

## A redescription of *Forcipomyia squamigera* Kieffer, 1916 in all stages (Diptera: Ceratopogonidae)

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**Abstract.** *Forcipomyia squamigera* Kieffer, 1916 is recognized as a valid European species and redescribed in all stages from Poland and Norway. Larva and pupa are described for the first time. Immatures and adults are compared with closely related species: *F. pulchrithorax* Edwards, 1924, *F. bipunctata* (Linnaeus, 1767), and *F. ciliata* (Winnertz, 1852). *Ceratopogon apricans* Kieffer, 1919 is proposed as a new synonym of *F. squamigera*, and *F. tenuisquama* Kieffer, 1924 as a junior synonym of *F. bipunctata*. *F. squamipes* (Coquillett, 1902) is excluded from the list of European biting midges.

**Key words:** Diptera, Ceratopogonidae, *Forcipomyia*, taxonomy, new synonyms

### Introduction

The classification of European biting midges of the genus *Forcipomyia* Meigen is poorly understood and still requires taxonomic changes. In this paper we redescribe all stages of *Forcipomyia squamigera* Kieffer, 1916. The correctly associated sexes and stages obtained from reared material shed new light on relations among *Forcipomyia apricans* (Kieffer, 1919), *F. bipunctata* (Linnaeus, 1767), *F. squamigera*, *F. squamipes* (Coquillett, 1902), and *F. tenuisquama* Kieffer, 1924 resulting in new synonyms and interpretations.

### Material and methods

The rearing methods used in this paper follow Saunders (1956). Terminology and abbreviations follow Saunders (1924), Wirth (1952) and Giłka (1996).

### *Forcipomyia squamigera* Kieffer, 1916 (Figs. 1–15)

*Forcipomyia squamigera* Kieffer in Thienemann and Kieffer 1916: 491 [female, figs., Sweden].

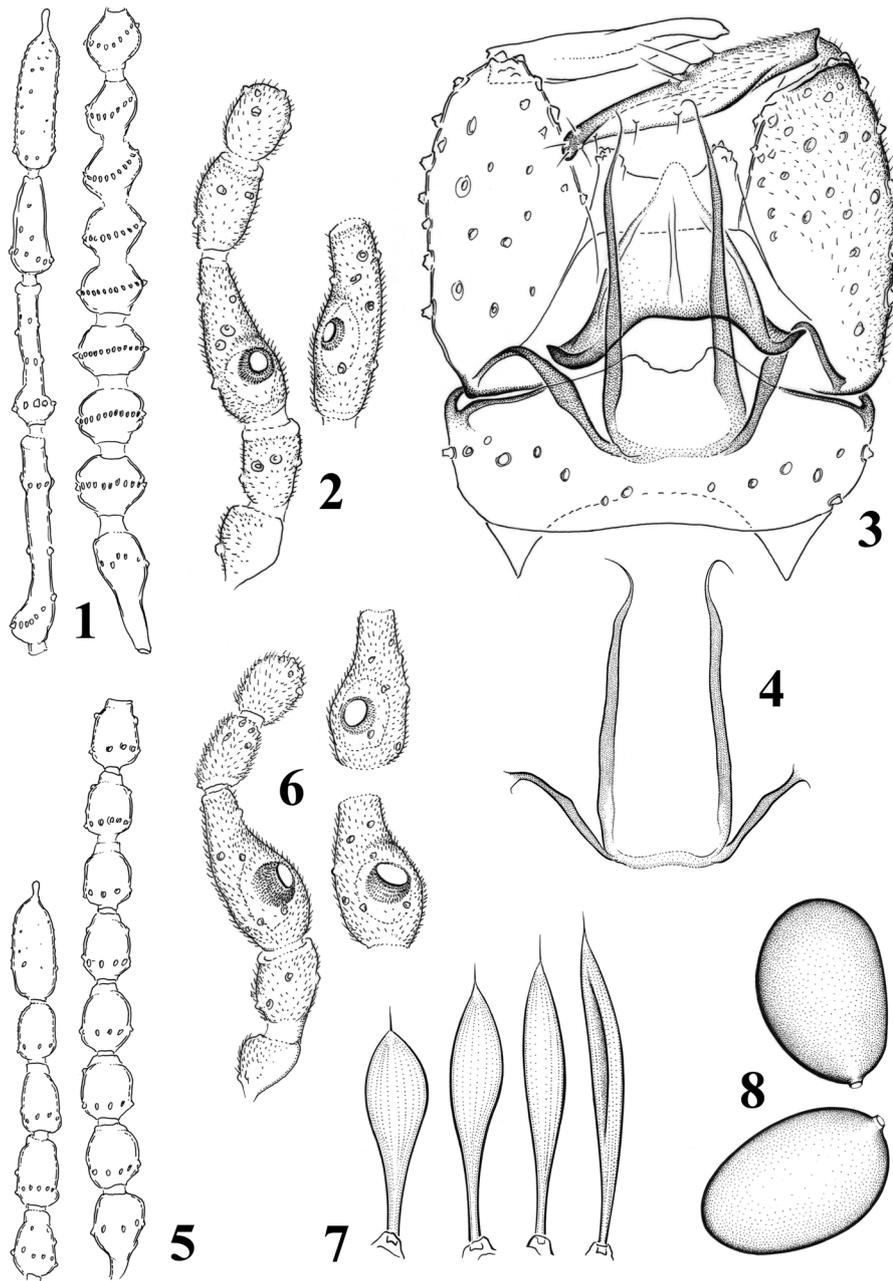
*Forcipomyia squamigera* Kieffer; Goetghebuer 1934: 7, 16 [female, key].

