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European *Atrichopogon* of the subgenus *Psilokempia* (Diptera: Ceratopogonidae)

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ABSTRACT. In Europe occur four species of the subgenus *Psilokempia* of *Atrichopogon*, i.e. Palaearctic arboreal *A. appendiculatus*, Palaearctic boreal *A. maculatus*, European arboreal *A. forcipatus*, and European boreal *A. paulus*. They are described, interpreted and illustrated. *Kempia armativentris* KIEFFER, 1923 is recognised as a new junior synonym of *A. appendiculatus* (GOETGHEBUER, 1920), and *A. silesiacus* KIEFFER, 1919 as a synonym of *A. forcipatus* (WINNERTZ, 1852). Unique parameres fused with the aedeagus into a ring are found and interpreted.

KEY WORDS: Diptera, Ceratopogonidae, *Atrichopogon*, *Psilokempia*, Europe.

INTRODUCTION

Adults of *Atrichopogon* KIEFFER are separated from related *Forcipomyia* MEIGEN by the thoracic paratergite bearing at least 1 seta (SZADZIEWSKI et al. 1995). They are common in all moist terrestrial habitats throughout the world including oceanic islands. The oldest fossils were reported from Eocene Baltic amber.

European *Atrichopogon* is still a poorly known group of biting midges. This paper reviews four European species of the subgenus *Psilokempia*. REMM (1959) recognised *Psilokempia* as a subgenus of *Atrichopogon* and included some species from Estonia and the Palaearctic region. In the catalogue of the Palaearctic Ceratopogonidae REMM (1988) listed 11 valid species. DE MEILLON & WIRTH (1989) into *Psilokempia* erroneously included *Gymnohelea* KIEFFER, which was relegated to the synonymy of the subgenus *Atrichopogon* s. str. by REMM (1959). According to DE MEILLON & WIRTH (1989) females of all species of the subgenus feed on pollens. Known larvae of *A. forcipatus* are terrestrial.

They were found under rotting leaves (BANGERTER 1933).

Acknowledgements

I am grateful to Dr P. Grootaert (Bruxelles), Dr hab. T. Zatwarnicki (Wrocław), Dr W. Mikołajczyk (Warsaw), Dr J. Luig (Tartu) and Dr J.-P. Haenni (Neuchâtel) who kindly arranged loans of the material.

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MATERIALS

Present studies are based on specimens mounted on microscope slides from the following collections: Department of Invertebrate Zoology, University of Gdańsk (UG), Museum and Institute of Zoology, PAS, Warsaw, Museum of Zoology, University of Tartu, Vanemuise 46 (UT), Institut Royal des Sciences Naturelles de Belgique, Bruxelles (IRSNB), and Musée d'histoire naturelle de Neuchâtel (MHNN).

DESCRIPTIONS

Genus *Atrichopogon* KIEFFER, 1906

Subgenus *Psilokempia* ENDERLEIN, 1936

Psilokempia ENDERLEIN, 1936: 49, type-species *Kempia appendiculata* GOETGHEUER, monotypic.
Atrichopogon subgenus *Psilokempia*: REMM 1959: 682.

Diagnosis

Females with unique genital armature present on sternites VII-VIII, X; VII-VIII, or on VIII. Abdominal tergite X totally reduced. Males with unique parameres fused with the base of aedeagus into a ring or tube.

Eyes usually pubescent in both sexes. Paratergite with 1-3 setae, anterior anepisternum with a weak incision and its shape is rather more P-like (Figs. 16-18) than B-like as in other *Atrichopogon*. First radial cell usually more or less greatly reduced. Wing membrane with or without macrotrichia in both sexes, or bare only in males. Seminal capsule single. Mandibles bearing small and distinct black teeth, which are indistinctly larger at middle of dentation (Fig. 11). Distal teeth are smaller, sometimes more blunt or even totally broken in probably old specimens.

Tergite VIII enlarged, heavily sclerotised, not fused with sternite VIII. Claws of female

legs expanded at middle (Fig. 21) and with simple apices; male claws bifid on apex. Prothoracic sternite trapezoid as in other *Atrichopogon*.

Discussion

DELÉCOLLE & BRAVERMAN (1997) in the female of *A. wirthorum* found unusual mandibles and maxilles armed with spines, which may suggest that they are not useful for feeding on pollens. These mouthparts resemble those present in males and it is possible that this female was an intersex.

