Zootaxa 2056: 1–45 (2009)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

The genus *Pseudexechia* Tuomikoski re-characterized, with a review of European species (Diptera: Mycetophilidae)

JOSTEIN KJÆRANDSEN
Museum of Zoology, Lund University, Helgonavägen 3, S-223 62 Lund, Sweden. E-mail: jostein.kjaerandsen@zool.lu.se.

Table of contents

Abstract

The genus *Pseudexechia* Tuomikoski is re-characterized and described, including a thorough morphological study of the male and female terminalia, providing homology assessment of the various parts and substructures. The 25 currently known species of *Pseudexechia* are tentatively grouped into four species groups that are characterized mainly by structures of the male terminalia: the *canalicula* group (Holarctic), the *longistylus* group (Afrotropical) the *trisignata* group (Holarctic and Oriental), and the *trivittata* group (Holarctic and Oriental). The ten European species of *Pseudexechia* are then revised, of which one, *Pseudexechia tuomikoskii* **sp. n.**, is described as new to science. All males and nine associated females are keyed, measured, described and illustrated. A principal component analysis of 59 morphometric measurements failed to give a clear separation of the different species and species groups. Except for overall size and some diffuse differences in flagellomere and tarsus lengths the present study also failed to reveal morphometric characters that are clearly taxonomically informative, and species identity must rest primarily on structural differences in the terminalia with aid of coloration patterns. Given as ratios, however, some measurements, like the wing vein R_{4+5} bending index and the length to width ratio of clypeus, appear to be informative at species group level.

Key words: Exechiini, morphometrics, species groups, new species, revision

Accepted by J.K. Moulton: 20 Feb. 2009; published: 30 Mar. 2009

Introduction

The genus *Pseudexechia* was established by Tuomikoski (1966) for a small group of closely related species in the tribe Exechiini, segregated from *Exechia* Winnertz by the absence of discal bristles on the mesoscutum, ovate clypeus and distinctive features of the male terminalia such as the bud-like hypandrial lobe (Chandler 1978, Kjærandsen & Chandler 2006). Staeger (1840) described the first species of *Pseudexechia* as *Mycetophila trivittata* Staeger, 1840. Zetterstedt (1852) then described a pale form of *M. trivittata*, later illustrated by Lundström (1909) and now known as *Pseudexechia aurivernica* Chandler, 1978 (Chandler 1978, Kjærandsen 2005). Tuomikoski (1966) included seven species in *Pseudexechia*, six European, one North American and one Afrotropical. He designated *Exechia trisignata* Edwards, 1913, described from Scotland, as the type species and noted that he had seen several undescribed species from Europe and Asia in the collections at the Zoological Museum, University of Helsinki, Finland. At present 25 species are associated to *Pseudexechia* (Fig. 1): 15 are known from the Holarctic region (Tuomikoski 1966, Stackelberg 1969, Chandler 1978, Ostroverkhova 1979, Zaitzev 1982, Zaitzev 1988, Chandler & Blasco-Zumeta 2001, Zaitzev 2003, Kjærandsen & Chandler 2006, Kjærandsen et al. 2007), 3 are known from the Oriental region (Kjærandsen 1994, Kallweit 1995, Wu & Yang 2003) and 7 are known from the Afrotropical region (Matile 1971, Kjærandsen 1994). However, several further species from the Afrotropical, the Oriental and the eastern Palaearctic regions await description and a few that are described in other genera probably belong to *Pseudexechia*.

Chandler (1978) summarized the knowledge of the six European species of *Pseudexechia* known at that time. Chandler & Blasco-Zumeta (2001) and Kjærandsen & Chandler (2006) added two new species from Spain and Great Britain, respectively. Kjærandsen & Chandler (2006) further synonymised *P. hamulata* (Lackschewitz, 1937) with *P. parallela* (Edwards, 1925). As a part of the Swedish Taxonomy Initiative (see Miller 2005) Nordic fungus gnats of the tribe Exechiini are being investigated (e.g. Kjærandsen & Bengtson 2005, Kjærandsen 2006, Kjærandsen et al. 2007), and this has resulted in yet another three species of *Pseudexechia* being recorded for the first time from Europe, one of which is regarded as new to science. *Pseudexechia canalicula* (Johannsen, 1912), originally described from USA, was recently reported from Finland (Jakovlev et al. 2006), Sweden (Kjærandsen et al. 2007), and Norway (Søli & Kjærandsen 2008), and a new combination of *Rhymosia pectinacea* Ostroverkhova, 1979 in *Pseudexechia* was first used by Jakovlev et al. (2006) and formally transferred by Kjærandsen et al. (2007). Thus, ten European species are known at present, and especially the species complex previously associated with *P. trisignata* is in need of a revision.

Material and methods

The examined material consists of some 1000 specimens, mainly collected in the Nordic countries or obtained from various museum and project collections. The material is deposited in the following museum collections; the codens are obtained from Evenhuis (2008):

BMNH	Natural History Museum, London, United Kingdom
CUIC	Cornell University, Ithaca, New York, USA
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MZH	Zoological Museum, University of Helsinki, Helsinki, Finland
NHRS	Swedish Museum of Natural History, Stockholm, Sweden
RSME	National Museums of Scotland, Edinburgh, United Kingdom
ZMHB	Museum für Naturkunde der Humboldt-Universität Berlin, Germany
MZLU	Museum of Zoology, Lund University, Lund, Sweden
USNM	National Museum of Natural History, Washington D.C., USA
ZMUN	Zoological Museum, University of Oslo, Oslo, Norway

Type material have been examined of *Mycetophila trivittata* Staeger, 1840 [ZMUC], *Exechia canalicula* Johannsen, 1912 [CUIC], *Exechia trisignata* Edwards, 1913 [BMNH], *Exechia parallela* Edwards, 1925 [BMNH], *Exechia hamulata* Lackschewitz, 1937 [ZMHB], *Pseudexechia aurivernica* Chandler, 1978 [BMNH], *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001 [BMNH], and *Pseudexechia monica* Kjærandsen & Chandler, 2006 [RSME]. The Russian type material of *Rhymosia pectinacea* Ostroverkhova, 1979 and *Exechia tristriata* Stackelberg, 1969 was unfortunately not available for study. An important secondary source was the collection after Risto Tuomikoski (1911–1989) at MZH. He identified and labelled several European species as new to science in the early 1960s (see Tuomikoski 1966: 180, these were later known as *Pseudexechia aurivernica, P. canalicula, P. pectinacea, P. tristriata* and *P. tuomikoskii* **sp. n.**). New female associations are obtained by combination of non-terminalic characters such as colour patterns and co-occurrences in samples.

All specimens examined were recorded with unique identification codes prefixed by "SPM–" in a Biota 2.04 database (Colwell 2007), and the lists of material examined were extracted from this database. For each species and country the localities are sorted hierarchically within provinces, districts, localities and sites respectively. For type material the type depository acronym is given first, followed by the Biota code with the added prefix "JKJ–" (acronym for J. Kjærandsen) as a prefix identifier to link specimens to this specific database. Unique SPM-codes are given on the determination labels of all examined material and data from the database is intended to be web published.

A Nikon Digital Sight DS-M5 microscope camera mounted on a Nikon SMZ1500 stereomicroscope was used to capture images of fresh specimens lying in alcohol or parts of slide-mounted specimens. Five or more males and females (when present) of each species were slide-mounted in Canada balsam as outlined by Kjærandsen (2006). Scanned sketches of terminalia, drawn using a drawing tube attached to a Nikon Eclipse 50i compound microscope, were used as templates to produce digital illustrations with Adobe Illustrator and Photoshop.

Terminology and measurements follows Søli (1997a) with modifications and additions as given by Kjærandsen (2006). Some additional terms to describe shapes are adopted from botanical terminology (Stearn 1991). One index and two ratios applied to describe the wing venation need to be precisely defined: 1) The R_{4+5}-bending index (= R_5 termination or "C/D fork with ratio" of Kjærandsen 2006) is applied to express the distance between R_1 and R_{4+5} termination (C in Fig. 3A) over the distance between R_{4+5} and M_1 termination (D in Fig. 3A). 2) The fork length ratio (Kjærandsen 2006) is measured as the distance from the distal median plate to the branching of M (A in Fig. 3A) over the distance from the distal median plate to the branching of CuA (B in Fig. 3A). 3) The fork width ratio (= "E/F fork with ratio" of Kjærandsen 2006) is measured as the distance between M_1 and M_2 termination (E in Fig. 3A) over the distance between CuA_1 and CuA_2 termination (F in Fig. 3A). Other ratios are self-explanatory or follow Søli (1997a) and Kjærandsen (2006).

Some Exechiini genera show two pairs of outgrowths from (remnants of) segment X looking like cerci. The mesal pair is here interpreted as the true cerci while the lateral pair is interpreted as secondary outgrowths from segment X, and hereafter named as "pseudocerci" (see Fig. 5B). Among the Exechiini genera distinct pseudocerci are found in *Stigmatomeria, Anatella, Brachypeza, Allodiopsis* and *Pseudexechia*, in *Pseudexechia* they are particularly well developed and articulated from the remains of segment X.

The measurements of 59 variables in 65 specimens were prepared for a morphometric analysis through a normalized principal component analysis (PCA), performed by the ADE-4 software (Thioulouse et al. 1997) Mac OSX version (Thioulouse 2003). All European species were included, with the exception of *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001 that had to too many missing values. Other missing values (0.9%) were replaced by averages for the species and sex.

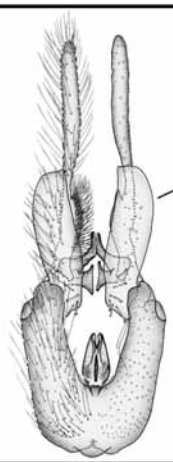
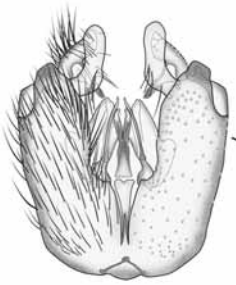
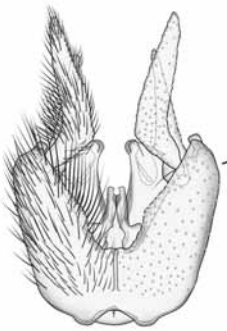
Representative male	Species groups and species	AFR 7	ORI 3	HOL 15	NEA 3	PAL 14	EUR 10
	***P. longistylus* group**						
	• *P. camerounensis* Matile, 1971	●	-	-	-	-	-
	• *P. longistylus* Kjaerandsen, 1994	●	-	-	-	-	-
	• *P. lanceostylus* Kjaerandsen, 1994	●	-	-	-	-	-
	unassociated species (known only from female holotypes)						
	• *P. silhouettensis* (Enderlein, 1910)	●	-	-	-	-	-
	• *P. tanganyikae* (Lindner, 1958)	●	-	-	-	-	-
	• *P. edwardsiana* Matile, 1971	●	-	-	-	-	-
	• *P. hancocki* Matile, 1971	●	-	-	-	-	-
	***P. trisignata* group**						
	• *P. trisignata* (Edwards, 1913)	-	-	●	-	●	●
	• *P. pectinacea* (Ostroverkhova, 1979)	-	-	●	-	●	●
	• *P. inthanonensis* Kjaerandsen, 1994	-	●	-	-	-	-
	• *P. tuomikoskii* sp. n.	-	-	●	-	●	●
	***P. canalicula* group**						
	• *P. canalicula* (Johannsen, 1912)	-	-	●	●	●	●
	• *P. parallela* (Edwards, 1925)	-	-	●	●	●	●
	• *P. ovata* (Fisher, 1934)	-	-	●	●	-	-
	• *P. aurivernica* Chandler, 1978	-	-	●	-	●	●
	• *P. ussuriensis* Zaitzev, 1982	-	-	●	-	●	-
	• *P. altaica* Zaitzev, 1988	-	-	●	-	●	-
	• *P. monica* Kjaerandsen & Chandler, 2006	-	-	●	-	●	●
	***P. trivittata* group**						
	• *P. trivittata* (Staeger, 1840)	-	-	●	-	●	●
	= *P. hamulata* (Lackschewitz, 1937)						
	• *P. tristriata* Stackelberg, 1969	-	-	●	-	●	●
	• *P. trilobata* Ostroverkhova, 1979	-	-	●	-	●	-
	• *P. macrocantha* Kallweit, 1995	-	●	-	-	-	-
	• *P. latevittata* Chandler & Blasco-Zumeta, 2001	-	-	●	-	●	●
	• *P. subtrilobata* Zaitzev, 2003	-	-	●	-	●	-
	• *P. sinica* Wu & Yang, 2003	-	●	-	-	-	-

FIGURE 1. List of World species of the genus *Pseudexechia* Tuomikoski divided into four species groups. The male terminalia of a typical representative of each group is illustrated to the left. Their known distribution in faunal regions and subregions is given to the right. The *longistylus* group (Matile 1971, Kjærandsen 1994) is known only from the Afrotropical Region. Four Afrotropical species described on single female holotypes cannot be placed with certainty but may belong to the *longistylus* group. Abbreviations: AFR = Afrotropical Region, ORI = Oriental Region, HOL = Holarctic Region, NEA = Nearctic subregion, PAL = Palaearctic subregion, EUR = European.