*Ceratopogon apricans* Kieffer, 1919: 19 [male, fig., Hungary], **new synonym.**

*Forcipomyia apricans* (Kieffer); Goetghebuer 1934: 10 [combination, male, key]; Havelka 1976: 228 [male, female, figs., Germany].

*Forcipomyia tenuisquama sensu* Zilahi-Sebess 1940: 31 [male, fig., Hungary]; Remm 1962: 173 [male, fig., Estonia]; Havelka and Caspers 1981: 24, 79 [male, fig., Germany]; Havelka 1982: 102 [male, fig., Spain]; *nec Forcipomyia tenuisquama* Kieffer, 1924 (see below).

**Material examined.** POLAND: Babi Dół near Żukowo, v.1991, under fallen branches of *Picea excelsa*, 6 larvae [together with *F. nigra* (Winnertz)], W. Giłka; Gdynia-Witomino, 10.ix.2000, net, 1 female, D. Graczyk; Nadole at Lake Żarnowiec, 2.vi.1982, net, 1 male, R. Szadziewski; Raciąż near Tuchola, 2.iv.1991, under bark of *Pinus sylvestris*, 1 pupa; 13.iv.1991, under bark of fallen pine branches, 8 larvae, ex cult.: 2 pupal exuviae, 3 males, 4 females; 5.x.1991, under rotting pine twigs, 5 larvae [together with *F. nigrans* Remm], W. Giłka; Silec near Kętrzyn, 5.vi.1981, net, 1 female, R. Szadziewski; Tuszyn near Piotrków Trybunalski, “Molenda” reserve, 20.vii.1980, at light, 1 male, B. Soszyński; Ustrzyki Górne in Bieszczady Mts., 23–30.vii.1980, net, 6 males; Zawoja - Barańcowa in Beskidy Mts., 700 m a.s.l., 28.vi.1989, at light, 1 male, R. Szadziewski. NORWAY: Buskerud, Sigdal, Heimseteråsen, 24.vi.1999, *Pinus* canopy, Sektor 71g, 0.5 m, 1 female; 26.vi.1999, pyrethroid fog; *Pinus* canopy, Sektor 46g, 3 m, 1 male, J. Skartveit & K.H. Thunes.