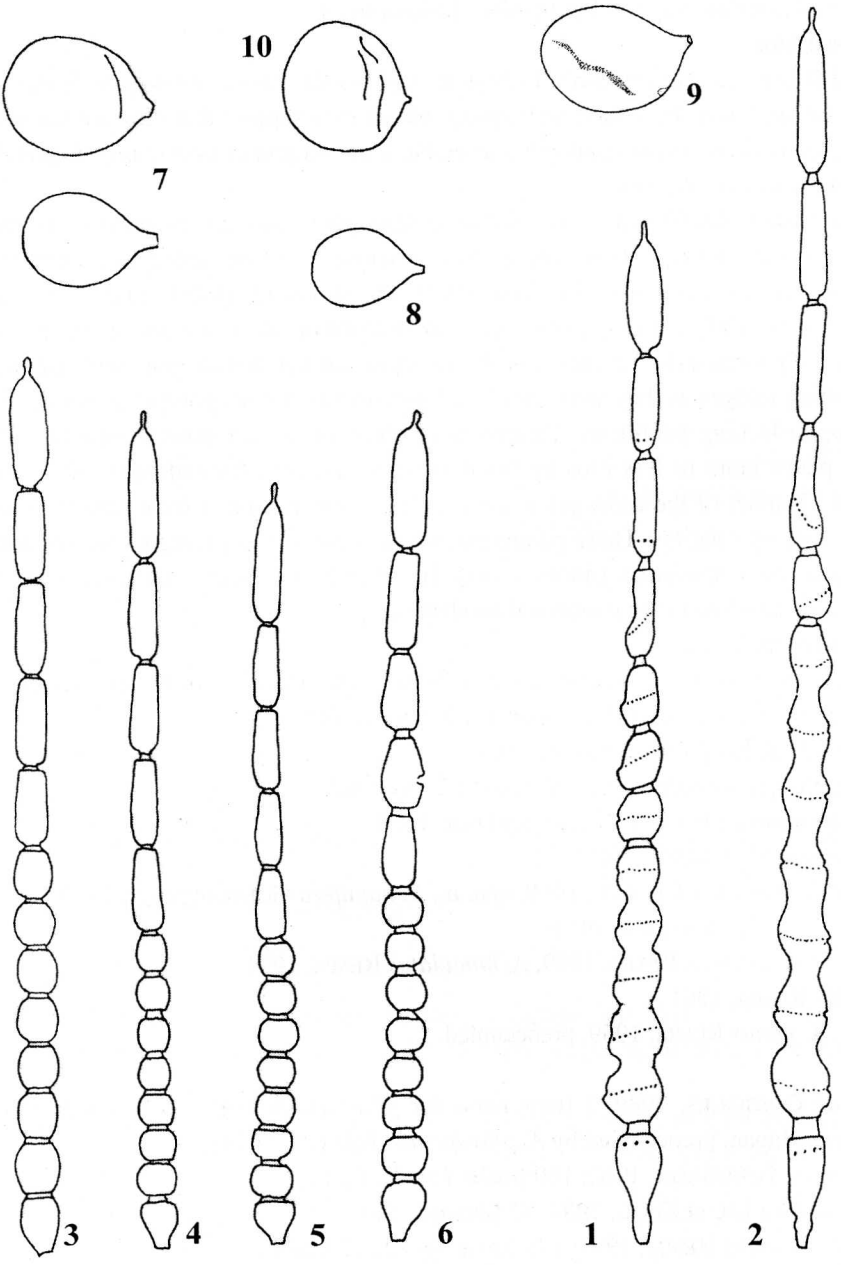
The widely distributed within biting midges parameres are absent in *Atrichopogon* except for the subgenus *Psilokempia*. The structures over the aedeagus in *Atrichopogon* were treated as parameres by TOKUNAGA & MURACHI (1959) and DELÉCOLLE & BRAVERMAN (1997). REMM (1959) only in description of *A. maculatus* mentioned that structure (?parameres). Parameres of *Psilokempia* are not homologous with parameres of other biting midges as they were developed secondarily in the apotypic group within other *Atrichopon* lacking parameres. Parameres of *Psilokempia* are usually weakly sclerotised paired plates more or less broadly fused at bases and with the aedeagus. As a result the internal chamber of the aedeagus is more or less tubular, limited from ventral, lateral and dorsal sides by sclerites. These parameres, when broader than aedeagus, are not connected with gonocoxal apodemes (dorsal roots). In other biting midges parameres are usually paired rods attached to the gonocoxal apodemes.

Species included

The subgenus is of worldwide distribution and includes over 30 species. In the Palaearctic region there are known the following species:

A. appendiculatus (GOETGHEBUER, 1920)
  syn. *Kempia armativentris* KIEFFER, 1923, **syn. n.**
  K. appendiculata var. *adjacens* KIEFFER, 1924.
A. forcipatus (WINNERTZ, 1852)
  syn. *A. silesiacus* KIEFFER, 1919, **syn. n.**, *K. hamifera* GOETGHEBUER, 1920.
A. maculatus (LUNDSTRÖM, 1910)
  syn. *A. avastensis* REMM, 1959, *A. hamulatus* REMM, 1971.
A. paulus REMM, 1961
  syn. *A. nanus* REMM, 1959, preoccupied.

A. ilonae GOSSERIES, 1989: 2 (new name for *pilosipennis* TOKUNAGA, 1940: 276; male, female, Japan, preoccupied by *A. pilosipennis* KIEFFER, 1919).
A. palmatus TOKUNAGA, 1962: 160 (male, female, Japan).
A. pallidicillus LIU et ZHOU, 1988: 85 (female, China).
A. quadrispinosus REMM, 1993: 196 (male, female, Sakhalin).
A. spiniventris TOKUNAGA, 1940: 273 (male, female, Japan).
A. tetramischus YU et LIU, 1995: 48 (female, China).
A. wirthorum DELÉCOLLE et BRAVERMAN, 1997 (male, female, Israel).



Figs. 1-10. Male (1, 2) and female (3-6) flagellum and seminal capsule (7-10); 1, 3, 7 - *A. appendiculatus*, 2, 4, 8 - *A. forcipatus*, 5, 9 - *A. maculatus*, 6, 10 - *A. paulus*.

From the subgenus *Psilokempia* should be excluded *A. nudus* ZILAHI-SEBESS, 1940: 38, 126 (female, Hungary) and *A. parvulus* KIEFFER, 1919: 25 (female, Ukraine, Carpathians) which have no preserved types and their descriptions are very poor, without any diagnostic character of the subgenus. They were placed here by REMM (1959, 1988). Similarly *A. japonicus* TOKUNAGA, 1940: 272 (female, first radial cell slit-like, wing membrane bare, no information on genital armature, Japan) should also be excluded from the subgenus where it was placed by REMM (1959, 1988). TOKUNAGA was an excellent and modern dipterist and it was impossible that he overlooked special genital armature typical of the subgenus.

Atrichopogon appendiculatus (GOETGHEBUER, 1920)

Figs. 1, 3, 7, 12, 16, 20-23, 26-29

Kempia appendiculata GOETGHEBUER, 1920: 37 (female, Belgium).
Kempia armativentris KIEFFER, 1923: 673 (female, Algeria). **Syn. n.**
Kempia appendiculata var. *adjacens* KIEFFER, 1924 (female, N France).
Atrichopogon appendiculatus: EDWARDS 1926: 400 (female, England); GOETGHEBUER 1934: 25 (female, Belgium, England, Austria); REMM 1959: 683 (male, female, Estonia, Ukraine = *adjacens* KIEFF., ?*silesiacus* KIEFF.); REMM 1973: 356 (Hungary, record); REMM 1988: 93 (Central Europe, European part of Russia, Georgia, Armenia, Kirghizia, West and East Siberia, Sakhalin); ORSZÁGH et al. 1997: 41 (Slovakia).