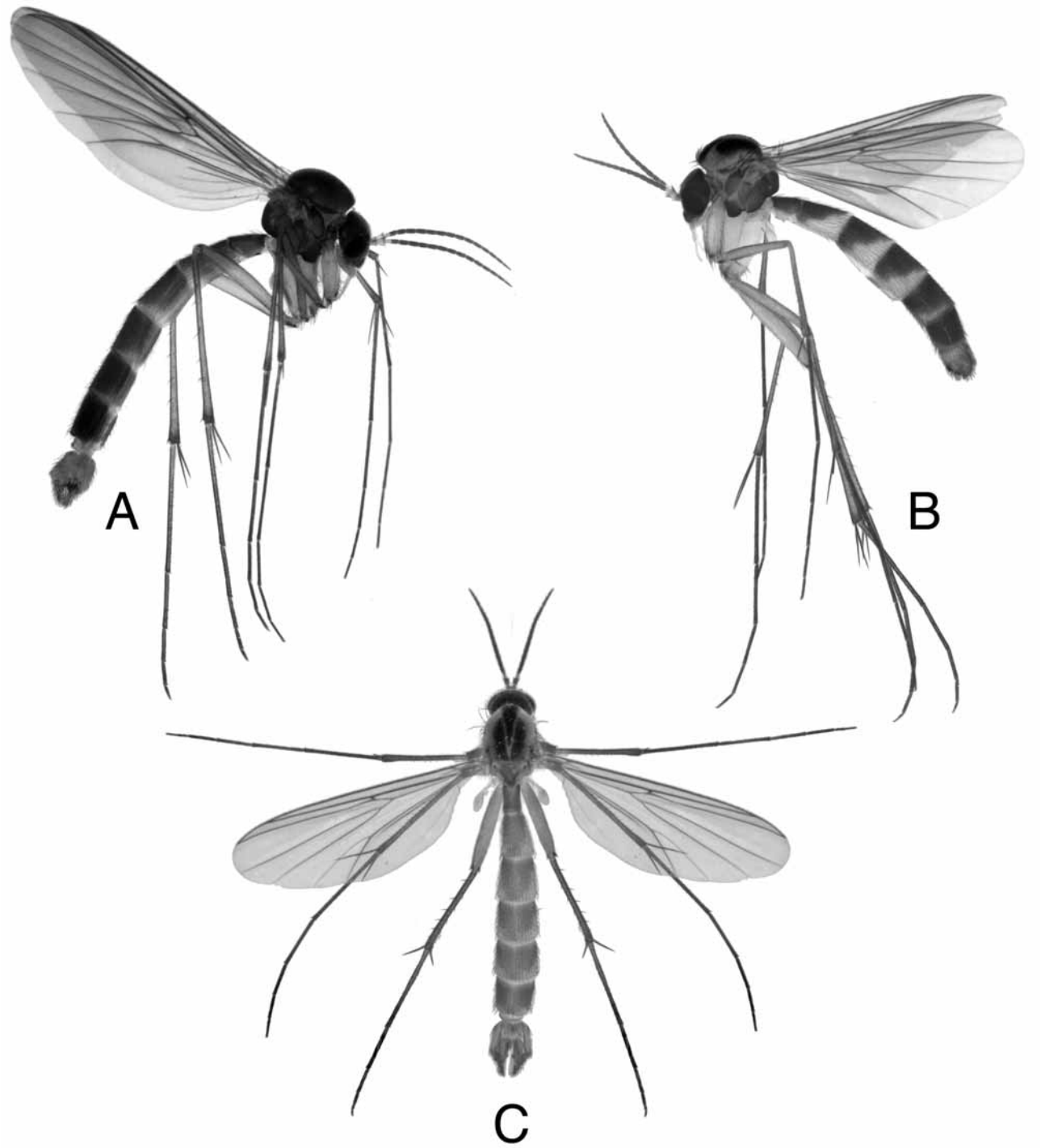


FIGURE 2. Habitus photos of *Pseudexechia*. —A. *P. trisignata* (Edwards, 1913) in lateral view, a dull brown species with a distinct greyish dusting, with fused thoracic stripes and narrow apical pale bands on abdomen. —B. *P. aurivernica* Chandler, 1978 in lateral view, a distinctly bi-coloured species in dark greyish brown and yellow, often with a reddish tinge, with distinct thoracic stripes and with large, triangular apical pale bands on abdomen —C. *P. canalicula* (Johannsen, 1912) in dorsal view, yet another bi-coloured species in greyish brown and yellow with distinct thoracic stripes.

Genus *Pseudexechia* Tuomikoski

Pseudexechia Tuomikoski, 1966:180
Type species. *Exechia trisignata* Edwards, 1913 by subsequent designation.

Diagnosis. Species of the genus *Pseudexechia* are medium sized to small, slender exechiines, body length 3.5–6.5 mm (Fig. 2). They can be recognized by the combination of the following characters: Ovate clypeus (Figs 4A&E). Vestigial, but usually traceable median ocellus (distinct but reduced in size in the *trisignata* group, Fig. 4A). Absence of distinct bristles on the mesoscutal disc, except along the margin (Fig. 4F) and sometimes one pair posteriorly. Wings (Fig. 3) with vein sc more or less distinctly ending in R_1, Cu branching beyond level of M branching (with one exception, see Kjærandsen 1994), M-petiole subequal in length to cross vein ta (ratio 0.87–1.56, 1.16, n=65), branches of M and Cu without setulae. Male terminalia characteristic; usually with a strongly sclerotized, bud-like hypandrial lobe with a small median split (e.g. Fig. 6A), ventral branch of gonostylus always with one long and one shorter, whip-like seta basally, often with a few characteristically fan-tipped setae ventrally (Fig. 5A), tergite IX without pair of extra long, apically truncated bristles (Fig. 6C), and pseudocercus slender and distinctly articulated (Fig. 5B, 6C). Female terminalia with sclerotized postgenital plate (Fig. 5C), usually with one-segmented (e.g. Fig. 6D), but sometimes two-segmented (Fig. 5C) cercus.

Description. Adults: Medium sized to small, slender with long legs and long abdomen (Fig. 2), body length 3.5–6.5 mm.

Head. Antenna (Figs 4B–C) with 14 flagellomeres; scape and pedicel with a few close set stout bristles ventromedially and dorsally, otherwise with scattered small setae apically; flagellars long rectangular, densely covered with medium sized pale, decumbent setae, some short stiff setae along ventral side; scape, pedicel and half of first flagellar pale, rest of flagellum darker. Vertex with five strong orbital bristles, otherwise covered with medium sized, decumbent dark setae. Ocelli (Fig. 4A) three or two, lateral ocellus touching eye margin, median ocellus either small but distinct or vestigial but usually traceable. Frontal furrow reduced, not reaching frontal tubercle. Face (Fig. 4E) wide rectangular, with scattered small setae. Clypeus (Fig. 4E) long ovate to subcircular, covered with small setae. Palp (Figs 4A&D) with four distinct palpomeres; sensory pit in third palpomere forming an ovate open furrow medially, with trichoid sensillae in internal sac; fifth palpomere as long as or longer than third and fourth palpomere combined.

Thorax (Fig. 4F). Proepisternum with 1–2 and antepronotum with 3 strong bristles. Scutum without distinct acrostichals and dorsocentrals, with strong prealar and postalar and sometimes with one pair of posteriorly situated bristles, otherwise covered with small to medium sized setae; with or without dark thoracic stripes on pale ground and pale band along lateral margin. Scutellum with one strong and one weaker pair of bristles otherwise covered with small setae. Anepisternum, anepimeron and preepisternum completely devoid of setae. Laterotergite scattered with tiny, thin setae and some large bristles. Mediotergite bare or at most with a couple of setae. Metepisternum posteriorly with a few bristles and some tiny setae. Metepimeron with some scattered tiny setae.

Wings (Fig. 3). Wing membrane unspotted yellowish tinted or with faintly smoked apical half and faint cloud around branching of media; with microtrichia only, trichia dark and arranged into regular rows apically. Basicosta with 1–2 strong bristles. Crossvein h without setae. Distal medial plate without setae both on dorsal and ventral side. Costa, R, $R_1$and R_5 with both dorsal and ventral setae. Sc, tb, ta, M, CuA, CuP, A_1 and A_2 without setae. Costa terminates at tip of R_5. R_4 absent. R_5 straight to moderately curved posteriorly. Crossvein ta with small white spot. M-fork long, M-petiole subequal in length to crossvein ta (0.87–1.56, 1.16, n=65). CuA-fork shorter, starts (with one exception, see Kjærandsen 1994) distinctly beyond M-fork. CuP long and basally strong, fading out about at level of CuA branching. A_1 shorter, distinct and strong, breaking abruptly well before CuA-fork. A_2 distinct, fading out about at level of A_1.

Legs (Figs 4F&G–J). Setosity dark. Fore coxa covered with small setae on anterior and lateral surface, anteriorly and apically with strong bristles. Mid coxa with narrow row of small setae anteriorly; bare basolaterally, apical third with narrow row of small setae laterally; apically with larger setae and some bristles. Hind coxa with one strong bristle basolaterally; with narrow row of small setae along posterolateral surface; apically with larger setae and some bristles. Femora uniformly covered with small setae. Tibiae with trichia in regular rows. Fore tibia with short anteroventral and posterior bristles, anteroapically with round depressed

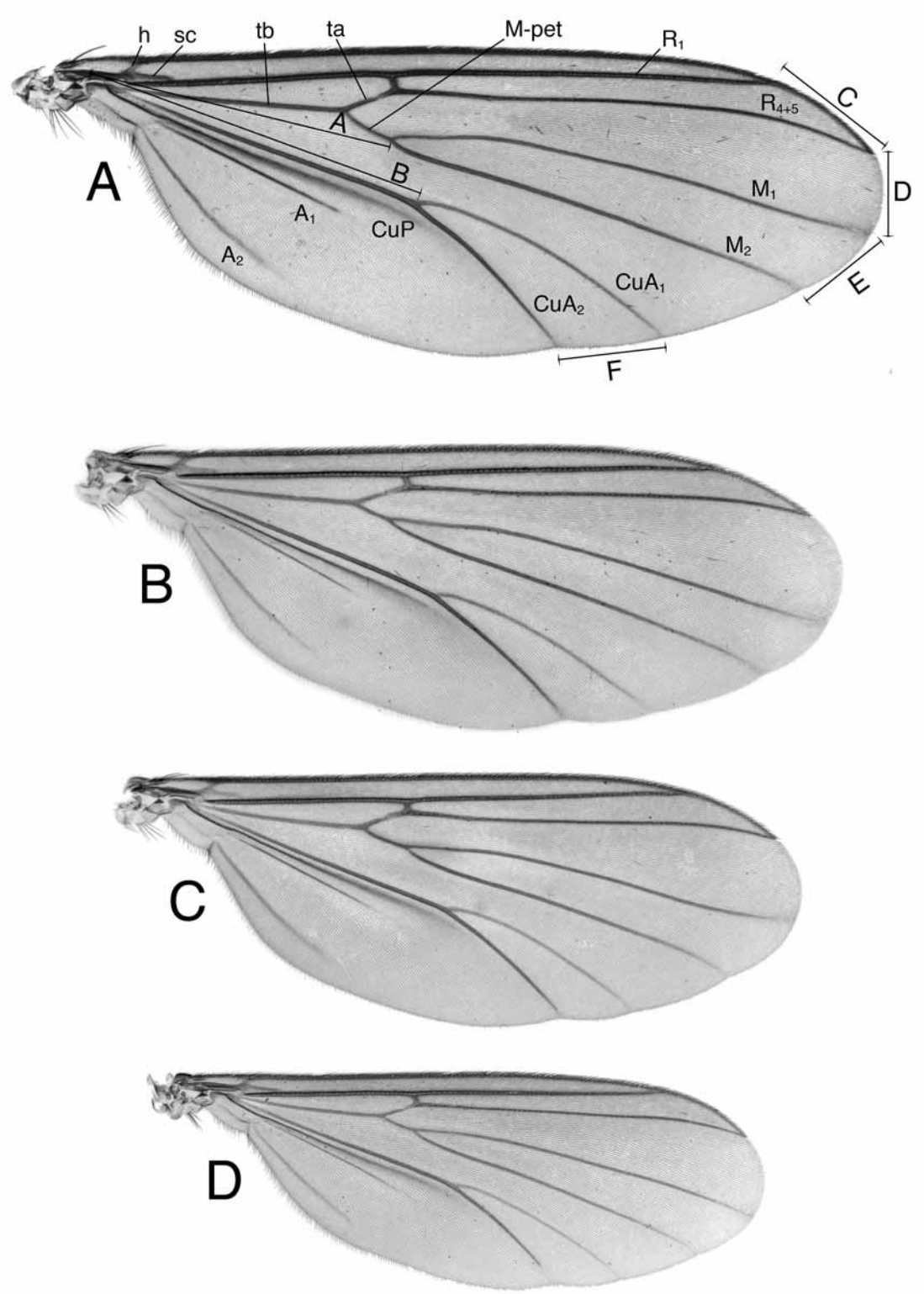


FIGURE 3. Wing photos of *Pseudexechia*. —A. *P. trisignata* (Edwards, 1913). —B. *P. aurivernica* Chandler, 1978. —C. *P. trivittata* (Staeger, 1840). —D. *P. parallela* (Edwards, 1925). Abbreviations: A = distance between base of the distal median plate to the branching of media; A_1 = anterior anal vein; A_2 = posterior anal vein; B = distance between base of the distal median plate to the branching of CuA; bc = basicosta; C = distance between R_1 and R_{4+5} termination; CuA_1 and CuA_2 = anterior branch of cubitus; CuP = posterior branch of cubitus; D = distance between R_5 and M1 termination; E = distance between M_1 and M_2 termination; F = distance between CuA_1 and CuA_2 termination; h = humeral; M-pet = petiole of media; M_1 and M_2 = branches of media; R_1 = anterior branch of radius; R_{4+5} = posterior branch of radius; sc = subcosta; ta = anterior transversal (= crossvein rm); tb = basal transversal.

