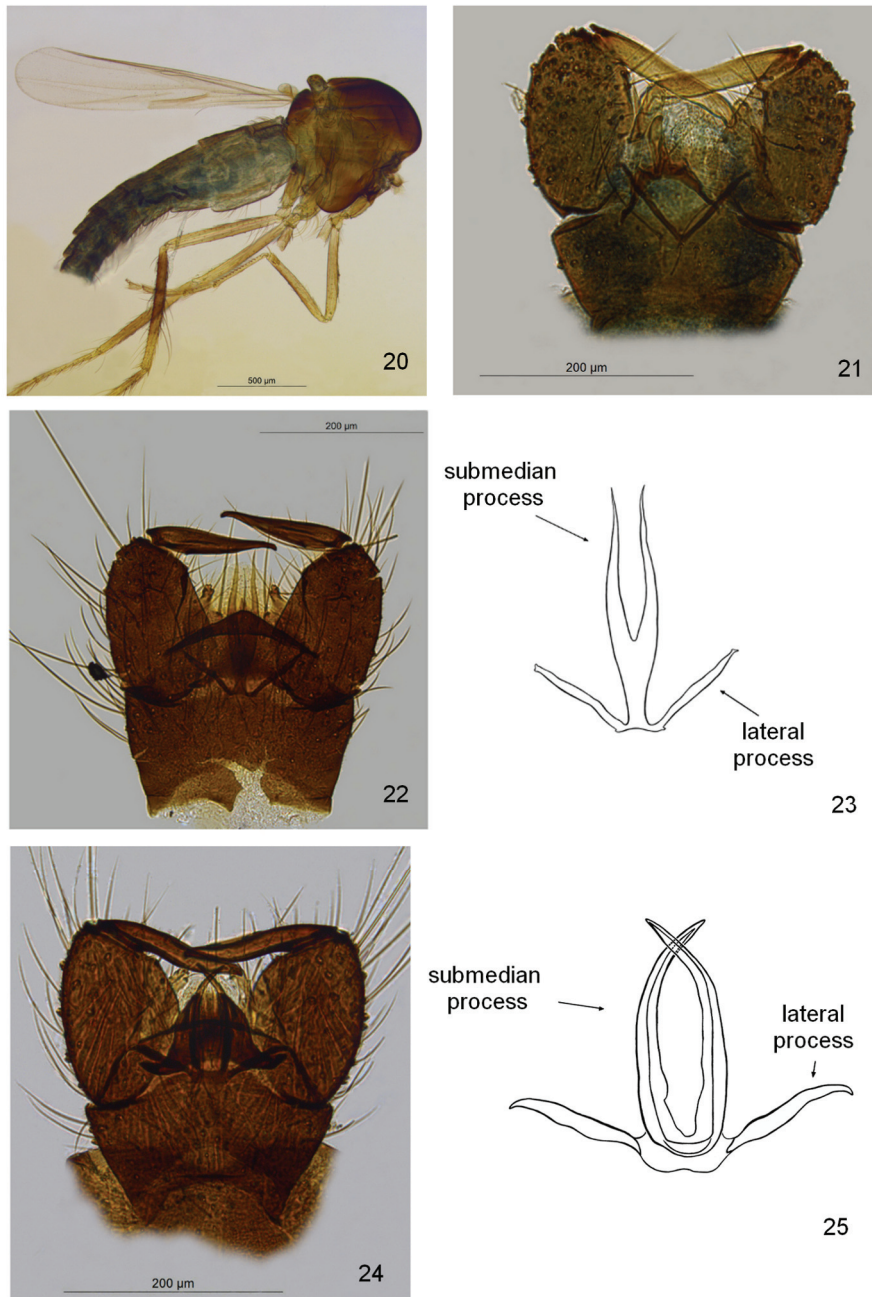
**Figs 16-19.** Female flagellum (16, 17) and palpus (18, 19): 16 – *F. (Pterobosca) paludis*; 17 – *F. (s. str.) ciliata*; 18 – *F. (Euprojoannisia) alacris*, 19 – *F. (Microhelea) fuliginosa*.