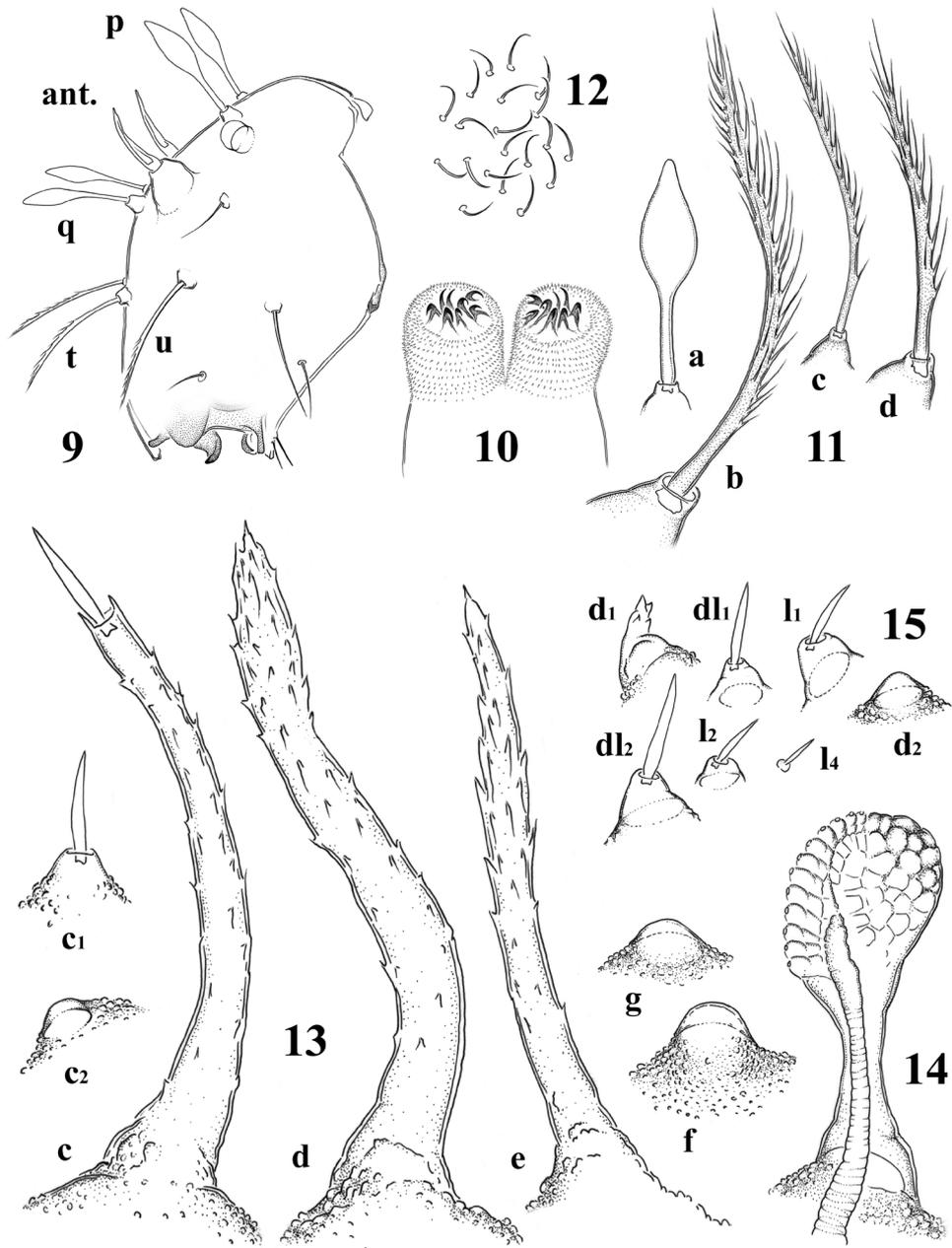
FIGS. 1–8. *Forcipomyia squamigera* Kieffer, 1916. 1. – Male flagellum. 2. – Male palpus. 3. – Ventral aspect of male genitalia. 4. – Parameres. 5. – Female flagellum. 6. – Female palpus. 7. – Lanceolate tibial scales of female. 8. – Seminal capsules.