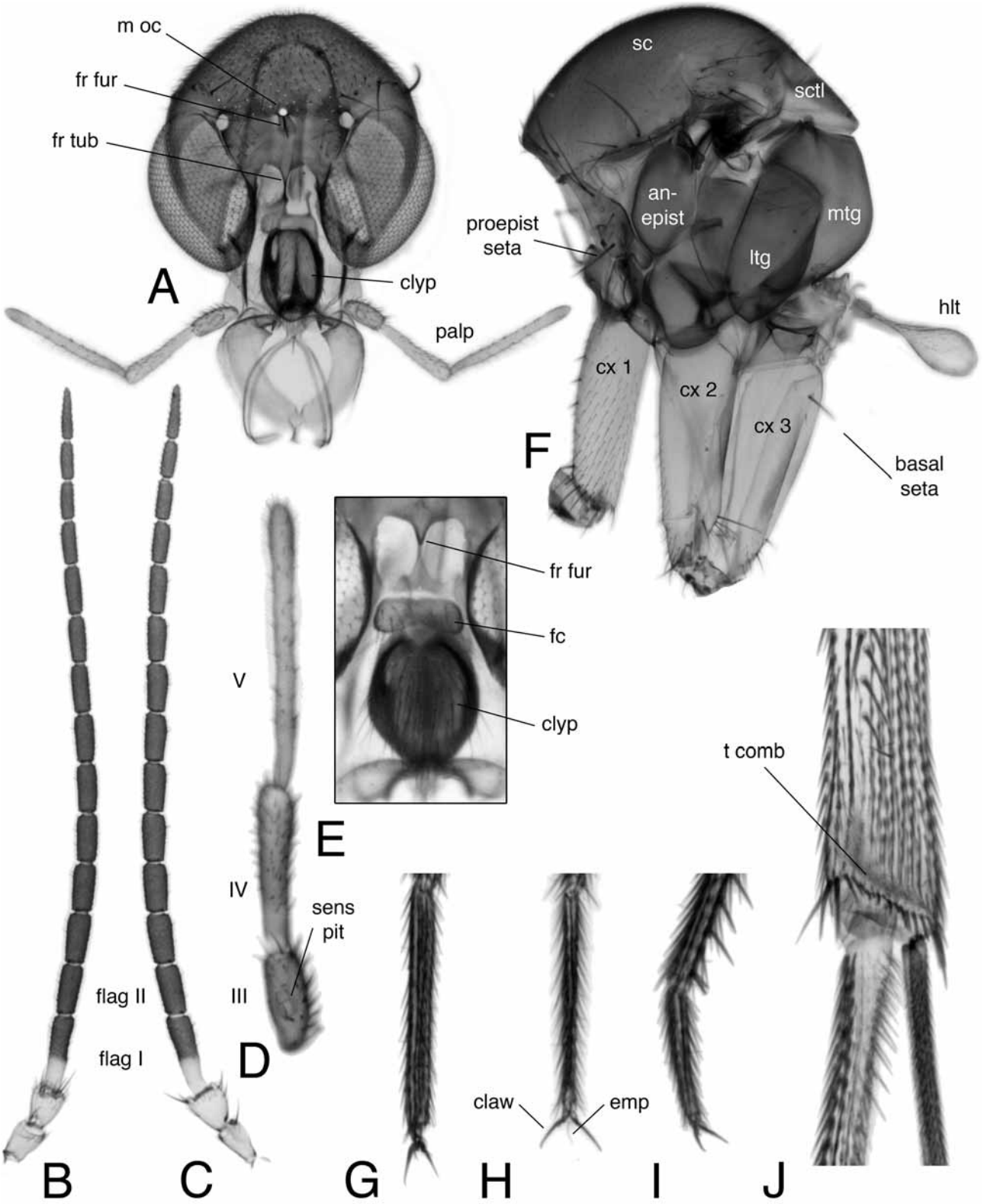


FIGURE 4. Morphology of *Pseudexechia* [A–D + F–J = *P. trisignata* (Edwards, 1913), E = *P. pectinacea* (Ostroverkhova, 1979)]. —A. Head in dorsal view. —B. Antenna, dorsal view. —C. Antenna, lateral view —D. Segment III–V of maxillary palp. —E. Face enlarged. —F. Thorax, lateral view. —G. Fore tarsus V. —H. Mid tarsus V. —I. Hind tarsus V. —J. Apex of hind tibia, medial view. Abbreviations: anepist = anepisternum; clyp = clypeus; cx 1 = forecoxa; cx 2 = midcoxa; cx 3 = hindcoxa; emp = empodium; fc = face; flag I = first flagellar segment; flag II = second flagellar segment; fr fur = frontal furrow; fr tub = frontal tubercle; htl = halter; ltg = laterotergite; m oc = medial ocellus; mtg = mediotergite; proepist seta = proepisternal seta; sc = scutum; sctl = scutellum; sens pit = sensory pit; t comb = tibial comb.

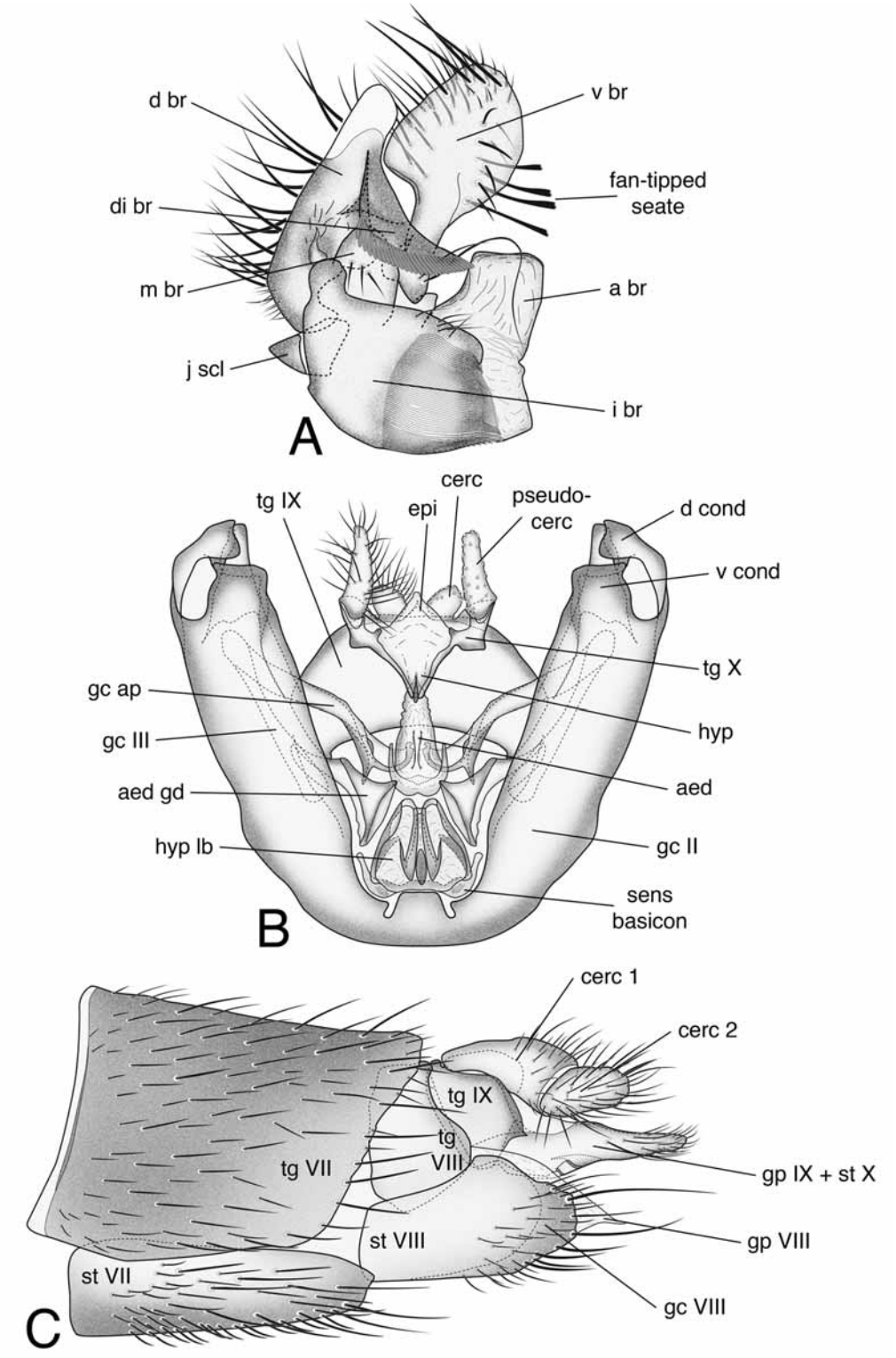


FIGURE 5. Morphology of terminalia of *Pseudexechia*. —A. Male gonostylus of *P. trisignata* (Edwards, 1913), internal view. —B. Male terminalia of *P. pectinacea* (Ostroverkhova, 1979), caudal view with gonostyles removed. —C. Female terminalia of *P. canalicula* (Johannsen, 1912), lateral view. Abbreviations: a br = anterior branch of gonostylus; aed = aedeagus; aed gd = aedeagal guide; cerc = cercus; d br = dorsal branch of gonostylus; d cond = dorsal condyle; di br = dorsointernal branch of gonostylus; epi = epiproct; gc ap = gonocoxal apodeme; gc II = section II of gonocoxite; gc III = section III of gonocoxite; gc = gonocoxite; gp = gonapophysis; hyp = hypoproct; hyp lb = hypandrial lobe; i br = internal branch of gonostylus; j scl = joint sclerite; m br = medial branch of gonostylus; pseudocerc = pseudocercus; sens basicon = basiconic sensillae; st = sternite; tg = tergite; v br = ventral branch of gonostylus; v cond = ventral condyle.

area, covered with trichia. Mid tibia with row of small, close set anterior bristles and a few posterior and posterodorsal bristles. Hind tibia with a few large anterior bristles; some large posterodorsal bristles; several small, close-set bristles in one row posterodorsally; tibial comb consisting of triangular area, densely covered with long microtrichia posteroapical and complete transverse row of setae along apical margin (Fig. 4J). Fore tarsus without distinct spine-like setae ventrally. Empodia (Fig. 4H) rudimentary, thread like.

Abdomen (Fig. 2). Pale abdominal markings present along posterior margin of tergites; more or less extended anteriorly to form larger triangular or complete pale areas laterally. Preterminal segments often darker than rest of abdomen.

Male terminalia (Figs 5A&B). Tergite IX medium sized, wide to long rectangular, more or less divided mesally, usually with sclerotized mesal suture; scattered with setae that get larger towards apicolateral corners, without any outstanding strong setae. Cercus small ovate knob; scattered with small, thin setae. Gonocoxite (Fig 5B) large, moderately to deeply incised ventrally in which a usually bud-shaped, strongly sclerotized hypandrial lobe is situated; apically divided into an outer wall (section II) and a medioventral, inner wall (section III). Epiproct (Fig. 5B) pointed triangular, very hyaline, without setae. Hypoproct (Figs 5B, 6C) usually forming long tapered posterior process, straight or downcurved. Lateral margin of tergite X forming slender, setose pseudocercus; clearly articulated against rest of segment; of variable length. Aedeagus (Fig. 5B) elongated, hyaline, tapered apically, well retracted within gonocoxite, basally jointed with strong gonocoxal apodemes. Aedeagal guides (Figs 5B, 6A) large, hyaline lobes; rectangular or elongated; situated dorsolaterad of hypandrial lobe. Hypandrial lobe (Fig. 5B) well developed, usually bud-shaped, of medium size and strongly sclerotized; its angle in relation to gonocoxite variable, usually exposed and aligned with gonocoxite, sometimes retracted into gonocoxite and produced interodorsad; basolaterally with patch of placoid sensillae; with a small split apicomedially. Gonostylus divided into six branches (Fig. 5A). Dorsal branch short with smooth whitish rounded tip or moderately to extremely elongated; without blunt lamellae; lateral surface always covered with strong setae. Dorsointernal branch usually present as a fan-shaped outgrowth of the ventrointernal margin of the dorsal branch; with row of small, blunt lamellae along entire internal margin; without setae, sometimes reduced to bifurcated or small bare knob (Fig. 14B). Medial branch reduced, present as small to large knob, with a few setae. Ventral branch large, usually shaped as a thin spatulate plate, sometimes elongated, lanceolate; typically with a few characteristically fan-tipped setae ventrolaterally and some strong setae apicomedially. Anterior branch forming ventrally directed, subrectangular to triangular cushion; without setae, sometimes with numerous small, blunt projections caudally (Fig. 14B). Internal branch forming medium sized, bulbous, largely striated pouch; posteriorly with a few setae, sometimes with a small, digitate lobe (Fig. 14B).

Female terminalia (Fig. 5C). Usually partly retracted within tergite VII. Tergite VIII well developed, subrectangular, devoid of setae. Sternite VIII large; ventrally scattered with small setae; fused with a well-developed, apically truncated or pointed gonocoxite VIII, bearing several strong setae along apical margin. Gonapophysis VIII present as hyaline tapered protrusion, usually extending beyond apex of gonocoxite VIII, without setae. Labia not discernible, or fused basally with gonapophysis VIII. Tergite IX well developed and partly fused with gonocoxite IX, without setae. Spermathecal duct ending in constricted, sclerotized eminence. Tergite X reduced or fused with epiproct. Sternite X apparently fused basally with gonapophysis IX; forming a stout, sclerotized, elongated postgenital plate; apically covered with small setae. Cercus one- or two-segmented, scattered with small setae; elongated to moderately truncate; apical segment when present short, ovate.

Larva unknown.

Notes on biology. Little is known about larval habitats of *Pseudexechia*. *P. trisignata* s. l. has been reared from soft gill fungi like *Naucoria* sp. and *Galerina* sp. (Chandler 1993) and *Psathyrella piluliformis* (Sasakawa & Ishizaki 1999). *P. tristriata* has been reared from *Thelephora terrestris* (Yakovlev 1994). *P. trivittata* has been reared from fruiting bodies of coprophilous agarics like *Coprinus, Psathyrella* and *Panaeolus* (Jakovlev et al. 2008). Adults of *Pseudexechia* were mainly collected with aspirator in caves in wintertime (55%) (see Kjærandsen 1993), with window traps (29%) or with sweep net (10%). It is noteworthy

that although large Malaise trap collections have been examined in search of *Pseudexechia*, only about 1% of the examined material originates from Malaise trap collections. This under-representation in Malaise trap collections seems to hold for several of the Exechiini genera, and might be explained by a general negative phototaxis for many members of the tribe.