Diagnosis

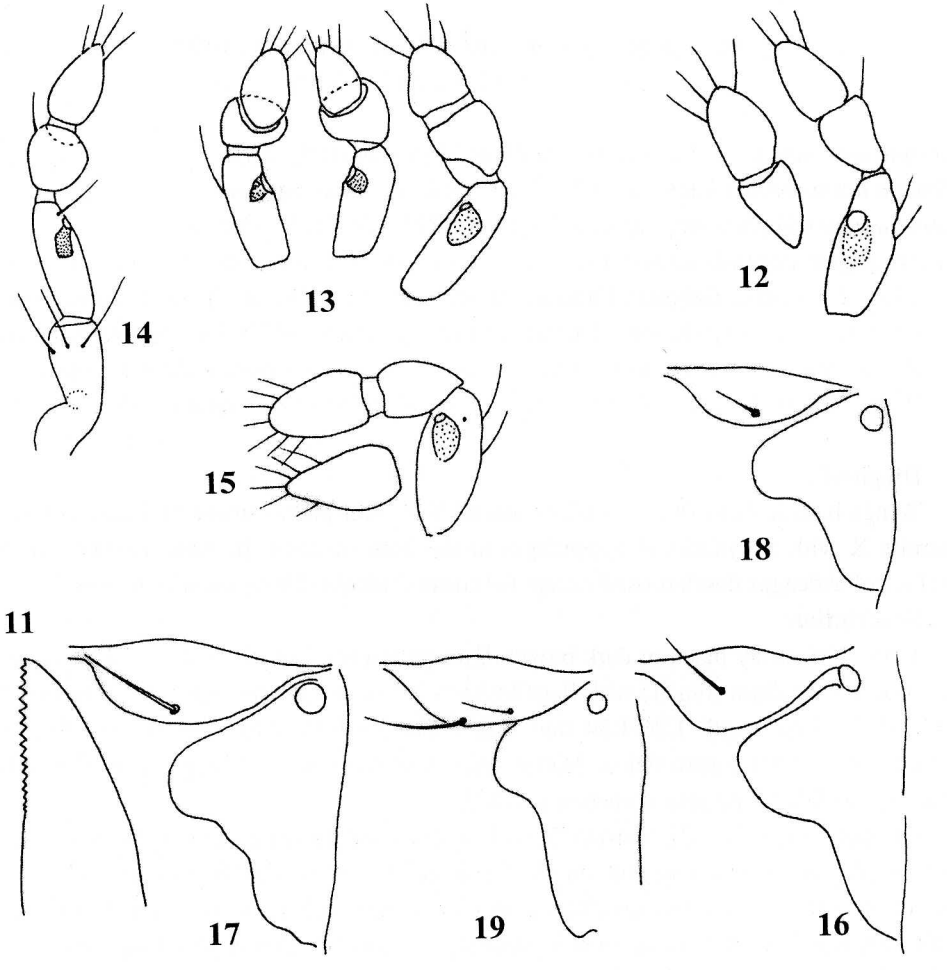
Wings bare in both sexes. Female sternite VIII with lateral strong and curved spines, sternite X with 2 cylindrical appendages at the base of cerci. In male genitalia ventral surface of aedeagus desclerotised except for convex, tonque-like apicomedian part.

Description

Male. Uniformly black or dark brown. Eyes pubescent. Length of third palpal segment 58-70 μm. Flagellum (Fig. 1) with flagellomeres 2-5 or 2-6 fused; length 740-839 μm, AR 0.67-0.81. Wing length 1.26-1.54 mm, CR 0.53-0.60; first radial cell present, line-like; membrane without macrotrichia. Halter pale. Scutellum with 2 long submedian setae. Paratergite with 1 long seta, sometimes with 2.

Genitalia (Figs. 22, 23). Sternite IX with straigh caudal margin, with a group of setae at middle. Tergite IX reaching mid length of gonocoxites, apex slightly rounded, cerci broad and fused with tergite in the apicolateral position. Gonocoxite long and slender; dorsal root well developed; ventral basal margin strongly sclerotised. Gonostylus long, tapering to pointed apex. Aedeagus broad; ventral surface M-shaped, with a tongue-like heavily sclerotised and convex projection; dorsal weakly sclerotised part with forked median process and lateral sclerite (Figs. 22, 23). Parameres in shape of transparent lobes fused into W-shape structure, fused with base of aedeagus, lateral free parts broader than aedeagus.

Female. Almost uniformly black or dark brown. Eyes pubescent. Flagellum with spherical proximal flagellomeres (Fig. 3), length 592-673 μm, AR 1.12-1.29. Distal palpal segments as in Fig. 12, third palpal segment 52-62 μm long. Wing length 1.14-1.49 mm, CR 0.61-0.66, first radial cell slit-like (Fig. 20), membrane without macrotrichia. Paratergite with 1, occasionally with 2 setae. Mandible with 11-13 small teeth. Scutellum with 2 long submedian and some small setae. Claws of legs expanded at midlength (Fig. 21), empodial hairs simple.



Figs. 11-19. Female mandible (11), palp (12-15), thoracic paratergite and anterior anepisternum (16-19); 11, 14, 18 - *A. maculatus*, 12, 16 - *A. appendiculatus*, 13, 17 - *A. forcipatus*, 15, 19 - *A. paulus*.

Genital armature (Figs. 26-29). Sternite VII more or less trapezoid. Caudomedian appendage of sternite VII long and slender, armed with 5-12 branches on apex (Figs. 28, 29); sternum VIII with a stripe-like anterior sclerite bearing simple setae on caudal margin and 2 strong curved lateral spines (Fig. 26); the lateral spine is single, or divided into 2-4 branches (Fig. 27); membrane of sternum VIII with 2 diverging rows of broad spines, about 9-10 in a single row; triangular small remnants of sternite IX not fused with subgenital plate or tergite IX; subgenital plate in shape of horseshoe, with strongly sclerotised arms. Tergite VIII enlarged and heavily sclerotised. Tergite X totally reduced. Sternite X weakly sclerotised, triangular, with small cylindrical lateral appendages bearing some black teeth on apex. Seminal capsule spherical with short or slightly elongated neck (Fig. 7), length 96-112 μm.

Material examined

Types: Lectotype female (present designation), Belgium, Gand (P) 15 May 1914, Ex-Typis, coll. et det M. Goetghebuer, *Kempia appendiculata*, cf. Mem. Mus. Hist. Nat. Belg. VIII (1920) fasc. 3 p. 37, at present mounted on slide; paralectotype female, (present designation), 28 April 1914, paratype pink label, paratype green label, *appendiculata*, R.I.Sc.N.B. 18.073, abdomen missing, left on a pin (IRSNB).

Other materials:

Bulgaria: Pirin Mts., Sandanski, 12 June 1984, 1 male, 1 female, W. Krzemiński.