### Identification key for subgenera of Polish *Forcipomyia*

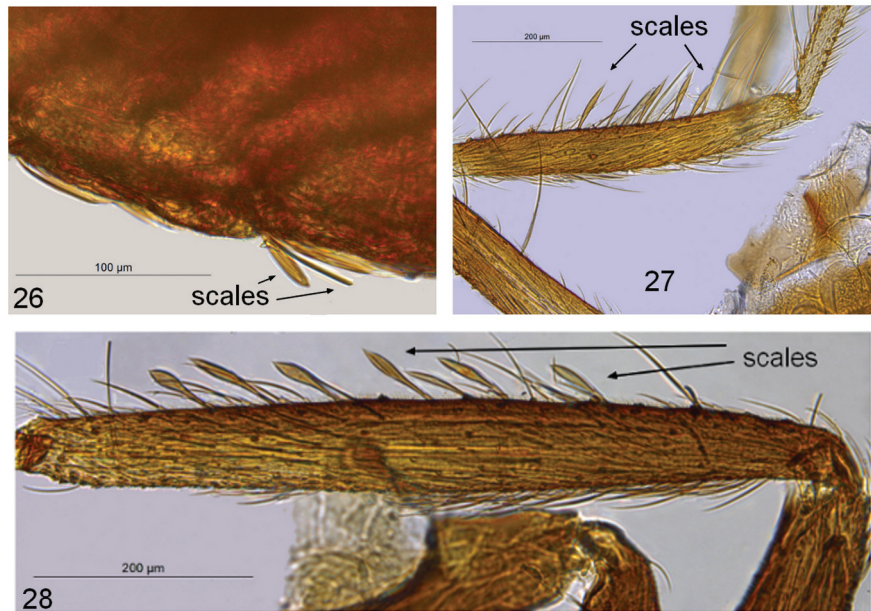
#### Females

1. Spermathecal duct strongly sclerotized for a long distance (Fig. 13) .....  
     ..... *Panhelea* REMM (1 species – *F. aristolochiae* (RONDANI, 1860))
- Spermathecal duct not sclerotized (Figs 3, 5, 7) ..... 2
2. Six terminal flagellomeres elongate (Fig. 16) .....  
     ..... *Pterobosca* MACFIE (1 species – *F. paludis* (MACFIE, 1936))
- Five terminal flagellomeres elongate (Figs 1, 17) ..... 3
3. Body pigmentation green or blue, especially in abdomen (Fig. 20) .....  
     ..... *Caloforcipomyia* SAUNDERS (1 species – *F. glauca* MACFIE, 1936)

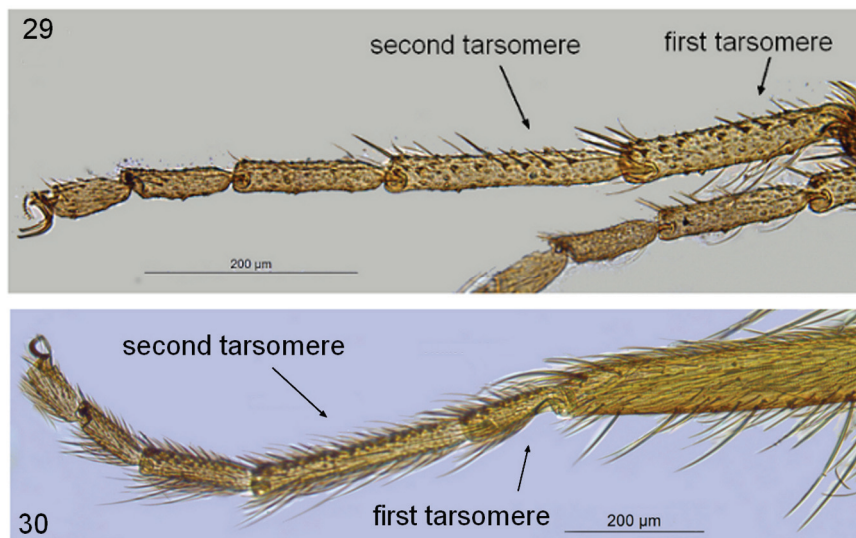




**Figs 20-15.** Subgenera *Caloformipomyia*, *Microhelea*, *Forcipomyia* (*s. str.*), males: 20 – abdomen; 21, 22, 24 – ventral aspects of genitalia; 23, 24 – parameres; 20, 21 – *F. (Caloformipomyia) glauca*; 22, 23 – *F. (Microhelea) fuliginosa*; 24, 25 – *F. (s. str.) hygrophila*.