Notes on phylogeny and classification of *Pseudexechia*

Tuomikoski (1966) considered *Pseudexechia* to be more related to *Allodiopsis* Tuomikoski and *Allodia* Winnertz than to *Exechia* and *Exechiopsis* Tuomikoski. In phylogenetic analyses based on morphological characters, Rindal & Søli (2006) placed *Pseudexechia* as sister taxon to *Tarnania* Tuomikoski, whereas Kjærandsen (2006), in a review of *Tarnania* and the *Rymosia* genus group, did not include *Pseudexechia* but found *Rymosia* Winnertz and *Pseudorymosia* Tuomikoski to be close relatives of *Tarnania*. The genus *Pseudexechia* was not included in the molecular studies presented so far, and it has shown difficult to get support for a rigid classification of the tribe Exechiini based on molecular data (Rindal et al. 2007, Rindal et al. *in press*). Species of *Pseudexechia* show intrageneric variation in several characters that usually are constant (though not universally) on generic level in the Exechiini, such as presence/absence of the median ocellus, Cu-fork usually branching beyond, but sometimes before the M-fork (see Kjærandsen 1994), and female cercus being one- or two-segmented. The placement of *Pseudexechia* in relation to other genera of the tribe Exechiini is thus an intriguing and unsettled issue, and homology assessments of structures in their terminalia will hopefully add character systems aiding to solve intergeneric relationships within the tribe. A preliminary first step to organize characters from the terminalia within the entire Exechiini into a transformational framework is in progress but still pending better character definitions to form basis for a phylogenetic analysis. At this stage I restrict the classification to present four tentatively defined species groups for the World species of *Pseudexechia* (Fig. 1). The step forward will be to try to condense informative transformational signals from the preliminary analysis into fewer, more complex and independently evolving character systems (sensu Wheeler 2008), that hopefully, and with the aid of new molecular data (see Scotland et al. 2003), will bring new insights into the evolutionary history of the Exechiini.

The *longistylus* group

The species belonging to this group are mainly characterized by having mesoscutum covered with short but comparatively stout setae, often with a single pair of distinct bristles posteriorly (Kjærandsen 1994), by having smaller and more narrow wings with relatively larger microtrichia, and by a number of characters in the male terminalia such as: dorsal branch of gonostylus usually extremely prolonged caudally (Fig. 1), dorsointernal branch being sclerotized, bi-furcated and without lamellae, ventral branch forming thin, enlarged plate bearing more than five strong, characteristically fan-tipped setae ventrally, and pseudocerci always bearing some strong bristles apically. The female terminalia has fused, slender, s-shaped cercus, and a long and slender, but sclerotized postgenital plate. The *longistylus* group is confined to the Afrotropical Region and the included species are: *P. camerounensis* Matile, 1971, *P. lanceostylus* Kjaerandsen, 1994 and, *P. longistylus* Kjaerandsen, 1994 (Fig. 1). The four unassociated Afrotropical species described from female holotypes may also belong to this group: *P. edwardsiana* Matile, 1971, *P. hancocki* Matile, 1971, *P. silhouettensis* (Enderlein, 1910), and *P. tanganyikae* (Lindner, 1958).

The *trisignata* group

The species in this group are mainly characterized by having vein R_{4+5} distinctly downcurved [R_{4+5}-bending index 1.44–1.84, 1.66, n = 26, Fig. 3A), by having only one strong bristle on proepisternum, and by a number of characters in the male terminalia such as the stout, subrectangular hypandrial lobe; the dorsointernal branch of the male gonostylus forming a large, strongly asymmetric, blade-shaped fan with blunt lamellae along the margin; the ventral branch of the gonostylus being shaped like a spatula, and bearing

less than five strong, characteristically fan-tipped setae ventrally. The pseudocercus is long and slender. The female terminalia has fused, slender, s-shaped cercus, and a long and slender, but sclerotized postgenital plate. The *trisignata* group is distributed in the Holarctic and the Oriental regions and the included species are: *P. inthanonensis* Kjaerandsen, 1994, *P. pectinacea*, *P. trisignata*, and *P. tuomikoskii* **sp. n.** (Fig. 1).

The *canalicula* group

This group is more vaguely defined with some species resembling the species of the *trisignata* group. The group is mainly characterized by having subsymmetric (not strongly asymmetric) and usually less prominent, lamellated dorsointernal branch of the male gonostylus, by having straight R_{4+5} vein (R_{4+5}-bending index 0.86–1.28, 1.1, n = 25, Fig. 3B&D), and by usually having greatly reduced and vestigial median ocellus. Species in this group share the characteristically smooth rounded, whitish apex of the dorsal branch of the gonostylus with the *trisignata* group, but the hypandrial lobe is more variable, being conic, triangular or enlarged and apically diverging. The ventral branch of the gonostylus is variable, often boot-shaped, with or without characteristically fan-tipped setae ventrally, and the pseudocercus is of variable length. The female terminalia is also variable, with two-segmented cercus retained in two (supposedly primitive) species, and with slender, sclerotized postgenital plate. Kjærandsen & Chandler (2006) suggested a separate subgroup for *P. parallela*, *P. monica* and an undescribed species from Burma, based on their smaller size and dull coloration with lack of distinct thoracic stripes. However, when looking at their terminalia in relation to other species, these characters are likely to be a result of parallel evolution. Pending a phylogenetic analysis, *P. parallela* and *P. monica* are included in the wider *canalicula* group. The *canalicula* group is distributed in the Holarctic Region and the included species are: *P. altaica* Zaitzev, 1988, *P. aurivernica*, *P. canalicula*, *P. monica*, *P. ovata* (Fisher, 1934), *P. parallela*, and *P. ussuriensis* Zaitzev, 1982 (Fig. 1).

The *trivittata* group

The species of this group are characterized by the combination of having virtually lost the median ocellus, having straight R_{4+5} vein (R_{4+5}-bending index 0.96–1.54, 1.14, n = 15, Fig. 3C), less ovate clypeus, and by a number of characters in their male terminalia; above all lacking the characteristically smooth rounded, whitish apex of the dorsal branch of the gonostylus, both the dorsal and ventral branches being moderately elongated. The anterior branch of the gonostylus is forming a large, ventrally directed, subtriangular cushion, with elaborate hooks and finger-like projections and with a distinctly constricted connection towards the internal branch. The hypandrial lobe is narrow rectangular, with two long, parallel branches medially. Tergite IX is longer than wide, and more or less fused into one, subrectangular plate. The pseudocercus is shorter relative to cercus. The female terminalia appears slightly truncated, with one-segmented cercus and short, stout postgenital plate. The *trisignata* group is distributed in the Holarctic and the Oriental regions and the included species are: *P. latevittata*, *P. macrocantha* Kallweit, 1995, *P. sinica* Wu & Yang, 2003, *P. subtrilobata* Zaitzev, 2003, *P. trilobata* Ostroverkhova, 1979, *P. tristriata*, and *P. trivittata* (Fig. 1).

Review of European *Pseudexechia*

Key to European males of *Pseudexechia*

1 Terminalia large, stout (Fig. 6A); dorsal branch of the gonostylus with a characteristically smooth whitish apex; ventral branch forming a thin plate shaped more or less like a spatula (Fig. 6B); hypandrial lobe heavily sclerotized, bud-like by elaborate folding, triangular to subrectangular (Fig 6A) 2

- Terminalia more slender (Fig. 14A), with elongated dorsal and ventral branches of the gonostylus (Fig. 14B); hypandrial lobe narrow rectangular, forming parallel branches medially (Fig. 14A) ..... *trivittata* group 8

2 Median ocellus small, but distinctly present (Fig. 4A); vein R_{4+5} distinctly downcurved (C > D in Fig. 3A); hypandrial lobe stout, subrectangular (Fig. 6A) ..... *trisignata* group 3

- Median ocellus absent or at most tiny and vestigial; vein R_{4+5} almost straight (C ≤ D in Fig. 3B&D); hypandrial lobe

conic, triangular (Fig. 9A) or enlarged and diverging apically (Fig. 11D) ..... *canalicula* group 5

3 A dull brown species with a distinct greyish dusting (Fig. 2A); hypandrial lobe with rounded corners (Fig. 6A); ventral branch of gonostylus with angular basodorsal corner making the spatula broadest basally (Fig. 6B); smooth whitish tip of dorsal branch of gonostylus evenly thick (Fig. 6B)..... *Pseudexechia trisignata* (Edwards, 1913)

- Moderately to distinctly bi-coloured species without greyish dusting; hypandrial lobe sharply pointed apically (Fig. 7A); ventral branch of gonostylus without angular basodorsal corner; smooth whitish tip of dorsal branch of gonostylus slightly dilated or constricted 4

4 Broad pale band along whole margin mesonotum; ventral branch of gonostylus forming small, symmetric and round spatula (Fig. 7B); smooth whitish tip of dorsal branch of gonostylus slightly constricted (Fig. 7B) .... *Pseudexechia pectinacea* (Ostroverkhova, 1979)

- Without or at most narrow pale band along margin of mesonotum; ventral branch of gonostylus forming large, asymmetric spatula that is broadest apically (Fig. 8B); smooth whitish tip of dorsal branch of gonostylus slightly dilated (Fig. 8B) ..... *Pseudexechia tuomikoskii* **sp. n.**

5 Larger species, distinctly bi-coloured in dark greyish brown and yellow, with sharply defined mesonotal stripes (Fig. 2B) 6

- Smaller species, weakly bi-coloured to dull brown, with indistinct or fused mesonotal stripes 7

6 Gonostylus large, exposed (Fig. 9A); dorsal branch distinctly dilated apically (Fig. 9B); ventral branch forming large, slightly asymmetrical spatula (Fig. 9B) ..... *Pseudexechia canalicula* (Johannsen, 1912)

- Gonostylus small, retracted (Fig. 10A); dorsal branch not dilated apically (Fig. 10B); ventral branch forming narrow, angular boot-shaped spatula (Fig. 10B) ..... *Pseudexechia aurivernica* Chandler, 1978

7 Hypandrial lobe enlarged, diverging apically (Fig. 11A&D); dorsal branch of gonostylus apically strongly dilated, campanulate (Fig. 11B); dorsointernal branch small (Fig. 11B); ventral branch narrow, angular boot-shaped (Fig. 11B) ..... *Pseudexechia monica* Kjaeandsen & Chandler, 2006

- Hypandrial lobe not enlarged, conic triangular (Fig. 12A); dorsal branch of gonostylus apically dilated, but not campanulate (Fig. 12B); dorsointernal branch large (Fig. 12B); ventral branch forming medium sized spatula with acute angled apicodorsal corner (Fig. 12B)..... *Pseudexechia parallela* (Edwards, 1925)

8 Dorsal branch of gonostylus subrectangular, with sharply truncated, whitish tip (Fig 13A&B); dorsointernal branch forming narrow, elongated lamellate fan (Fig. 13B); hypoproct reduced, hyaline (Fig. 13C) .... *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001

- Dorsal branch of gonostylus oblong to lanceolate, without sharply truncated, whitish tip (Fig. 14A&B); dorsointernal branch reduced to hyaline knob basally on dorsal branch (Fig. 14B); hypoproct sclerotized, pointed (Fig. 14C) 9

9 A distinctly bi-coloured species in dark greyish brown and yellow, with sharply defined thoracic stripes and triangular pale bands on abdominal tergites; dorsal branch of gonostylus shorter and smaller than ventral branch which has medial surface covered with setae and no brush apically (Fig. 14B) ..... *Pseudexechia tristriata* Stackelberg, 1969

- A dull brown species with fused, hardly discernible thoracic stripes and indistinct, narrow (if any) pale bands on abdominal tergites; dorsal branch of gonostylus longer than ventral branch which has medial surface devoid of setae but a narrow brush of strong setae apically (Fig. 15B) ..... *Pseudexechia trivittata* (Staeger, 1840)

Key to European females of *Pseudexechia* (female of *P. monica* is unknown)

1 Cercus two segmented (e.g. Fig. 5C) 2

- Cercus one-segmented (e.g. Fig 6D) 3

2 Tergite VII prolonged dorsally, with smooth, straight posterior edge; postgenital plate stout (Fig. 9D)..... .....*Pseudexechia canalicula* (Johannsen, 1912)

- Tergite VII emarginated dorsally and smoothly convex laterally; postgenital plate with a more tapered apex (Fig. 12D) ..... *Pseudexechia parallela* (Edwards, 1925)

3 Tergite VII with strongly dentate to laciniate posterior edge, widely excavated dorsally (Fig. 10D)..... ..... *Pseudexechia aurivernica* Chandler, 1978

- Tergite VII with smooth or at most weakly dentate posterior edge..... 3

3 Apicolateral corner of tergite VII with nude area, cercus and postgenital plate in lateral view slender and pointed (Fig. 8D)..... *trisignata* group 4

- Tergite VII evenly covered with setae; cercus and especially postgenital plate in lateral view broader and less stretched ..... *trivittata* group 6

4 A dull brown species with a distinct greyish dusting, usually without distinct pale bands on abdominal tergites; tergite VII widely but shallowly excavated dorsally, with rounded, weakly crenulated posterior edge; setae along apical margin long, slender (Fig. 6D) ..... *Pseudexechia trisignata* (Edwards, 1913)

- Moderately to distinctly bi-coloured species in dark greyish brown and yellow, with a pale band along lateral side of mesonotum and distinct triangular pale bands on abdominal tergites; tergite VII not excavated dorsally, with almost straight and smooth posterior edge; seta along apical edge long, slender or short, stout 5

5 Seta along apical margin of tergite VII long, slender; sternite VIII with rounded apex (Fig. 7D)..... ..... *Pseudexechia pectinacea* (Ostroverkhova, 1979)

- Seta along apical margin of tergite VII short, stout; sternite VIII subsquare, with truncated apex (Fig. 8D) .... *Pseudexechia tuomikoskii* **sp. n.**

6 Tergite VII with distinctly pointed margin laterally; sternite VIII with pointed apex 7

- Tergite VII with smoothly rounded margin laterally; sternite VIII with truncated apex, appearing almost rectangular in lateral view (Fig. 13D) ..... *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001

7 A dull brown species with fused, hardly discernible thoracic stripes and indistinct, usually narrow pale bands on abdominal tergites (Fig. 15D) ..... *Pseudexechia trivittata* (Staeger, 1840)

- A distinctly bi-coloured species in dark greyish brown and yellow, with distinct, sharply defined thoracic stripes and broad, triangular pale bands on abdominal tergites (Fig. 14D) ..... *Pseudexechia tristriata* Stackelberg, 1969

The *trisignata* group

Pseudexechia trisignata (Edwards, 1913)

(Figs 2A, 3A, 4A–D&F–J, 5A, 6A–D)

Exechia trisignata Edwards, 1913:370, figs 73–75
? *Exechia trisignata* Stackelberg, 1969:300 [454 in English translation], figs 185,4 a&b
nec *Pseudexechia trisignata*; Zaitzev 1999:188, figs 108,9 & 109,1
nec Pseudexechia trisignata; Zaitzev 2003:193, figs 42,2 & 42,6
nec *Pseudexechia trisignata*; Sasakawa & Ishizaki 1999:156, figs 23–25

Diagnostic characters. Rather similar to *P. pectinacea* and *P. tuomikoskii*, but can be distinguished by its overall dull brown coloration (with a distinct greyish dusting on dry specimens), and narrow pale bands on abdominal segments. Distinctive features of the male terminalia include a rather rounded hypandrial lobe with smoothly rounded corners; the ventral branch of gonostylus having an angular corner basodorsally, making the spatula broadest basally; and the smooth whitish tip of dorsal branch of gonostylus being evenly thick. Females are distinguished by the combination of coloration; having tergite VII widely but shallowly excavated posterodorsal, forming a rounded, weakly crenulated posterior margin with long, slender seta; and by having a truncated tip of sternite VIII.