France: Alps nr Geneva, Six Fer á Cheval, 11 June 1994, 1000 m., 3 males, R. Szadziewski

Poland: Będkowice nr Kraków, 5 July 1984, *Aegopodium podagraria*, 1 female, J. Krzywiński; Chylice nr Warsaw, 15-21 July 1982, 1 male, 2 females, IZPAN (UG); Moszczenica nr Żywiec, 15 July, 1992, 1 male, J. Krzywiński; Ojców nr Kraków, 24 June 1988, 2 females, R. Szadziewski; Olsztyn, 23 Aug. 1990, Apiaceae, 1 male, Zadroga; Pieniny Mts., Wąwóz Sobczański, 22 June 1988, 6 males, 7 females, R. Szadziewski; Radków, 20 June 1987, 3 male, G. Okróy-Rysop; Sztabin nr Augustów, 24 June 1985, *Aegopodium podagraria*, 1 male, J. Krzywiński; Zabierzów nr Kraków, 3 Aug. 1981, 2 males, 5 females, R. Szadziewski; Żarnowiec, 11 Aug. 1988, 1 male, R. Szadziewski.

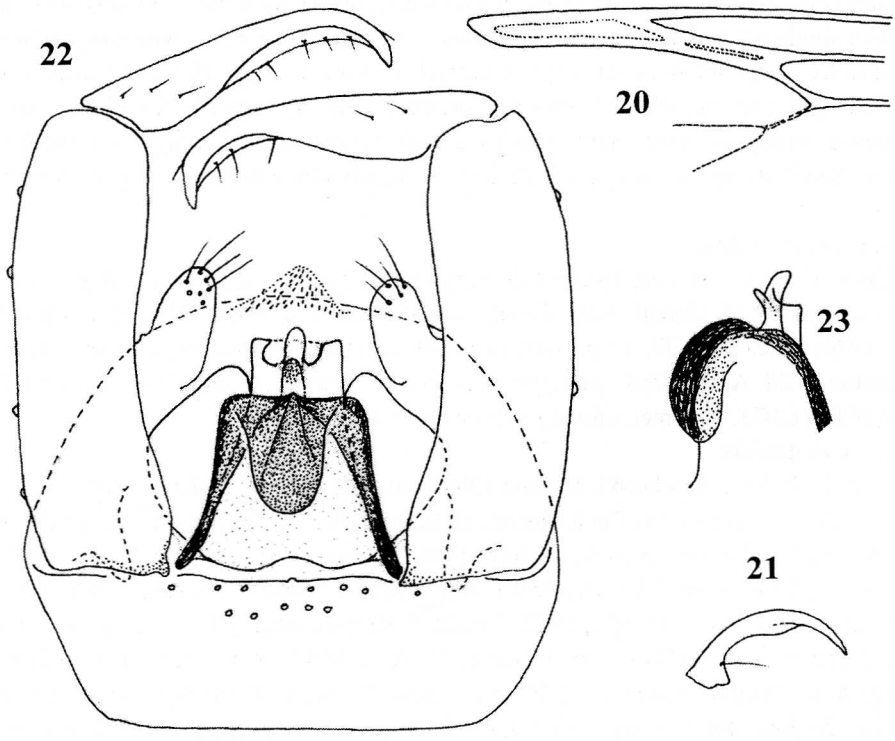
Distribution

The species is widely distributed in the Palaearctic region from North Africa (Algeria) to Far East of Russia (Sakhalin). In Europe it is reported from France, Switzerland, Austria, Bulgaria, Hungary, Belgium, England, Germany, Slovakia, Poland, Ukraine, Estonia, Finland and European part of Russia. It is also recorded from the Caucasus (Georgia, Armenia), Kazakhstan, Kirghizia, West and East Siberia and Sakhalin. Collected from April to August (mostly in June) on lowlands and in mountains. It can be recognised as arboreal transpalaearctic faunal element, i.e. distributed in the zone of forests (pine and deciduous).

Discussion

Kempia armativentris described by KIEFFER from Algeria I recognise in this paper as a junior synonym of *A. appendiculatus*. In the illustration of the female genital armature presented by KIEFFER (1923) are shown strong lateral projections of sternite VIII and the

appendage of sternite VII similar to that presented in my Fig. 28 which are diagnostic for *A. appendiculatus*.

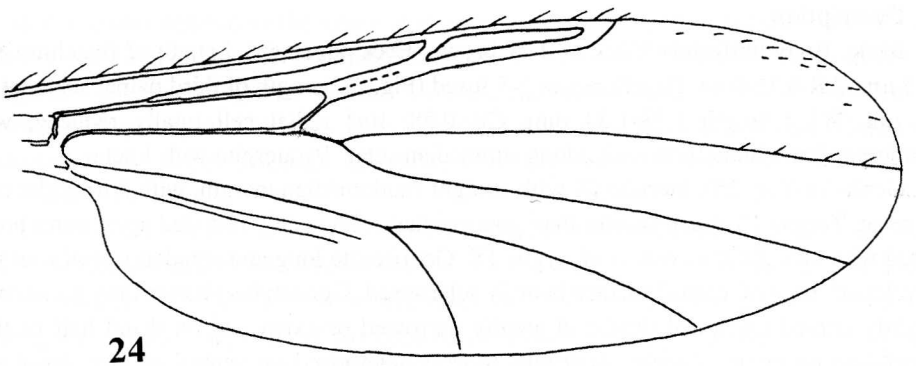


Figs. 20-23. *A. appendiculatus*; 20 - female radial cells, 21 - female claw, 22 - male genitalia, 23 - lateral aspect of aedeagus.

***Atrichopon forcipatus* (WINNERTZ, 1852)**
Figs. 2, 4, 8, 13, 17, 24, 25, 30-32

Ceratopogon forcipatus WINNERTZ, 1852: 30 (male, Germany).
Kempia hamifera GOETGHEBUER, 1920: 38 (male, female, Watermael, Belgium); Bangerter 1933 (larva, pupa, Switzerland).
Atrichopogon hamiferus: EDWARDS 1926: 400 (female, macrotrichia absent or present, England).
A. silesiacus KIEFFER, 1919: 30 (male, Silesia, Poland). **Syn. n.**

A. forcipatus: GOETGHEBUER 1934: 20 (male, syn. ?silesiacus); REMM 1959: 689 (male, female, Estonia, Karelia, Petersburg region, Ukraine); REMM 1988: 93 (North and Central Europe, European part of Russia, Kazakhstan, East Siberia); ORSZÁGH et al. 1997: 41 (Czechia, Slovakia).