#### Diagnosis

*Adults.* Small species with wing length 1.0–1.3 mm. Anteroanepisternum brown, scutum uniformly brown. Male parameres U-shaped, widely separated at base, connected by a narrow, poorly sclerotized strand bridge, each paramere stout, gradually tapering to apical 3/4 and then sharply bent and thin (Figs. 3, 4). All female tibiae armed with lanceolate scales (Fig. 7). Seminal capsules ovoid with very short neck (Fig. 8).

*Larva.* Head setae p and q as well as body seta a lanceolate with short stem as long as its lanceolate expansion; head setae t and u and body setae b, c, d with spines; setae b and d on separate tubercles (Figs. 9, 11). Prolegs bilobed in distal half, apically rounded with hooklets placed centrally (Fig. 10). Cuticle with long curved hooks (Fig. 12).

*Pupa.* Head processes a and b absent. Thoracic processes c, d, e long and serrated; process c with seta, processes f represented by tubercle only;



**FIGS. 9–15.** *Forcipomyia squamigera* Kieffer, 1916. 9. – Lateral view of larval head. 10. – Prolegs. 11. – Larval body setae. 12. – Cuticular hooks of larva. 13. – Thoracic processes of pupa. 14. – Thoracic horn. 15. – Abdominal processes and setae of pupa.

additional pair/pairs of thoracic processes  $c_1$  and  $c_2$  in anteprenotal position (Fig. 13). Distal surface of thoracic horn papillate with 12–18 openings arranged in a row (Fig. 14). Abdominal segments I–VI with small processes and/or with short setae only (Fig. 15).

**Male**

Eyes bare. Flagellum 0.70–0.80 mm long, AR 0.95–1.00, flagellomeres 5–8 fused, other separate,

flagellomere 10 relatively short, 1.4–1.5 times longer than next one (Fig. 1). Palpus 5-segmented, third palpal segment 0.072–0.080 mm long, sensory pit small, placed in basal third (Fig. 2). Scutum, scutellum, and postscutellum uniformly dark brown; anteroanepisternum D-shaped, brown; haltere knob pale. Wing length measured from basal arculus 1.05–1.29 mm, CR about 0.40–0.42; second radial cell small, first one absent. Legs brownish with paler knees and tarsi; tarsal ratio of foreleg TR(I)

1.2–1.3, midleg TR(II) 1.1–1.2, and hind leg TR(III) 1.1–1.2. Abdomen including genitalia brown. Sternite IX with shallow caudomedian excavation. Gonocoxite simple; gonostylus almost straight, slightly tapering to apex; aedeagus triangular, its basal arch heavily sclerotized, low, apical portion barely visible; parameres U-shaped, widely separated at base, connected by a narrow poorly sclerotized strand bridge, each paramere gradually tapering to apical 3/4 and then at distal 1/4 sharply bent and thin (Figs. 3, 4).

#### Female

Similar to male, with usual sexual differences. Head brownish. Antennal flagellum uniformly brownish, 0.50–0.53 mm long, AR 0.61–0.63, all flagellomeres short, proximal flagellomeres ovoid to slightly cylindrical (Fig. 5). Palpus 5-segmented, third palpal segment 0.058–0.062 mm long, comparatively stout, enlarged in basal 2/3, sensory pit small, located in basal third (Fig. 6). Wing length 0.97–1.16 mm, CR 0.43–0.45; second radial cell small, first one absent. Legs brown with paler knees and tarsi. Tarsal ratio of foreleg TR(I) 1.1–1.2, midleg TR(II) 0.9–1.1, and hind leg TR(III) 0.9–1.2. All tibiae armed with lanceolate scales varying in shape from broad to slender (Fig. 7). Two subequal, well sclerotized, ovoid seminal capsules present, length 0.08–0.09 mm, neck very short (Fig. 8).