Description. Male (n = 5, except where otherwise stated). Total length 5.5–6.1, 5.8 (n=10) mm. Wing length 4.1–4.18, 4.14 mm, or 3.2–3.49, 3.36 x as long as profemur. Antenna 1.86–2.1, 2.03 mm long.

Coloration (specimen in alcohol). A dull brown species with a distinct greyish dusting; mesonotal stripes fused, hardly discernable, dark; humeral area dark, sometimes with small pale corner. Wings yellowish, with indistinct spot at base of posterior fork and greyish smoked towards tip. Legs pale with dark spots on coxae and femur. Abdomen dark with narrow to slightly triangular pale bands on tergite II–V, tergite VI extra dark; terminalia dark yellow.

Head (Figs 4A–D). Width / length to frontal tubercle 1.32–1.54, 1.43. First flagellomere 1.38–1.63, 1.52 times as long as second flagellomere. Second flagellomere 2–2.56, 2.28 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.29–1.53, 1.39. Antepenultimate segment 0.14–0.15, 0.15 mm long, palpomere ratios 1: 1.29–1.52, 1.39: 2.24–2.52, 2.34.

Thorax. Mesonotum length 1.14–1.22, 1.18 mm, or 0.28–0.29, 0.29 x as long as wing. Proepisternum with 1 (–2) strong bristles.

Wings (Fig. 3A). Wing length to length of R_1 2.13–2.24, 2.18; wing length to length of R_5 1.67–1.69, 1.68. Length of r-m to length of M-petiole 1–1.31, 1.12. R_{4+5}-bending index 1.6–1.8, 1.68. Fork length ratio 0.77–0.91, 0.85. Fork width ratio 0.76–0.96, 0.84. M-ratios 0.53–0.65, 0.61 and 0.6–0.73, 0.68. CuA-ratios 1.1–1.26, 1.21 and 1.6–1.76, 1.7. CuP length to length of wing 0.43–0.49, 0.46. A_1 length to length of wing

0.33–0.35, 0.34.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.06–1.14, 1.1: 0.81–0.88, 0.86: 0.69–0.72, 0.71; SV 1.62–1.75, 1.69: 1.96–2.16, 2.05: 2.39–2.47, 2.42; BV 1.62–1.7, 1.65: 2.11–2.22, 2.16: 3.24–3.47, 3.35; TR 1.46–1.51, 1.49: 1.69–1.78, 1.73: 2.12–2.25, 2.19.

Terminalia (Figs 6A–C). Gonocoxite subsquare, with distinct condyles; sternal sclerite forming small, sclerotized, bifurcated plate. Hypandrial lobe subrectangular, with softly rounded apicolateral corner. Aedeagal guides subrectangular, apically pointed. Gonostylus medium sized; dorsal branch elongated, with obtuse, whitish tip; dorsointernal branch forming large, asymmetric, broad lamellate fan; medial branch present as large knob with three setae; ventral branch forming medium sized, strongly asymmetrical spatula, with angular basodorsal corner making the spatula broadest basally, ventrolaterad with 2–4 fan-tipped setae; internal branch forming large, striated cushion; anterior branch forming ventrally directed, subrectangular cushion. Tergite IX wide subrectangular, fused, with strong mesal suture. Pseudocercus long, setose. Cercus forming small knob, 1.44–1.69, 1.59 as long as wide in dorsal view. Hypoproct triangular, apiculate. Epiproct vestigial or absent.

Female (n = 5, except where otherwise stated). Total length 5–6.4, 5.6 (n=10) mm. Wing length 4.04–4.64, 4.4 mm, or 3.38–3.6, 3.49 x as long as profemur. Antenna 1.74–1.86, 1.8 mm long.

Coloration. As in male except indistinct pale bands on abdomen and tergite VI not extra dark.

Head. Width / length to frontal tubercle 1.48–1.64, 1.55. First flagellomere 1.38–1.75, 1.63 times as long as second flagellomere. Second flagellomere 2.26–2.67, 2.42 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.19–1.4, 1.29. Antepenultimate segment 0.15–0.16, 0.15 mm long, palpomere ratios 1: 1.25–1.53, 1.39: 2.12–2.4, 2.24.

Thorax. Mesonotum length 1.12–1.34, 1.22 mm, or 0.26–0.29, 0.28 x as long as wing. Proepisternum with 1 strong bristle.

Wings. Wing length to length of R_1 2.06–2.34, 2.19; wing length to length of R_5 1.65–1.86, 1.71. Length of r-m to length of M-petiole 1.07–1.42, 1.19. R_{4+5}-bending index 1.55–1.94, 1.74. Fork length ratio 0.88–0.9, 0.89. Fork width ratio 0.72–0.96, 0.85. M-ratios 0.58–0.64, 0.6 and 0.65–0.72, 0.68. CuA-ratios 1.05–1.22, 1.14 and 1.47–1.69, 1.57. CuP length to length of wing 0.42–0.46, 0.43. A_1 length to length of wing 0.3–0.38, 0.33.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.07–1.12, 1.09: 0.86–0.89, 0.87: 0.7–0.73, 0.72; SV 1.66–1.74, 1.71: 1.99–2.05, 2.01: 2.36–2.44, 2.39; BV 1.7–1.78, 1.74: 2.27–2.35, 2.31: 3.29–3.48, 3.39; TR 1.48–1.58, 1.52: 1.77–1.89, 1.82: 2.2–2.37, 2.26.

Terminalia (Fig. 6D). Tergite VII widely but shallowly excavated dorsally, forming rounded, weakly crenulated posterior margin; apicolateral corner with nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, long sinusoid with obtuse tip, 2.5–2.79, 2.63 as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with apiculate tip. Sternite VII subequal in length to tergite VII. Apex of sternite VIII truncated. Gonapophysis VIII weak, narrow.

Distribution. Palaearctic, in Europe mainly western. The reported Eastern European (Krivosheina et al. 1986) and Eastern Palaearctic (Zaitzev 1999, 2003) distribution is questionable due to mixing with *P. pectinacea*.

Biology. The records reared from soft gill fungi like *Naucoria* sp. and *Galerina* sp. (Chandler 1993) is yet to be confirmed due to possible mixing with *P. tuomikoskii* and *P. pectinacea*.

Type material examined: Holotype male, **UK**, **SCOTLAND**: Beattock, 55°18'15"N, 3°27'9"W, undated (Marked BMNH (E) #236695, Leg. C. G. Lamb) [BMNH, JKJ–SPM–005284].

Other material examined: NORWAY: **HOI**, Kvinnherad, Varaldsøy, in fissures close to a cave opening, 60°6'6"N, 6°1'17"E, 10 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 11 females, 5 males; Kvinnherad, Fugleberg, in man-made soapstone caves, 60°0'41"N, 5°51'24"E, 9 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 1 female; **HOY**, Bergen, Haukeland, in mine galleries, 12 Jan 1991 (MZLU, Leg. J. Kjærandsen) — 3

females, 1 male; Sveio, Førde, Solheimshaugen, 27 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 1 female; Sveio, Førde, 10 Nov 1990 (MZLU, Leg. J. Kjærandsen) — 1 male; 1 Apr 1991 (MZLU, Leg. J. Kjærandsen) — 6 females, 3 males; 12 Jan 1992 (MZLU, Leg. J. Kjærandsen) — 1 female; Bergen, Haukeland, in mine galleries, 60°21'16"N, 5°27'19"E, 21 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 1 female; Bergen, Riple, 60°18'51"N, 5°26'33"E, 12 Mar 1991, (MZLU, Leg. J. Kjærandsen) — 1 male; 23 Apr 1991 (MZLU, Leg. J. Kjærandsen) — 1 male; Bergen, Svartediket, 60°23'42"N, 5°22'44"E, 18 Apr 1988 (MZLU, Leg. G. E. E. Søli) — 1 male; **MRI**, Sunndal, Jordalsgrenda, Jordalsøra, Hamrene, 62°46'18"N, 008°19'12"E, 140 m a.s.l. (MZLU, Leg. J. B. Jordal), 26 Apr–13 May 2005— 1 female; 13–31 May 2005 — 1 female, 4 males; 25 Aug–15 Sep 2005 — 3 males; 15 Sep–6 Oct 2005 — 2 females, 7 males; 6–23 Oct 2005 — 16 females, 34 males; 23 Oct–11 Nov 2005 — 19 females, 24 males; 11 Nov–1 Dec 2005 — 16 females, 28 males; 1 Dec 2005–1 Jan 2006 — 2 females, 8 males; 1 Jan–1 Feb 2006 — 3 females, 4 males; 1 Feb–1 Mar 2006 — 1 male; 1 Mar–1 Apr 2006 — 1 male; 1–26 Apr 2006 — 5 females, 11 males; **MRY**, Aure, Ånes, Stølhaugen, 63°16'31"N, 008°27'30"E, 15 m a.s.l. (MZLU, Leg. F. Oldervik), 26 Apr–13 May 2006 — 1 male; 13–31 May 2006 — 5 males; 31 May–14 Jun 2006 — 2 females, 5 males; 1 Dec 2006–1 Jan 2007 — 5 females, 7 males; 1 Mar–1 Apr 2007 — 1 female, 3 males; **NNV**, Vågan, Rørvik, 68°12'19"N, 14°14'42"E, 27 Jun 1956 (MZLU, Leg. H. Andersson) — 1 male; **STI**, Oppdal, Kongsvoll, 62°17'40"N, 009°37'04"E, 1060 m a.s.l., yellow pantrap no. 15–17 at forest limit w/birch & *Salix*, 8–11 Jul 1992 (MZLU, Leg. J. Skartveit) — 5 females, 1 male; **SWEDEN**: **SK**, Blentarp, Stampenbäcken, 55°35'53"N, 13°33'12"E, 28 Nov 1969 (MZLU, Leg. B. W. Svensson) — 1 female; **TO**, Kiruna, Abisko, 68°21'1"N, 18°49'50"E, 20–27 Oct 1975 (MZLU, Leg. K. Müller) — 2 males; 6–20 Oct 1975 — 1 male; Kiruna, Abisko, Stordalen, 68°21'29"N, 18°58'51"E, 18–25 Sep 1975 (MZLU, Leg. K. Müller) — 1 male.

***Pseudexechia pectinacea* (Ostroverkhova, 1979)**
(Figs 4E, 5B, 7A–D)

Rymosia pectinacea Ostroverkhova, 1979:178, fig. 34,5
Pseudexechia parallela; Krivosheina et al. 1986:155, figs 45,1 & 45,5
Pseudexechia trisignata; Zaitzev 1999:188, figs 108,9 & 109,1
Pseudexechia trisignata; Zaitzev 2003:193, figs 42,2 & 42,6

Diagnostic characters. Rather similar to *P. trisignata* and *P. tuomikoskii*, but can be distinguished by its distinctly bi-coloured pattern in dark greyish brown and yellow with a broad pale band along margin of mesonotum. Distinctive features of the male terminalia include a rectangular hypandrial lobe with sharp apices and corners; the ventral branch of gonostylus forming a small, round, symmetrical spatula; and the smooth whitish tip of dorsal branch of gonostylus being slightly acute. Females are distinguished by the combination of coloration; having tergite VII straight dorsally, forming a smooth, straight posterior margin with long, slender seta; and by having obtuse tip of sternite VIII.

Description. Male (n = 6, except where otherwise stated). Total length 4.5–6, 5.3 (n=10) mm. Wing length 3.2–4.04, 3.71 mm, or 3.19–3.42, 3.31 x as long as profemur. Antenna 1.58–1.8, 1.71 mm long.

Coloration (specimen in alcohol). Distinctly bi-coloured in dark greyish brown and yellow; mesonotal stripes indistinct, diffusely defined and dark; pale humeral area extended to form broad pale band along entire margin of mesonotum. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark with small triangular, apical band on tergite II–V, tergite VI all dark; terminalia pale yellow.

Head (Fig. 4E). Width / length to frontal tubercle 1.49–1.65, 1.57. First flagellomere 1.67–1.88, 1.77 times as long as second flagellomere. Second flagellomere 1.76–1.94, 1.84 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.25–1.44, 1.34. Antepenultimate segment 0.11–0.14, 0.13 mm long, palpomere ratios 1: 1.4–1.66, 1.47: 2.49–2.83, 2.61.

Thorax. Mesonotum length 0.9–1.14, 1.07 mm, or 0.28–0.32, 0.29 x as long as wing. Proepisternum with

1 strong bristle.

Wings. Wing length to length of R_1 2.2–2.36, 2.28; wing length to length of R_5 1.7–1.76, 1.73. Length of r-m to length of M-petiole 1–1.25, 1.11. R_{4+5}-bending index 1.44–1.84, 1.64. Fork length ratio 0.9–0.94, 0.91. Fork width ratio 0.83–1.19, 0.96. M-ratios 0.62–0.68, 0.65 and 0.69–0.77, 0.74. CuA-ratios 1.13–1.28, 1.19 and 1.6–1.74, 1.67. CuP length to length of wing 0.45–0.49, 0.47. A_1 length to length of wing 0.34–0.36, 0.34.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.06–1.14, 1.1: 0.82–0.91, 0.88: 0.7–0.74, 0.72; SV 1.67–1.74, 1.71: 1.99–2.18, 2.04: 2.34–2.49, 2.4; BV 1.55–1.68, 1.59: 2.05–2.17, 2.11 (n=5): 3.2–3.51, 3.39; TR 1.48–1.78, 1.56: 1.75–1.94, 1.83: 2.27–2.52, 2.36.