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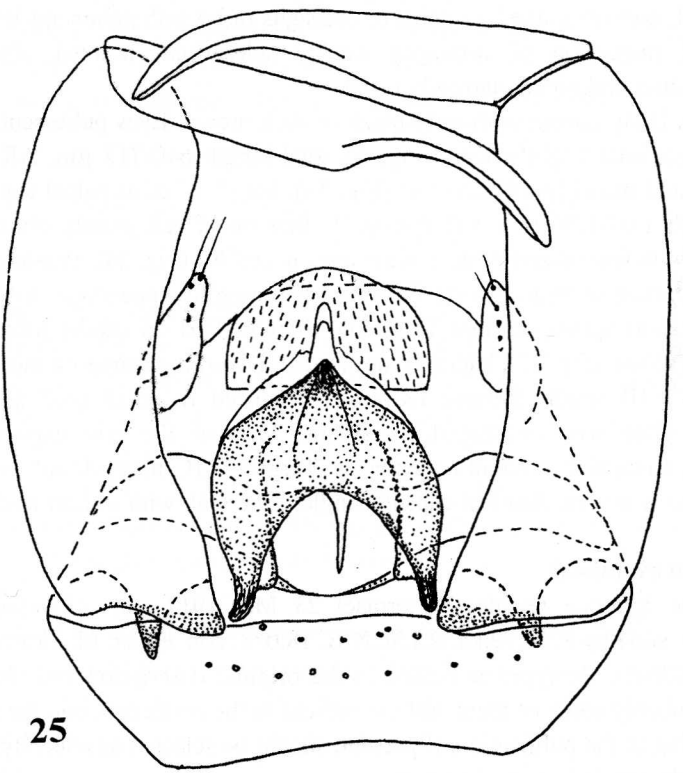

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Figs. 24, 25. *A. forcipatus*; 24 - female wing, 25 - male genitalia.

Diagnosis

Female: wing membrane with some macrotrichia at apex; genital armature with slender appendage of sternite VII, lateral spines of sternite VIII and appendages of sternite X absent, caudal margin of sternite VIII with a row of strong blunt spines. Male: hypoproct large, well sclerotised; basal arch of aedeagus high; apicodorsal part of the aedeagus slender; parameres low and broad, narrowly fused.

Description

Male. Body uniformly black or dark brown. Eyes pubescent. Length of flagellum 843-955 μm, AR 0.75-0.84, flagellomeres 2-8 fused (Fig. 2). Length of third palpal segment 70-72 μm. Wing length 1.28-1.34 mm, CR 0.58; first radial cell totally reduced, wing membrane bare. Scutellum with 2 long submedian setae. Paratergite with 1 seta.

Genitalia (Fig. 25). Sternite IX with straight caudomedian margin, with 2 irregular rows of setae. Tergite IX much shorter than gonocoxites, with evenly rounded apex; cerci broad, fused with apicolateral corners of tergite IX. Gonocoxite long and slender; dorsal root well developed, base of ventral surface heavily sclerotised. Gonostylus shorter than gonocoxite, slightly curved on apical third and greatly narrowed or excavated on distal half or third depending on angle of view. Aedeagus broadly sclerotised on ventral surface, basal arch high; lateral, dorsally curved, margins of aedeagus fused with parameres into a ring or tube; apicodorsal projection of aedeagus weakly sclerotised, pointed, directed ventrally. Parameres short and broad, narrowly fused.

Female. Body almost uniformly black or dark brown. Eyes pubescent. Flagellum with spherical proximal flagellomeres (Fig. 4), total length 640-717 μm, AR 1.51-1.62. Palp with short and broad fourth segment (Fig. 13), length of third palpal segment 50-58 μm. Wing length 1.07-1.30 mm, CR 0.66-0.71, first radial cell greatly obliterated, line-like, membrane with few macrotrichia at wing apex in cell R5 (Fig. 24). Paratergite with 1 seta.

Genital armature (Figs. 30-32). Sternite VII trapezoid; appendage slender, bent at base, with some short spines on apex (Fig. 31). Sternite VIII on caudal margin bearing 8-15 strong dark spines (Fig. 32), lateral spines absent. Diverging spines on membranous surface of sternum VIII small. Sternite IX greatly reduced to small oval and free sclerites. Subgenital plate well developed, horseshoe, base of the arm expanded. Sternite X transparent, triangular, without appendages. Tergite VIII enlarged, not fused with sternite VIII. Tergite X absent. Seminal capsule single, spherical, with a short neck, length 88-100 μm.

Material examined

Belgium: Syntype female, Watermael 23 Mai 1917, *Atr.* (*Kempia*) *hamifer* Gtg. Mounted on slide by P. Havelka. R.I.Sc.N.B. 18.073. coll. et det. M. GOETGHEBUER; wings missing (IRSNB). Syntypes indicated in the original description include 7 males and 2 females. Probably some of them still are present in the collection, and the specimen with a label referring to the publication, if present, should be selected as a lectotype. It is a reason why now I do not designate a lectotype.

Poland: Abramowice nr Lublin, 26-27 May 1963, 1 male, Z. Biliński (UG). Kampinos

National Park, 30 May-4 June 1979, 1 male, IZPAN (UG); Niesiołowice, 9 June 1998, at pond, 1 male, W. Giłka (UG); Sztabin nr Augustów, 5 Aug. 1985, *Heracleum sibiricum*, 1 female; 7 Aug. 1985, *Cicuta virosa*, 1 male, 1 female, *Sium latifolium*, 3 females, *Pastinaca sativa* 1 female; 9 Aug. 1985, *Angelica silvestris*, 2 females, *Torilis japonica* 1 female, J. Krzywiński (UG).

Distribution

A. forcipatus represents the arboreal European faunal element distributed mostly in the zone of deciduous forests. It is recorded mostly on lowlands of Central and North Europe: Belgium, Germany, England, Poland, Czechia, Slovakia, Switzerland, Ukraine, Estonia, Finland, European part of Russia. Reported also from Kazakhstan and Siberia. More rarely collected than *A. appendiculatus*. Adults occur in May, June and August.

Discussion

A. silesiacus based on a male was described by KIEFFER (1919) from Silesia in Poland. The type was destroyed in Budapest in 1956. GOETGHEBUER (1934) suggested that it could be synonymous with *A. forcipatus*. However, REMM (1959) suggested that it could be synonymous with *A. appendiculatus* because a drawing of distal flagellomeres presented by KIEFFER shows relatively short distal flagellomeres. Later REMM (1988) recognised *A. silesiacus* as a distinct species in the Palaearctic catalogue. In the short original description of the species by KIEFFER I see no any important character, which is absent in A. forcipatus, and I follow the GOETGHEBUER suggestion and relegate *A. silesiacus* to the synonymy of *A. forcipatus.*

Atrichopogon maculatus (LUNDSTRÖM, 1910)

Figs. 5, 9, 14, 18, 33-35

C. minutus var. *maculatus* LUNDSTRÖM, 1910: 35 (female, Finland).

A. avastensis REMM, 1959 (male, female, Estonia, Ukraine, Petersburg region); REMM 1981: 30 (syn. *hamulatus*); REMM 1988: 93 (Estonia, Lithuania, Ukraine, Czechoslovakia, Russia - Petersburg obl., West and East Siberia, Far East); SZADZIEWSKI 1991: 106 (Poland).