**Figs 26-28.** Female scales: 26 – abdomen of *Forcipomyia (Lepidohelea)* sp.; 27 – hind tibia of *F. (Lepidohelea)* sp.; 28 – fore tibia of *F. (s. str.) ciliata*.

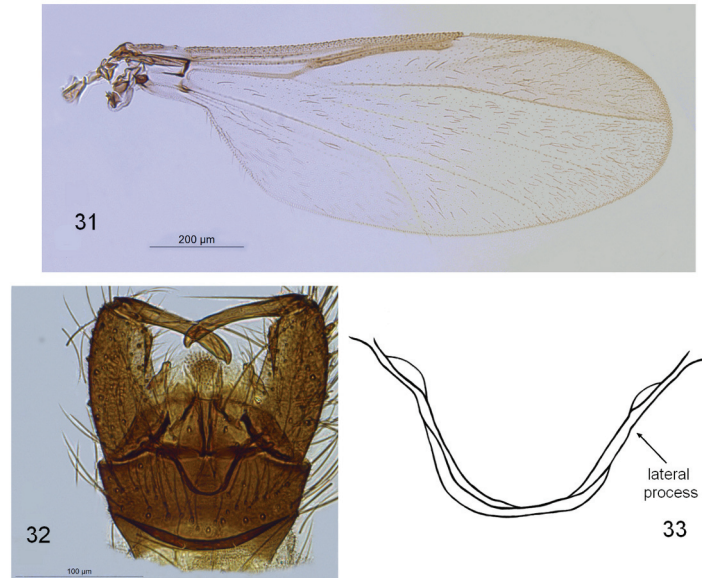


**Figs. 29-30.** Male tarsus of middle leg: 29 – *Forcipomyia (s. str.) ciliata*; 30 – *F. (Microhelea) fuliginosa*.

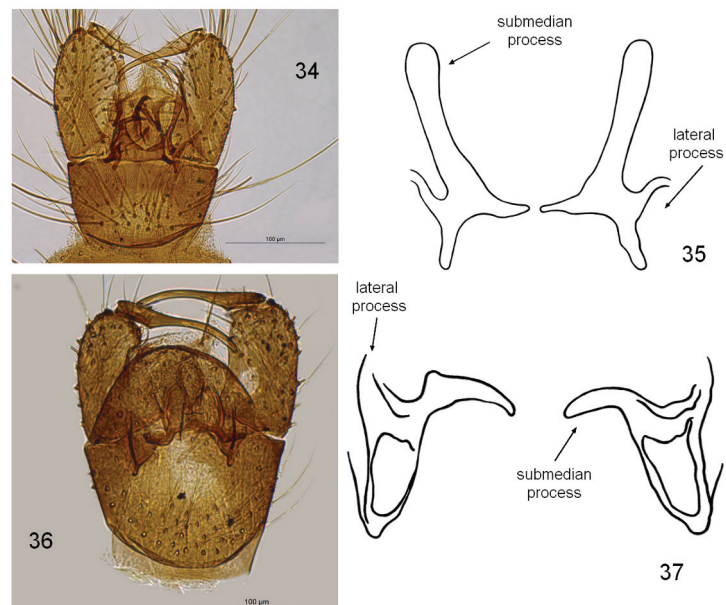
- Body pigmentation brown, black or yellow . . . . . 4
- 4. Fourth and fifth palpal segments fused, joint immovable (Fig. 18) . . . . .  
     . . . . . *Euprojoannisia* BRÉTHES (5 species)
- Fourth and fifth palpal segments not fused (Fig. 19) . . . . . 5
- 5. Body with flattened scales (Figs 26, 27) . . . . .  
     . . . . . *Lepidohelea* KIEFFER (1 species – *F. tibialis* REMM, 1961)
- Body without flattened scales, or present only on tibiae (Fig. 28) . . . . . 6
- 6. Only one functional seminal capsule . . . . . 7
- Two functional seminal capsules . . . . . 8
- 7. Costa long, ending beyond half the wing length (Fig. 31) . . . . .  
     . . . . . *Lasiohelea* KIEFFER (2 species)
- Costa short, ending around the middle of wing length . . . . .  
     . . . . . *Synthyridomyia* SAUNDERS, *Thyridomyia* SAUNDERS (5 species in each subgenus)
- 8. Tarsal ratio of hind leg (TR) about 0.4-0.5 (Fig. 30), peglike sensory spines at sensory  
     pore present (Fig. 19) . . . . .  
     . . . . . *Microhelea* KIEFFER (1 species – *F. fuliginosa* (MEIGEN, 1818))
- Tarsal ratio of hind leg (TR) more than 0.5 (Fig. 29), peglike sensory spines at sensory  
     pore absent . . . . . 9
- 9. Proximal flagellomeres very short, discoidal (Fig. 1), antennal ratio (AR) 1.8-1.9 . . . . .  
     . . . . . *Trichohelea* GOETGHEBUER (3 species)
- Proximal flagellomeres subcylindrical to cylindrical (Fig. 17), antennal ratio (AR) less  
     than 1.7 . . . . . *Forcipomyia* MEIGEN (16 species)