Terminalia (Figs 7A–C). Gonocoxite subsquare, with distinct condyles; sternal sclerite forming small, sclerotized, bifurcated plate. Hypandrial lobe subrectangular, with sharp apices and corners. Aedeagal guides subrectangular. Gonostylus medium sized; dorsal branch elongated, with slightly acute, whitish tip; dorsointernal branch forming large, asymmetric, broad lamellate fan; medial branch present as large knob with three setae; ventral branch forming small, round, symmetrical spatula, ventrolaterad with 2–4 fan-tipped setae; internal branch forming large, striated cushion; anterior forming branch ventrally directed, subrectangular cushion. Tergite IX wide subrectangular, fused, with strong mesal suture. Pseudocercus long, setose. Cercus forming small knob, 1.21–1.82, 1.56 (n=5) as long as wide in dorsal view. Hypoproct triangular, apiculate. Epiproct vestigial or absent.

Female (n = 4, except where otherwise stated). Total length 5–6.2, 5.6 (n=7) mm. Wing length 3.96–4.3 mm, or 3.29–3.41 x as long as profemur. Antenna 1.42–1.82 mm long.

Coloration. As in male except tergite VI and VII usually also with pale apical bands.

Head. Width / length to frontal tubercle 1.23–1.55. First flagellomere 1.47–1.88 times as long as second flagellomere. Second flagellomere 1.68–2.15 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.25–1.4. Antepenultimate segment 0.14–0.16 mm long, palpomere ratios 1: 1.31–1.44: 2.22–2.42.

Thorax. Mesonotum length 1.12–1.3 mm, or 0.28–0.31 x as long as wing. Proepisternum with 1 strong bristle.

Wings. Wing length to length of R_1 2.14–2.29; wing length to length of R_5 1.66–1.73. Length of r-m to length of M-petiole 0.87–1.33. R_{4+5}-bending index 1.64–1.75. Fork length ratio 0.83–0.96. Fork width ratios 0.87–1. M-ratios 0.57–0.66 and 0.66–0.78. CuA-ratios 1.04–1.21 and 1.42–1.67. CuP length to length of wing 0.45–0.47. A_1 length to length of wing 0.33–0.35.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.09–1.14: 0.87–0.91: 0.73–0.76; SV 1.63–1.72: 1.95–2.04: 2.29–2.4; BV 1.61–1.69: 2.22–2.38: 3.41–3.55; TR 1.5–1.62: 1.85–1.95: 2.34–2.57.

Terminalia (Fig. 7D). Tergite VII straight dorsally, with smooth posterior edge; apicolateral corner with nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, long sinusoid with obtuse tip, 3.52–3.88 as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with round, obtuse tip. Sternite VII subequal in length to tergite VII. Apex of sternite VIII obtuse. Gonapophysis VIII weak, narrow.

Distribution. The Japanese record indicates a Wide Palaearctic distribution. In Western Europe so far reported only from Finland and Sweden.

Biology unknown.

Material examined. FINLAND: **Ks**, Kuusamo, Kiutaköngäs, 19–24 Jul 1967 (MZH, Leg. R. Tuomikoski) — 1 male; **SWEDEN**: **LU**, Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE Vuollerim, 66°25'28"N, 20°40'17"E, 60 m a.s.l., 13 Aug–13 Oct 2004 (MZLU, Leg. M. Karström) — 1 female, 10 males; 1–15 May 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female, 1 male; 15 May–1 Jun 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 5 females; 1–15 Jun 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 male; 16 Sep–1 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female, 5 males; 1–16 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female, 1 male; Jokkmokk, Bombmurkleskogen VVO, 4 km SSE Messaure, 66°38'47" N 20°22'49"E, 85 m a.s.l., 10 Jun 2006 (MZLU,

Leg. J. Kjærandsen) — 1 male; 66°38'59"N, 20°22'45"E, 17 Jun 2004 (MZLU, Leg. J. Kjærandsen) — 1 male; Jokkmokk, Vuollerim, Varjek, Varjekbäcken/Jovvamyran, 66°23'48"N, 20°26'58"E, 16 Sep 2000 (Coll. & Leg. K. Hedmark) — 1 male; **JAPAN**: Hokkaido, Kamikawa-cho, O-bako, Souunkyo, 43°42'10"N, 143°0'43"E, 713 m. a.s.l., 5 Oct 2006 (MZLU, Leg. J. Kjærandsen) — 2 males.

***Pseudexechia tuomikoskii* sp. n.**
(Figs 8A–D)

Mycetophila trivittata var. b Staeger, 1840:261
Pseudexechia trisignata; Chandler 1978:44, figs 3 & 5

Diagnostic characters. Rather similar to *P. trisignata* and *P. pectinacea*, but can be distinguished by its moderately bi-coloured pattern in dark greyish brown and yellow with a narrow pale band along margin of mesonotum. Distinctive features of the male terminalia include having rectangular hypandrial lobe with sharp apices and relative sharp corners; the ventral branch of gonostylus forming large, slightly asymmetrical spatula that is broadest apically; and the smooth whitish tip of dorsal branch of gonostylus being slightly club-shaped. Females are distinguished by the combination of coloration; having tergite VII straight dorsally, forming a straight, weakly crenulated posterior margin with short, stout seta; and by having truncated tip of sternite VIII. Also similar to *P. inthanonensis* Kjaerandsen, 1994, described from Thailand, which has inverted thoracic colours (yellow stripes on brown ground), a distinctly more dilated apex of the dorsal branch of gonostylus and a more stretched hypandrial lobe (Kjærandsen 1994).

Etymology. Named in honour of Risto Tuomikoski (1911–1989) who in the early 1960s collected and identified this species as separate from *P. trisignata*. The collections after him at the museum of zoology in Helsinki, Finland, show that Tuomikoski took special interest in the genus *Pseudexechia* and identified and labelled a number of undescribed species at that time, both from Europe and from the Oriental region (J. Kjærandsen in prep.).

Description. Male (n = 5, except where otherwise stated). Total length 5.2–6.5, 5.9 (n=8) mm. Wing length 3.54–4.46, 4.01 mm, or 2.95–3.57, 3.27 x as long as profemur. Antenna 1.7–2.04, 1.91 mm long.

Coloration (specimen in alcohol). Moderately bi-coloured in dark greyish brown and yellow; mesonotal stripes indistinct, diffusely defined and dark; pale humeral area extended to forming narrow pale band along entire margin of mesonotum. Wings unmarked, greyish tinted. Legs pale with indistinct dark spots on coxae and femur. Abdomen dark with small triangular, apical band on tergite II–V, tergite VI extra dark; terminalia dark yellow.

Head. Width / length to frontal tubercle 1.37–1.53, 1.46. First flagellomere 1.49–1.63, 1.56 times as long as second flagellomere. Second flagellomere 2–2.35, 2.11 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.21–1.4, 1.29. Antepenultimate segment 0.14–0.17, 0.15 mm long, palpomere ratios 1: 1.25–1.4, 1.32: 2.08–2.58, 2.33.

Thorax. Mesonotum length 1.04–1.26, 1.17 mm, or 0.28–0.32, 0.29 x as long as wing. Proepisternum with 1 strong bristle.

Wings. Wing length to length of R_1 2.22–2.3, 2.25; wing length to length of R_5 1.7–1.81, 1.73. Length of r-m to length of M-petiole 1–1.33, 1.15. R_{4+5}-bending index 1.46–1.84, 1.61. Fork length ratio 0.88–0.95, 0.91. Fork width ratio 0.87–1.04, 0.92. M-ratios 0.58–0.74, 0.66 and 0.66–0.82, 0.74. CuA-ratios 1.11–1.28, 1.21 and 1.57–1.83, 1.69. CuP length to length of wing 0.44–0.57, 0.48. A_1 length to length of wing 0.32–0.36, 0.33.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.06–1.14, 1.1: 0.8–0.9, 0.85: 0.64–0.74, 0.71; SV 1.62–1.86, 1.7: 1.96–2.18, 2.05: 2.37–2.68, 2.44; BV 1.6–1.72, 1.66: 2.16–2.32, 2.22: 3.3–3.67, 3.48; TR 1.47–1.52, 1.51: 1.76–1.84, 1.79: 2.15–2.39, 2.3.

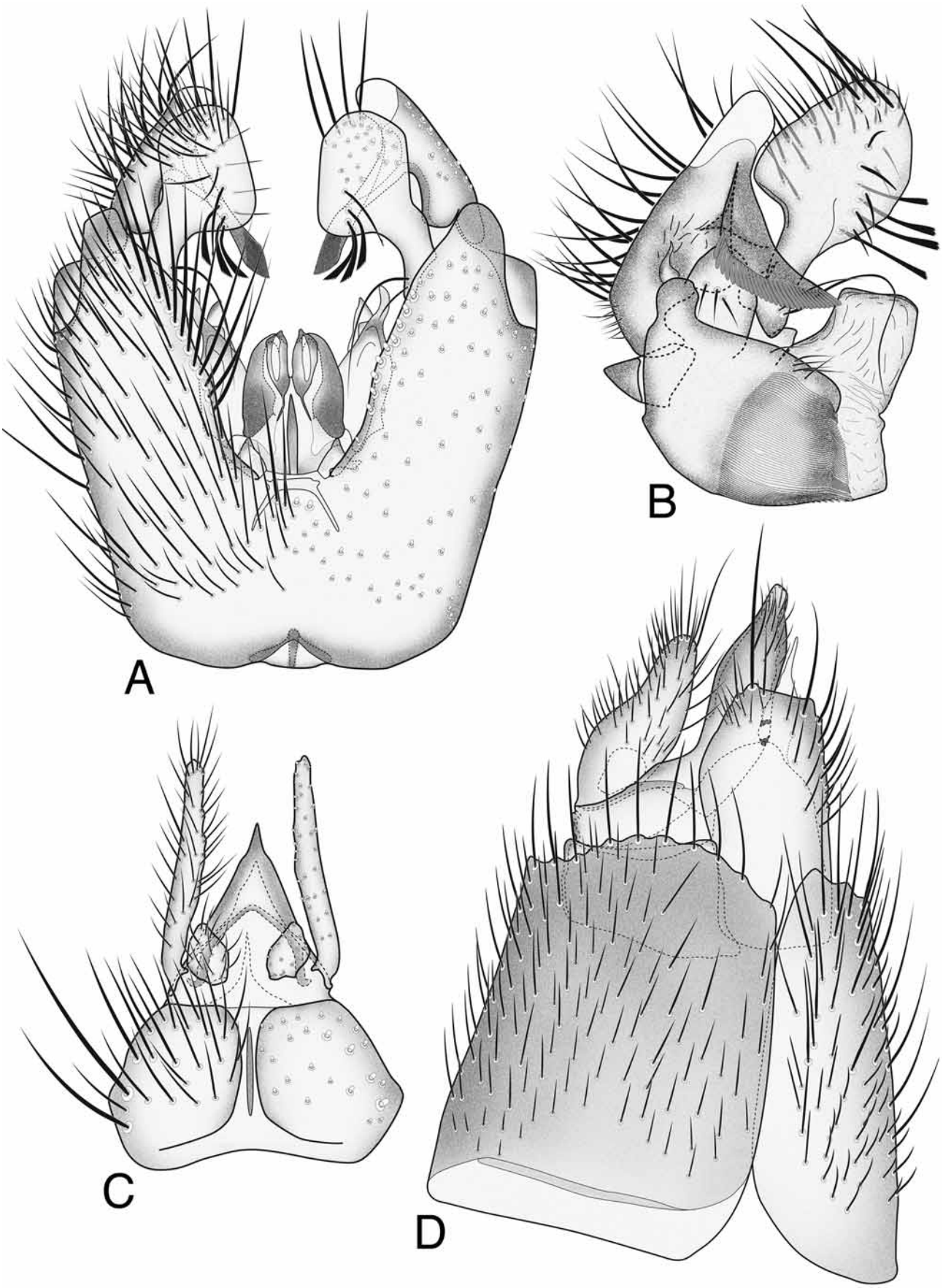


FIGURE 6. *Pseudexechia trisignata* (Edwards, 1913). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

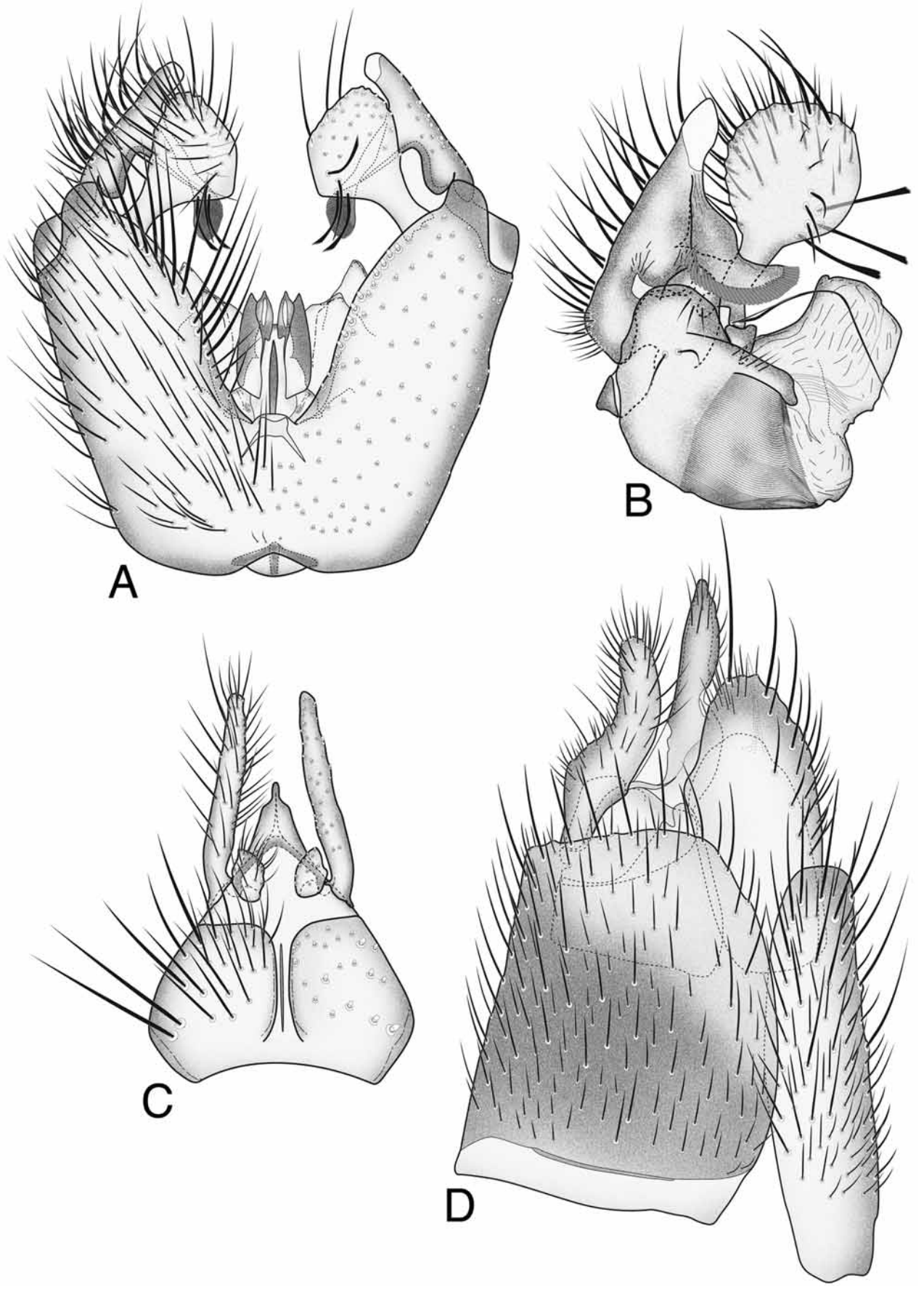


FIGURE 7. *Pseudexechia pectinacea* (Ostroverkhova, 1979). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