A. hamulatus REMM, 1971: 197 (male, female, Far East of Russia).

A. maculatus: SZADZIEWSKI et al. 1996: 300 (female, redescription, syn. *A. avastensis* and *A. hamulatus*); (ORSZÁGH et al. 1997: 41 (Slovakia).

Diagnosis

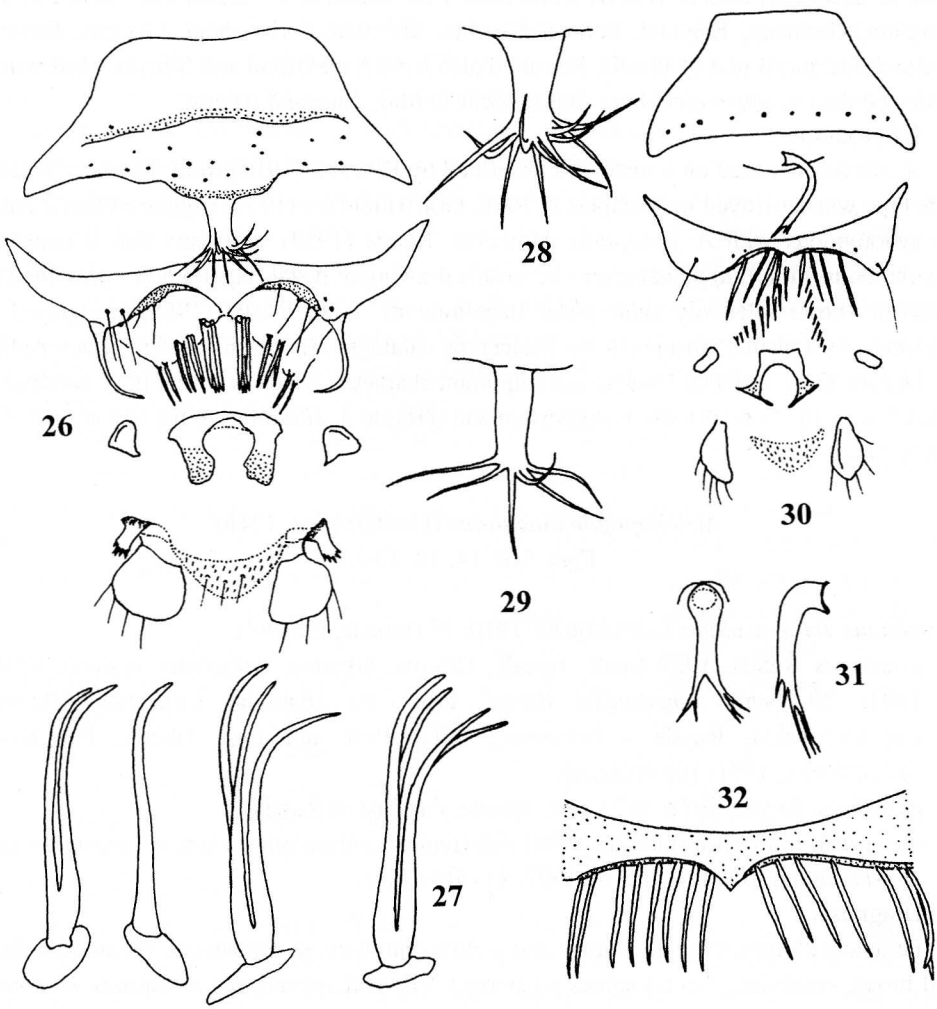
Female with bare wing membrane and yellow scutellum; appendage of VII sternite short and broad, comb-like; lateral spines on sternite VIII and appendages on sternite X absent. Aedeagus with low basal arch and 2 apical processes (Fig. 33), parameres high and broad, teat-like, narrowly fused.

Description

Male. Not available for present studies.

Female. Body brown, scutum yellowish with 3 brown stripes, humerus, scutellum

yellowish, halteres and legs yellowish to brownish; Postnotum, paratergite, anterior anepisternum and most of katepisternum dark brown. Eyes pubescent. Flagellum 580-608 μm.long, AR 1.34-1.49, proximal flagellomeres spherical (Fig. 5). Palp (Fig. 14), third palpal segment 60 μm.long. Mandible with 17 small teeth (Fig. 11). Wing length 0.97-1.17 mm, CR 0.62-0.66, first radial cell obliterated, line-like, membrane without macrotrichia. Scutellum with 2 submedian bristles and some short setae. Paratergite with 1 seta (Fig. 18).



Figs. 26-32. Female genital armature of *A. appendiculatus* (26-29) and *A. forcipatus* (30-32); 26, 30 - sternites VII-X and cerci, 27 - lateral spines of sternite VIII, 28, 29, 31 - appendage of sternite VII, 32 - sublateral spines of sternite VIII.

Genital armature (Figs. 34, 35); sternite VII with short and broad appendage like a comb (Fig. 35) with two diverging main arms divided into spine-like branches (total 9-11); sternite VIII with normal marginal setae, membranous part of sternum VIII with some short pale spines. Sternite IX totally reduced, traces of subgenital plate barely visible. Tergite IX totally reduced. Seminal capsule ovoid with short neck, length 88-96μm.

Material examined

Switzerland: Suisse VD, Grangettes, Gros Brasset, 19 June 1992, 1 female, 17 July 1992, 1 female, 7 Aug. 1992, 1 female, 21 Aug. 1992, 1 female (Musée d'histoire naturelle de Neuchâtel).

Poland: Babia Góra Mts., Zawoja Czatoża, 3 July 1989, 1 female, R. Szadziewski leg.

Distribution

A boreal transpalaearctic species recorded from Finland, Petersburg region, Estonia, Lithuania, West and East Siberia and Far East of Russia. In Central Europe it was reported in the Carpathian mountains (Poland, Slovakia and Ukraine) and in the Alps (Switzerland).