#### Males

- 1. Empodium absent . . . . . *Trichohelea* GOETGHEBUER (3 species)
- Empodium well developed . . . . . 2
- 2. Body pigmentation green or blue (Figs 20, 21) . . . . .  
     . . . . . *Caloforcipomyia* SAUNDERS (1 species – *F. glauca* MACFIE, 1936)
- Body pigmentation, brown, black or yellow . . . . . 3
- 3. Fourth and fifth palpal segments fused, joint immovable (Fig. 18) . . . . .  
     . . . . . *Euprojoannisia* BRÉTHES (5 species)
- Fourth and fifth palpal segments not fused, joint movable (Fig. 19) . . . . . 4
- 4. Body with flattened broad scales (Figs 26, 27) . . . . .  
     . . . . . *Lepidohelea* KIEFFER (1 species – *F. tibialis* REMM, 1961)
- Body without flattened broad scales . . . . . 5
- 5. Costa ending beyond half the wing length, (Fig. 31), submedian processes of parameres  
     completely reduced (Figs 32, 33) . . . . . *Lasiohelea* KIEFFER (2 species)



**Figs 31-33.** *Forcipomyia (Lasiohelea) velox*: 31 – female wing; 32 – ventral aspect of male genitalia, 33 – parameres.



**Figs 34-37.** Ventral aspect of male genitalia (34, 36) and parameres (35, 37): 34, 35 – *Forcipomyia (Synthyridomyia) murina*; 36, 37 – *F. (Thyridomyia) monilicornis*.

- Costa ending before middle of wing length, submedian processes of parameres present (Figs 23, 25, 35, 37) ..... 6
- 6. Submedian processes of parameres fused (Figs 22, 23, 24, 35) ..... 7
- Submedian processes of parameres separated (Figs 34, 35, 36, 37) ..... 9
- 7. Tarsal ratio of hind leg (TR) higher than 2.3 .....  
..... ***Pterobosca* MACFIE** (1 species – *F. paludis* (MACFIE, 1936))
- Tarsal ratio of hind leg (TR) about 0.4-1.3 ..... 8
- 8. Tarsal ratio of hind leg (TR) about 0.4-0.5 (Fig. 30), peglike sensory spines at sensory pore present (Fig. 19), base of fused submedian processes of parameres narrow (Figs 22, 23) ..... ***Microhelea* KIEFFER** (1 species – *F. fuliginosa* (MEIGEN, 1818))
- Tarsal ratio of hind leg (TR) about 0.5-1.3, sensory spines at sensory pit absent, base of fused submedian of parameres broad (Figs 24, 25) .....  
..... ***Forcipomyia* MEIGEN** (16 species)
- 9. Lateral processes of parameres fragile, separated from submedian processes (Figs 14, 15) ..... ***Panhelea* REMM** (1 species – *F. aristolochiae* (RONDANI, 1860))
- Lateral processes of parameres massive, each fused with submedian process (Figs 35, 37) ..... 10
- 10. Submedian processes long and rod-like, directed upwards (Figs 34, 35) .....  
..... ***Synthyridomyia* SAUNDERS** (5 species)
- Submedian processes greatly reduced, short (Figs 36, 37) .....  
..... ***Thyridomyia* SAUNDERS** (5 species)

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