#### Larva (4th instar)

Total length 2.5–3.3 mm. Tegument pale yellowish, almost white. Antenna moderately long, curved and directed posteriorly, pointed; setae p and q lanceolate, slightly curved and directed anteriorly, stems as long as their lanceolate expansions; setae t and u with short spines placed along one side; other setae smooth, not modified (Fig. 9). Prolegs bilobed in distal half, apically rounded, armed with hooklets placed centrally (Fig. 10). Seta a lanceolate, short, its narrow stem and lanceolate expansion of equal length; setae b, c, d darkly pigmented with long dense spines, setae b and d placed on separate tubercles (Fig. 11). Cuticle covered with long strongly curved hooks (Fig. 12). Anal papillae bilobed.

#### Pupa

Total length about 2.3 mm. Head processes a and b absent. Thoracic processes c, d and e long and serrated; process c with short stout seta, process d distinctly curved, processes f absent, represented by a tubercle only, pair of small tubercles placed at base of thoracic prolongation; additional pair of thoracic processes  $c_1$  armed with short seta always present and small tubercles  $c_2$  usually developed (Fig. 13), both additional pairs in

anteprenotal position. Thoracic horn knob-shaped, ThR 0.41, distal surface papillate with 12–18 openings arranged in a row (Fig. 14). Thoracic caudomedian prolongation reaching almost end of 1st abdominal segment. Abdominal processes always short or represented by fine setae only (Fig. 15), their distribution on segments I–VI variable, segment VI sometimes bare. First abdominal segment bearing pair of dorsolateral ( $dl_1$ ) and lateral ( $l_1$ ) tubercles, additional pair of dorsal tubercles ( $d_1$ ) sometimes present (Fig. 15). Segments II–VI with three pairs of processes in dorsal (as  $d_1$ ), dorsolateral ( $dl_2$ ), and lateral ( $l_2$ ) position; dorsal processes sometimes represented only by swellings of tegument or small tubercles ( $d_2$ ) (Fig. 15).

#### Distribution and biology

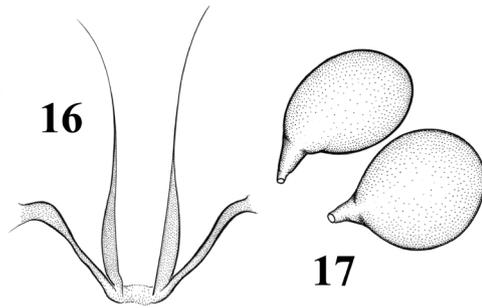
The species is probably widely distributed throughout Europe. It is recorded from Sweden, Norway, Estonia, Poland, Germany, Hungary, and Spain. Larvae and pupae were found under bark of logs, fallen branches and rotting twigs of *Pinus sylvestris* and *Picea excelsa* in April, May, and October. Adults were recorded in June, July, and September.

#### Discussion

The location of the female holotype of *Forcipomyia squamigera* from Sweden is unknown, and the type is probably lost, as most of the material described by Kieffer. According to the original description it had lanceolate scales on all tibiae. This and other characters allow adopting this name for the herein redescribed species. Types of *Ceratopogon apricans* Kieffer, 1919 are probably also lost; the species as interpreted by Havelka (1976) evidently is synonymous with *F. squamigera*.

The larvae of *F. squamigera* will key out to couplet 4 in the key to larvae proposed by Gilka (1996) together with *F. pulchrithorax*, *F. bipunctata*, and *F. ciliata*. All these species have setae p, q and a lanceolate, setae b and d placed on separate tubercles, and prolegs with rounded apices. *F. squamigera* can be distinguished from the larvae of the other species by having setae with very short stems as long as its lanceolate expansion (Fig. 11).