Discussion

Males of *A. maculatus* are very rare. According to REMM (1959) they are much darker than females and their eyes are devoid of pubescence.

Atrichopogon paulus REMM, 1961

Figs. 6, 10, 15, 19, 36-38

A. paulus REMM, 1961: 928 (new name for *nanus*); REMM 1988: 93 (Estonia, European territory of Russia).

A. nanus REMM, 1959 (male, female, Estonia, preoccupied).

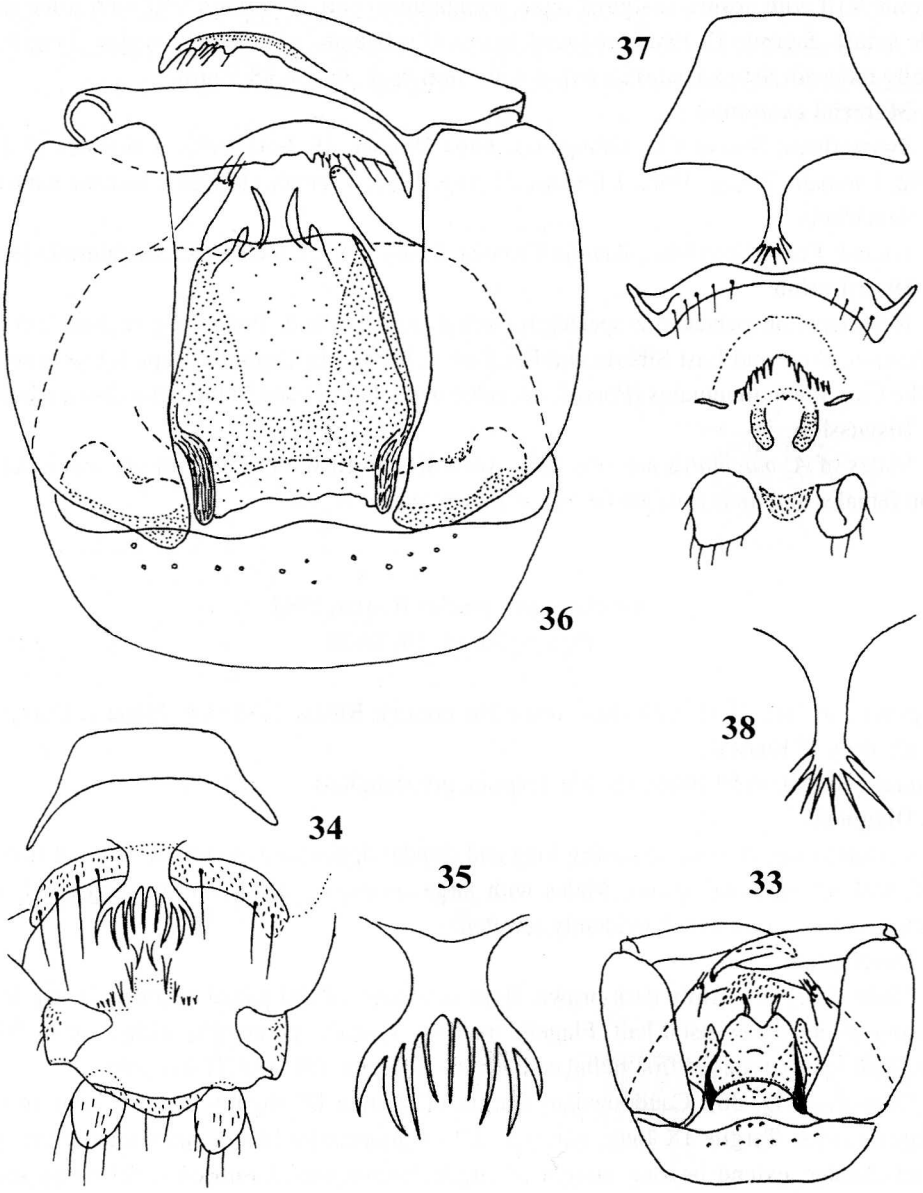
Diagnosis

Females characteristic in having long and slender appendage of sternite VII and sternite VIII without marginal spines. Males with large aedeagus, slender converging cerci, and ventral surface of gonostyli evidently serrated.

Description

Male. Body uniformly dark brown. Eyes pubescent. Third palpal segment 66 μm long, sensory pit small on distal half. Flagella missing. Thoracic paratergite with 3 setae. Wing bare with totally reduced first radial cell, length 1.05 mm, CR 0.56. Halter pale.

Genitalia (Fig. 36). Caudomedian margin of sternite IX slightly convex, setae in two irregular rows. Tergite IX long, reaching 2/3 of gonocoxite length, apex almost straight. Cerci slender, extend beyong margin of tergite, converging. Gonocoxite relatively stout; dorsal roots of horizontal position. Gonostylus stout with pointed and curved apex; ventral surface on apical third serrated. Aedeagus large with low basal arch and basal arms directed ventrally; whole ventral surface well sclerotised; apex with 4 submedian projections. Paramares not broader than aedeagus, barely visible.



Figs. 33-38. *A. maculatus* (33-35) and *A. paulus* (36-38); 33, 36 - male genitalia (33 after REMM 1959), 34, 37 - sternites VII-X and cerci, 35, 38 - appendage of sternite VII.

Female. Body uniformly dark brown. Eyes pubescent. Flagellum with spherical proximal flagellomeres (Fig. 6), total length 629 μm, AR 1.36. Third palpal segment 64 μm long (Fig. 15). Mandible armed with small teeth. Wing membrane without macrotrichia, length 1.11 mm, CR 0.60, first radial cell obliterated, Halter pale. Thoracic paratergite with 2 setae (Fig. 19). Scutellum bearing 2 submedian and 2 lateral long setae. Empodial hairs simple.

Genital armature (Figs. 37, 38). Sternite VII trapezoid, its appendage long and slender armed with 8 spine-like branches. Sternite VIII stripe-like, without normal setae only, diverging rows of small spines on membrane of sternum VIII present. Remnants of sternite IX almost line-like; subgenital plate like a horseshoe. Sternite X without modifications. Tergite X absent. Seminal capsule spherical with short neck, 100 x 100 μm (Fig. 10).

Material examined

Paratype male, Tuhu marsh (pit bog), Lihula distr., 28 V 57, Estonia, H. Remm, *A. nanus* REMM, flagella missing; paratype female, labelled as above. At present mounted on microscope slides. In the collection of Museum of Zoology, University of Tartu.