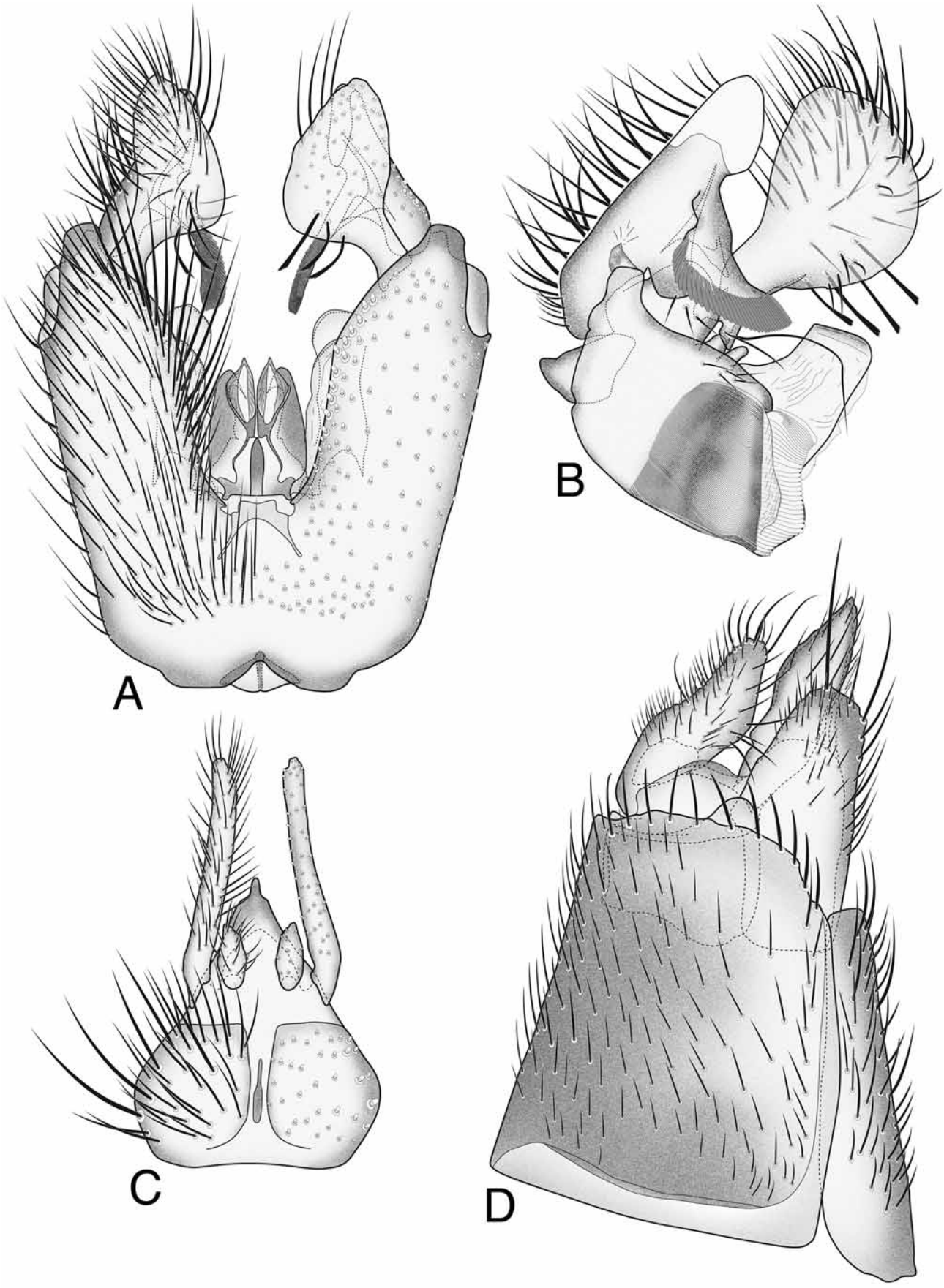


FIGURE 8. *Pseudexechia tuomikoskii* **sp. n.** —A. Male terminalia, ventral view. —B. Male gonostylus, internal view. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

Terminalia (Figs 8A–C). Gonocoxite subrectangular, with distinct condyles; sternal sclerite forming small, sclerotized, bifurcated plate. Hypandrial lobe subrectangular, with sharp apices and blunt corners. Aedeagal guides subrectangular, but apically rounded. Gonostylus large; dorsal branch elongated, with slightly club-shaped, whitish tip; dorsointernal branch forming large, asymmetric, broad lamellate fan; medial branch present as large knob with three setae; ventral branch forming large, slightly asymmetrical spatula, widest at apex, ventrolaterad with 2–4 fan-tipped setae; internal branch forming large, striated cushion; anterior branch forming ventrally directed, subrectangular cushion. Tergite IX wide subrectangular, fused, with strong mesal suture. Pseudocercus long, setose. Cercus forming small knob, 1.75–2.4, 1.98 as long as wide in dorsal view. Hypoproct triangular, apiculate. Epiproct vestigial or absent.

Female (n = 1). Total length 6 mm. Wing length 4.28 mm, or 3.34 x as long as profemur. Antenna 1.7 mm long.

Coloration. As in male except tergite VI and VII also with pale apical bands.

Head. Width / length to frontal tubercle 1.41. First flagellomere 1.49 times as long as second flagellomere. Second flagellomere 2.53 times as long as wide. Median ocellus small but distinct, lateral ocellus touching compound eye. Length / width of clypeus 1.4. Antepenultimate segment 0.17 mm long, palpomere ratios 1: 1.3: 1.95.

Thorax. Mesonotum length 1.28 mm, or 0.3 x as long as wing. Proepisternum with 1 strong bristle.

Wings. Wing length to length of R_1 2.23; wing length to length of R_5 1.77. Length of r-m to length of M-petiole 1.25. R_{4+5}-bending index 1.33. Fork length ratio 0.9. Fork width ratios 0.96. M-ratios 0.64 and 0.73. CuA-ratios 1.2 and 1.69. CuP length to length of wing 0.46. A_1 length to length of wing 0.33.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.11: 0.88: 0.72; SV 1.68: 2.04: 2.41; BV 1.83: 2.31: 3.9; TR 1.61: 1.86: 2.84.

Terminalia. Tergite VII straight dorsally, with smooth posterior edge; apicolateral corner with nude area; setae along margin short, stout. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, long sinusoid with obtuse tip, as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with obtuse tip. Sternite VII subequal in length to tergite VII. Sternite VIII apically truncated. Gonapophysis VIII weak, narrow.

Remarks. The single female associated to the new species is confusingly similar to *P. trisignata* and to *P. pectinacea*. The association is based on the slightly diverged terminalia in combination with a good coloration match with the male. The diagnostic characters further seem to fit well with the female that was illustrated by Chandler (1978, fig. 5), who also figured the male of this species under the name *P. trisignata*.

Distribution. The confirmed records from Norway, Sweden, Great Britain (Chandler 1978) and probably France indicate a western European distribution.

Biology unknown.

Holotype male: **NORWAY**: **MRI**, Sunndal, Jordalsgrenda, Jordalsøra, Hamrene, 62°46'18"N, 008°19'12"E, 140 m a.s.l. 23 Oct–11 Nov 2005 (Leg. J. B. Jordal) [MZLU, JKJ–SPM–013145, on slide].

Paratypes: **NORWAY**: **MRI**, Sunndal, Jordalsgrenda, Jordalsøra, Hamrene, 62°46'18"N, 008°19'12"E, 140 m a.s.l. 6–23 Oct 2005 (Leg. J. B. Jordal) — 1 male [MZLU, JKJ–SPM–011950, on slide]; 23 Oct–11 Nov 2005 (Leg. J. B. Jordal) — 1 male [MZLU, JKJ–SPM–011950, on slide]; **FV**, Alta, Mattisdalen (S), SE-faced slope, 69°50'6"N, 22°51'23"E, 4 Aug–26 Sep 1996 (Leg. L.O. Hansen & H. Rinden) — 1 female [ZMUN, JKJ–SPM–005565, on slide]; Alta, Elvestrand, 69°57'12"N, 23°15'32"E, 18 Jul–16 Sep 1996 (Leg. H. Rinden) — 1 male [MZLU, JKJ–SPM–011880 on slide]; **SWEDEN**: **SK**, Blentarp, Stampenbäcken, 55°35'53"N, 13°33'12"E, 25 Sep 1969 (Leg. B. W. Svensson) — 1 male [MZLU, JKJ–SPM–004651, on slide].

Additional material examined: NORWAY: **FØ**, Tana, Nedre Storfosen, 70°4'47"N, 27°40'25"E, 4 Jul 1964 (MZH, Leg. R. Tuomikoski) — 1 male; **FV**, Alta, Elvestrand, 69°57'12"N, 23°15'32"E, 18 Jul–16 Sep 1996 (ZMUN, Leg. H. Rinden) — 1 male; Kvalsund, Skaidi, 70°25'56"N, 24°29'24"E7, Jul 1964 (MZH, Leg. R. Tuomikoski) — 1 male; **MRI**, Sunndal, Jordalsgrenda, Jordalsøra, Hamrene, 62°46'18"N, 008°19'12"E,

140 m a.s.l.,15 Sep–6 Oct 2005 (MZLU, Leg. J. B. Jordal) — 2 males; 6–23 Oct 2005 (MZLU, Leg. J. B. Jordal) — 1 male; **TRY**, Kvænangsfjord, 69°45'51"N, 21°56'45"E, 8 Jul 1964 (MZH, Leg. R. Tuomikoski) — 1 male. **SWEDEN**: **SK**, Blentarp, Stampenbäcken, 55°35'53"N, 13°33'12"E, 10 Nov 1969 (MZLU, Leg. B. W. Svensson) — 1 male; 20 Nov 1969 (MZLU, Leg. B. W. Svensson) — 1 male. **DENMARK**: Frederiksberg, undated (ZMUC, Leg. C. Staeger) — 2 males (paralectotypes of *M. trivittata*, var. b). **? FRANCE**: Without label (sans étiquette), from general collection MNHN, terminalia mounted on slide by L. Matile — 1 male.

The *canalicula* group

***Pseudexechia canalicula* (Johannsen, 1912)**
(Figs 2C, 5C, 9A–D)

Exechia canalicula Johannsen, 1912:69, fig. 36
Exechia canalicula; Shaw & Fisher 1952:202, fig. 33

Diagnostic characters. With its large gonostylus the male show some resemblance to the species of the *trisignata* group, but has the mesonotal stripes distinctly separated, a conically tapered hypandrial lobe and subsymmetric dorsointernal branch of the gonostylus. Further distinctive features of the male terminalia include a distinctly club-shaped dorsal branch of the gonostylus, and the ventral branch forming a large, subrectangular spatula. Females are characterized by the combination of a two-segmented cercus and tergite VII with smooth, straight posterior edge that is prolonged dorsally.

Description. Male (n = 4, except where otherwise stated). Total length 4.7–6, 5.4 (n=8) mm. Wing length 3.48–3.84 mm, or 3.22–3.36 x as long as profemur. Antenna 1.5–1.56 mm long.

Coloration (specimen in alcohol). Distinctly bi-coloured in dark greyish brown and yellow; mesonotal stripes distinct, but less sharply defined, dark; humeral area less pale. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark with small triangular, apical band on tergite II–IV, tergite V & VI all dark; terminalia dark yellow.

Head. Width / length to frontal tubercle 1.39–1.58. First flagellomere 1.88–2.07 times as long as second flagellomere. Second flagellomere 1.36–1.72 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.22–1.35. Antepenultimate segment 0.13–0.15 mm long, palpomere ratios 1: 1.06–1.3: 1.93–2.16.

Thorax. Mesonotum length 1.08–1.2 mm, or 0.3–0.32 x as long as wing. Proepisternum with (1–) 2 strong bristles.

Wings. Wing length to length of R_1 2.31–2.45; wing length to length of R_5 1.78–1.83. Length of r-m to length of M-petiole 1.07–1.36. R_{4+5}-bending index 1.04–1.26. Fork length ratio 0.8–0.85. Fork width ratio 0.88–1.17. M-ratios 0.58–0.64 and 0.67–0.73. CuA-ratios 1.35–1.56 and 1.87–2.12. CuP length to length of wing 0.44–0.47. A_1 length to length of wing 0.3–0.36.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.02–1.17: 0.81–0.85: 0.67–0.69 (n=3); SV 1.63–1.83: 2.05–2.16: 2.5–2.61 (n=3); BV 1.61–1.69: 2.09–2.29: 3.07–3.47 (n=2); TR 1.49–1.6: 1.66–1.77: 2–2.32 (n=3).