Pupae without head processes will also fall in the same group of closely related species (couplet 2 in the key to pupae by Gilka (1996)). The following combination of characters allows distinguishing *F. squamigera*: processes c, d, e long and serrated, process c with seta, additional pair/pairs of thoracic processes present (Fig. 13).



**FIGS. 16–17.** *Forcipomyia pulchrithorax* Edwards, 1924. 16. – Parameres. 17. – Seminal capsules.

Adults of the redescribed species belong to a group of common and often misidentified biting midges in Central Europe. This group comprises *F. bipunctata*, *F. pulchrithorax* and *F. ciliata*. Their females can be identified by thorax coloration, distribution of lanceolate scales on the tibiae and the shape of the seminal capsules. Females of *F. bipunctata* can be easily separated as they have lanceolate scales on mid- and hind tibiae only. *F. pulchrithorax* is unique in having yellow anteroanepisternum and pale scutal stripes as well as seminal capsules with long necks (Fig. 17). *F. ciliata* is a distinctly larger and darker species. We exclude from the group *F. squamipes* incorrectly interpreted by Remm (1962) (see below).

***Forcipomyia bipunctata* (Linnaeus, 1767)**

*Tipula bipunctata* Linnaeus, 1767: 978 [Sweden].  
*Forcipomyia tenuisquama* Kieffer, 1924: 393 [male, female, fig. male genitalia, France], **new synonym**.  
*Forcipomyia tenuisquama* Kieffer; Kieffer 1925: 32 [male, female, fig. lanceolate scale]; Remm 1962: 173 [female, Estonia].

Wing length 1.2–1.5 mm. Female tibiae of mid- and hind legs armed with slender lanceolate scales. Seminal capsules slightly unequal, ovoid, without neck. Parameres U-shaped, straight, gradually tapering to filiform apex (as in *F. pulchrithorax*, Fig. 16).

According to the original description and further interpretations of *F. tenuisquama* (Kieffer 1924, 1925; Edwards 1926; Remm 1962), the slender lanceolate scales present on mid- and hind tibiae in the female do not differ from those found in *F. bipunctata* and we see no reason to treat *F. tenuisquama* as a distinct species.

*F. tenuisquama* as redescribed by Zilahi-Sebess (1940) and followed by Remm (1962), Havelka and Caspers

(1981) and Havelka (1982) has incorrectly associated sexes. The males belong to *F. squamigera* (Zilahi-Sebess 1940; Remm 1962; Havelka & Caspers 1981; Havelka 1982), while the females to *F. bipunctata* (Remm 1962). The male genitalia illustrated by Remm (1962) as *F. squamipes* actually concern *F. bipunctata* (see below).

***Forcipomyia ciliata* (Winnertz, 1852)**

Large species, wing length 1.6–1.7 mm. All female tibiae with slender lanceolate scales. Parameres U-shaped, with broadly fused bases. Gonostylus abruptly narrowed in distal half.

***Forcipomyia pulchrithorax* Edwards, 1924**

Small species, wing length 1.0–1.2 mm. Both sexes have yellow anteroanepisternum and scutum with yellow stripes. Ventral surface of gonocoxite with group of strong spines in basal third. Parameres U-shaped, straight, stout in basal half and filiform in distal half (Fig. 16). All female tibiae armed with broad lanceolate scales. Seminal capsules almost spherical, with long, slightly curved necks (Fig. 17).

***Forcipomyia squamipes* (Coquillett, 1902)**

Female wing length 1.4 mm. All female tibiae armed with lanceolate scales. Male genitalia have parameres fused at the very base, Y-shaped (Wirth 1952). Male genitalia illustrated by Remm (1962) fit well those of *F. bipunctata*. North American species, which is absent in Europe.

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