Table. Numerical characters of European species of the subgenus *Psilokempia*.

	A. appendiculatus		*A. forcipatus*		*A. maculatus*	*A. paulus*	
	male	female	male	female	female	male	female
wing (mm)	1.26-1.54	1.14-1.49	1.28-1.34	1.07-1.30	0.97-1.17	1.05	1.11
CR	0.53-0.60	0.61-0.66	0.58-0.60	0.66-0.71	0.62-0.66	0.56	0.60
flagellum (μm)	740-839	592-673	843-955	640-717	580-608		629
AR	0.67-0.81	1.12-1.29	0.75-0.84	1.51-1.62	1.34-1.49		1.36
seminal capsule (μm)	-	96-112	-	88-100	88-96	-	100
setae on paratergite	1-2	1-2	1	1	1	3	2

REFERENCES

BANGERTER H. 1933. Mücken-Metamorphosen V. Konowia **12**: 248-259, 1 pl.

DELÉCOLLE J.C., BRAVERMAN Y. 1997. A new species of *Atrichopogon* from Israel (Diptera: Ceratopogonidae). Memoirs of the Entomological Society of Washington **18**: 101-107.

DE MEILLON B., WIRTH W.W. 1989. A new pollen feeding Atrichopogon midges from Magagascar, with notes on closely related subsaharan species [Diptera, Ceratopogonidae]. Revue Francaise d'Entomologie **11**: 85-89.

EDWARDS F.W. 1926. On the British biting midges (Diptera, Ceratopogonidae). Transactions of the Royal Entomological Society of London **74**: 389-426.

ENDERLEIN G. 1936. Ordnung: Zweiflügler, Diptera. Abt. 16. In: BROHMER P. et al. (Eds) Die Terwelt Mitteleuropas 6: Insekten III Teil. Leipzig.

GOETGHEBUER M. 1920. Ceratopogoninae de Belgique. Memoires du Musee Royal d'Histoire Naturelle de Belgique **8**, 3: 1-116.

GOETGHEBUER M. 1934. 13 a. Heleidae (Ceratopogonidae). In: LINDNER E. (Ed.) Die Fliegen der Palaearctischen Region 1-94.

GOSSERIES J. 1989. Replacement of some junior primary homonyms in the Diptera. Insect Nomenclature **1**: 1-4.

KIEFFER J.J. 1919. Chironomides d'Europe conservés au Musée National Hongrois de Budapest. Annales Historico-Naturales Musei Nationalis Hungarici **17**: 1-160.

KIEFFER J.J. 1924. Quelques nouveaux chironomides piqueurs de l'Europe centrale. Archives de l'Institute Pasteur Algérie **2**: 391-408.

LUNDSTRÖM C. 1910. Beiträge zur Kenntnis Dipteren Finlands VI. Chironomidae. Acta Societatis pro Fauna et Flora Fennica **33**: 1-47.

ORSZÁGH I., KNOZ J., CHALUPSKÝ J. 1997. Ceratopogonidae, pp. 39-42. In: CHVÁLA M. (ed.) Check list of Diptera (Insecta) of the Czech and Slovak Republics, Karolinum - Charles Univ. Press, Prague, 130 pp.

REMM H. 1959. Estonian species of the genus *Atrichopogon* KIEFFER (Diptera, Heleidae). I. Subgenus Psilokempia Enderlein [in Russian]. Entomologitsheskoe Obozrenie **38**: 682-692.

REMM H. 1961. Estonian species of the genus *Atrichopogon* KIEFFER (Diptera, Heleidae). II. Description of three new species and key to the Estonian species of the subgenus *Atrichopogon* s. str. Entomologitsheskoe Obozrenie **40**: 920-928 (in Russian).

REMM H. 1971. On the fauna of Ceratopogonidae of South Primorye (Ussuri Land). In: Living Nature of the Far East, pp. 182-220 [in Russian].

REMM H. 1973. Beiträge zur Ceratopgoniden-Fauna Ungarns (Diptera). Folia Entomologica Hungarica **26** Suppl.: 349-357.

REMM H. 1981. New synonyms and new names of the Palaearctic Ceratopogonidae (Diptera). Eesti NSV Teaduste Akademia Toimetised, Biologia **30**: 27-32.

REMM. H. 1988. Ceratopogonidae. In: SOOS Á., PAPP L. Catalogue of Palaearctic Diptera. **3**: 11-114.

REMM H. 1993. New species of Ceratopogonidae (Diptera) from the CIS [in Russian]. Eesti Teaduste Akadeemia Toimetised, Bioloogia **42**: 180-200.

SZADZIEWSKI R. 1991. Ceratopogonidae. W: RAZOWSKI J. (Ed.) Wykaz zwierząt Polski **2**: 103-109.

SZADZIEWSKI R. GIŁKA W., HENNING A. 1995. Immature stages of two European species of the genus *Meloehelea* (Diptera: Ceratopogonidae), with keys to the European subgenera of *Atrichopogon*. Entomologica Scandinavica **26**: 181-190.

SZADZIEWSKI R., KACZOROWSKA E., KRZYWIŃSKI J. 1996. Redescriptions of some European species of *Atrichopogon* (Diptera: Ceratopogonidae). Polskie Pismo Entomologiczne **65**: 297-318.

TOKUNAGA M. 1940. Chironomoidea from Japan (Diptera), XII. New or little-known Ceratopogonidae and Chironomidae. Philippine Journal of Science **72**: 255-311.

TOKUNAGA M. 1962. Biting midges of the Ryukyu Islands (Diptera: Ceratopogonidae). Pacific Insects **4**: 153-217.

TOKUNAGA M., MURACHI E.K. 1959. Diptera: Ceratopogonidae. Insects of Micronesia **12**: 103-434.

WINNERTZ J. 1852. Beitrag zur Kenntniss der Gattung *Ceratopogon* Meigen. Linnaea Entomologica **6**: 1-80.

YU Y., LIU K. 1995. Two new species of *Atrichopogon* from Sichuan (Diptera: Ceratopogonidae). Sichuan Journal of Zoology **14**: 47-49.

YU Y., ZHOU M.-J. 1988. Description of *Atrichopogon* (*Psilokempia*) *pallidicillus* sp. nov. and their intersex (Diptera: Ceratopogonidae). Acta Zootaxonomica Sinica **13**: 85-87.

ZILAHI-SEBESS G. 1940. Magyarorszag Heleidai. Folia Entomologica Hungarica **5**: 10-133.

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