Terminalia (Figs 9A–C). Gonocoxite rounded, with less distinct condyles; sternal sclerite forming short, cordate plate. Hypandrial lobe triangular, conically tapered. Aedeagal guide forming elongated lobe. Gonostylus large; dorsal branch elongated, with distinctly club-shaped, whitish tip; dorsointernal branch forming large, subsymmetric, broad lamellate fan with long stalk; medial branch present as small knob with three setae; ventral branch forming large, subrectangular, slightly asymmetrical spatula, apically somewhat tapered and slightly serrated, ventrolaterad with 2–4 fan-tipped setae; internal branch forming large, striated cushion; anterior branch forming ventrally directed, subrectangular cushion. Tergite IX subquadrate, fused,

with strong mesal suture. Pseudocercus moderately long, setose. Cercus forming small knob, 1.31–1.54 as long as wide in dorsal view. Hypoproct long, acuminate. Epiproct vestigial or absent.

Female (n = 3, except where otherwise stated). Total length 5–5.5 (n=4) mm. Wing length 3.74–3.78 mm, or 3.4–3.48 x as long as profemur. Antenna 1.34–1.4 mm long.

Coloration. As in male except tergite VII also all dark.

Head. Width / length to frontal tubercle 1.38–1.5. First flagellomere 1.88–2.46 times as long as second flagellomere. Second flagellomere 1.2–1.53 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.11–1.18. Antepenultimate segment 0.14–0.15 mm long, palpomere ratios 1: 1.12–1.22: 2.24–2.36.

Thorax. Mesonotum length 1.14–1.16 mm, or 0.3–0.31 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 2.27–2.3; wing length to length of R_5 1.7–1.8. Length of r-m to length of M-petiole 1.08–1.56. R_{4+5}-bending index 0.88–1.25. Fork length ratio 0.74–0.85. Fork width ratio 0.96–1.19. M-ratios 0.54–0.62 and 0.63–0.7. CuA-ratios 1.29–1.54 and 1.83–2.1. CuP length to length of wing 0.44–0.48. A_1 length to length of wing 0.3–0.35.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.08–1.13: 0.82–0.84: 0.65–0.68; SV 1.65–1.74: 2.08–2.14: 2.51–2.65; BV 1.69–1.75: 2.17–2.29: 2.96–3.23; TR 1.59–1.7: 1.71–1.89: 1.92–2.03.

Terminalia (Fig. 9D). Tergite VII prolonged dorsally, with smooth straight posterior edge; apicolateral corner with nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus two-segmented, apical segment ovate, the two combined 2.79–3.32 as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with obtuse tip. Sternite VII subequal in length to tergite VII. Sternite VIII slightly truncated apically. Gonapophysis VIII more strongly developed, broad.

Distribution. Holarctic, in the Palaearctic region known only from the Nordic region (Finland, Sweden and Norway).

Biology unknown.

Type material examined: Holotype male, **USA**: North Carolina, 35°10'14"N, 079°51'40"W, July, year unknown [CUIC, JKJ–SPM–015088, Leg. O. A. Johannsen]. Holotype in poor condition, terminalia mounted on slide in the 70s—although very hyaline and difficult to interpret clearly conspecific with Nordic material.

Other material examined: FINLAND: **N**, Tvärminne, 59°50'31"N, 23°12'6"E, 14 Jun 1966 (MZH, Leg. K. Keynäs) — 1 male; **NORWAY**: **TRY**, Kvaenangen, Kvaenangen, 69°43'33"N, 22°4'45"E, 25 Jul 1965 (MZH, Leg. R. Tuomikoski) — 1 male; **SWEDEN**: **LU**, Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE Vuollerim, 66°25'28"N, 20°40'17"E, 60 m a.s.l., 14 Apr–18 Oct 2003 (MZLU, Leg. M. Karström) — 1 female; 6 May–13 Aug 2004 (MZLU, Leg. M. Karström) — 4 males; 13 Aug–13 Oct 2004 (MZLU, Leg. M. Karström) — 1 female, 1 male; 15 May–1 Jun 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 2 males; 16 Sep–1 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 4 males; 1–16 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female; **USA**: **Alaska**, Palmer, 61°35'55"N, 149°07'21"W, 13 Jul 1964 (USNM, Leg. K. M. Sommerman) — 2 females.

Pseudexechia aurivernica Chandler, 1978

(Figs 2B, 3B, 10A–D)

Mycetophila trivittata var. b.; Zetterstedt 1852:4234
Exechia trivittata pale form; Lundström 1909:41, figs 67 & 68a
Pseudexechia aurivernica Chandler, 1978:45, figs 1,2 & 6
Pseudexechia aurivernica; Krivosheina et al. 1986: 155, figs 45,6 & 45,7
Pseudexechia aurivernica; Zaitzev 2003:190, figs 42,3 & 42,5

Diagnostic characters. A quite distinctively bi-coloured species, often with a reddish tinge, and broad triangular, apical band on abdominal tergites. The combination of vivid coloration and small, retracted gonostylus with boot-shaped ventral branch and conically tapered hypandrial lobe separate males of this species from other European species. Further distinctive features of the male terminalia includes having only slightly club-shaped tip of the dorsal branch of gonostylus, and dorsointernal branch forming large, subsymmetric, lamellate fan with a short stem. Females are easily distinguished by combination of coloration and having strongly dentate to laciniate posterior edge of tergite VII.

Description. Male (n = 5, except where otherwise stated). Total length 4.8–5.6, 5.1 (n=10) mm. Wing length 3.48–3.68, 3.6 mm, or 3.12–3.29, 3.19 x as long as profemur. Antenna 1.68–1.74, 1.71 mm long.

Coloration (specimen in alcohol). Distinctly bi-coloured in dark greyish brown and yellow, often with a reddish tinge; mesonotal stripes distinct, sharply defined and dark; humeral area pale. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark with broad triangular, apical band on tergite II–VI; terminalia yellow.

Head. Width / length to frontal tubercle 1.06–1.77, 1.42. First flagellomere 1.78–2.03, 1.9 times as long as second flagellomere. Second flagellomere 1.5–2.06, 1.74 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.22–1.31, 1.25. Antepenultimate segment 0.13–0.14, 0.14 mm long, palpomere ratios 1: 1.15–1.38, 1.24: 2.15–2.79, 2.42.

Thorax. Mesonotum length 1.12–1.16, 1.14 mm, or 0.31–0.33, 0.32 x as long as wing. Proepisternum with 2 strong bristles.

Wings (Fig. 3B). Wing length to length of R_1 2.25–2.36, 2.3; wing length to length of R_5 1.8–1.81, 1.81. Length of r-m to length of M-petiole 1.08–1.56, 1.3. R_{4+5}-bending index 0.86–1.07, 0.93. Fork length ratio 0.67–0.84, 0.78. Fork width ratio 0.75–0.91, 0.88. M-ratios 0.49–0.61, 0.58 and 0.54–0.67, 0.63. CuA-ratios 1.25–1.42, 1.32 and 1.69–1.91, 1.8. CuP length to length of wing 0.41–0.48, 0.45. A_1 length to length of wing 0.33–0.36, 0.35.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.12–1.2, 1.17: 0.86–0.94, 0.9: 0.66–0.7, 0.68; SV 1.56–1.64, 1.59: 1.91–2.05, 1.97: 2.44–2.56, 2.51; BV 1.58–1.65, 1.62: 1.98–2.1, 2.04: 2.91–3.14, 3.05; TR 1.57–1.65, 1.62: 1.72–1.8, 1.77: 1.9–2.11, 2.

Terminalia (Figs 10A–C). Gonocoxite subrectangular, with distinct condyles; sternal sclerite forming elongated, cordate plate. Hypandrial lobe large, conically triangular. Aedeagal guides subrectangular. Gonostylus small, retracted; dorsal branch elongated, with slightly club-shaped, whitish tip; dorsointernal branch forming large, subsymmetric, broad lamellate fan; medial branch reduced or fused with internal branch; ventral branch forming narrow, angular boot-shaped spatula, without fan-tipped setae; internal branch forming large, striated cushion; anterior branch forming ventrally directed, round cushion. Tergite IX wide subrectangular, fused, with strong mesal suture. Pseudocercus long, setose. Cercus forming small knob, 1.29–1.75 (n=4) as long as wide in dorsal view. Hypoproct long, rostrate. Epiproct vestigial or absent.

Female (n = 4, except where otherwise stated). Total length 4.5–5.6, 5 (n=10) mm. Wing length 3.46–3.86 mm, or 3.24–3.36 x as long as profemur. Antenna 1.5–1.64 mm long.

Coloration. As in male except tergite VII dark with central white spot.

Head. Width / length to frontal tubercle 1.29–1.46. First flagellomere 1.75–2.03 times as long as second flagellomere. Second flagellomere 1.52–1.68 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.16–1.34. Antepenultimate segment 0.13–0.15 mm long, palpomere ratios 1: 1.06–1.21: 2.24–2.57.

Thorax. Mesonotum length 1.08–1.24 mm, or 0.31–0.33 x as long as wing. Proepisternum with 2–3 strong bristles.

Wings. Wing length to length of R_1 2.23–2.32; wing length to length of R_5 1.74–1.81. Length of r-m to length of M-petiole 1–1.27. R_{4+5}-bending index 0.93–1. Fork length ratio 0.77–0.86. Fork width ratio 0.78–0.95. M-ratios 0.54–0.61 and 0.6–0.67. CuA-ratios 1.16–1.4 and 1.45–1.95. CuP length to length of wing 0.43–0.46. A_1 length to length of wing 0.31–0.33.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.09–1.18: 0.89–0.92: 0.65–0.69; SV 1.59–1.69: 1.95–2.01: 2.48–2.65; BV 1.58–1.68: 2.02–2.14: 2.99–3.2; TR 1.58–1.67: 1.75–1.78: 1.97–2.03.

Terminalia (Fig. 10D). Tergite VII excavated dorsally, with strongly dentate to laciniate posterior edge; apicolateral corner with nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, long sinusoid with obtuse tip, 2.82–3.2 as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with obtuse tip. Sternite VII subequal in length to tergite VII. Sternite VIII obtuse. Gonapophysis VIII weak, narrow.

Distribution. Palaearctic, mainly northwesterly in Europe.

Biology. Breeding sites unknown, but shown by Kjærandsen (1993) to be a common cave dweller during wintertime in western Norway.

Type material examined: ENGLAND (U.K.): **Wales**, Gwynedd (Merioneth), Brithdir, near Dolgellau, 52°45'10"N, 003°49'26"W, 23 May, 1972 (Leg. A. M. Hutson) [BMNH, JKJ–SPM–005282].

Additional material examined: DENMARK: Unlabelled, undated (ZMUC, Leg. C. Staeger) — 1 female (paralectotype of *M. trivittata*, var. b); **ESTONIA**: **Tôrva**, Helme Cave [old refuge cave in sandstone], 58°01'00"N, 025°53'00"E, 19 Jan 1996 (MZLU, Leg. O. Kurina) — 1 female; **FINLAND**: **Ab**, Karislojo (MZH, Leg. R. Frey) — 1 female; Kuustö (MZH, Leg. C. Lundström) — 1 female; Sammatti (MZH, Leg. J. Sahlberg) — 1 male; **Ka**, Vehkalahti, 29 Aug 1972 (MZH, Leg. L. Tiensuu) — 1 male; 1 May 1973 (MZH, Leg. L. Tiensuu) — 1 male; **N**, Helsinge (MZH, Leg. R. Frey) — 1 female; **Oa**, Wasa (MZH, Leg. R. Frey) — 1 male; **Sa**, Joutseno, 30 Sep 1965 (MZH, Leg. E. Thumeberg) — 2 males; **Ta**, Ruoveri, Ryivärinkuoppa, 20 Sep 1965 (MZH, Leg. R. Tuomikoski) — 1 female; **NORWAY**: **HOI**, Kvinnherad, Varaldsøy, in fissures close to a cave opening, 60°6'6"N, 6°1'17"E, 10 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 2 females, 2 males; Kvinnherad, Atramadalen, in mine galleries, 60°2'1"N, 5°52'35"E, 9 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 5 females, 4 males; Kvinnherad, Fugleberg, in man-made soapstone caves, 60°0'41"N, 5°51'24"E, 9 Mar 1991 (MZLU, Leg. J. Kjærandsen) — 3 females,1 male; Voss, Nesheimstunet, 60°49'08"N, 006°27'59"E, in cellar, 4 Apr 1992 (MZLU, Leg. J. Kjaerandsen) — 1 male; **HOY**, Bergen, Haukeland, in mine galleries, 60°21'16"N, 5°27'19"E, 11 Oct 1990 (MZLU, Leg. J. Kjærandsen) — 14 females, 16 males; 4 Nov 1990 — 14 females, 6 males; 2 Dec 1990 — 24 females, 7 males; 12 Jan 1991 — 20 females, 18 males; 17 Feb 1991 — 2 females; Bergen, Riple, in mine galleries, 60°18'51"N, 5°26'33"E, 27 Oct 1990 (MZLU, Leg. J. Kjærandsen) — 18 females, 19 males; 9 Dec 1990 — 61 females, 59 males; 17 Feb 1991 — 4 females, 2 males; 21 Mar 1991 — 7 females, 2 males; Bergen, Gymmeland, in mine galleries, 60°18'6"N, 5°27'1"E, 9 Dec 1990 (MZLU, Leg. J. Kjærandsen) — 4 males; 3 Feb 1991 — 3 females, 5 males; 4 Mar 2001 — 2 males; Bergen, Trengereid, in mine gallery, 60°25'20"N, 5°37'34"E, 22 Jan 1991 (MZLU, Leg. J. Kjærandsen) — 6 females, 3 males; Vaksdal, Langhelle, in limestone cave (MZLU, Leg. J. Kjærandsen) — 3 females, 1 male; Bergen, Trollhaugen, in unfinished road tunnel, 60°19'10"N, 5°20'2"E, 8 Nov 1991 (MZLU, Leg. J. Kjærandsen) — 1 female, 4 males; Bømlo, Hidle, in mine gallery, 59°43'39"N, 5°14'36"E, 10 Feb 1991 (MZLU, Leg. J. Kjærandsen) — 5 females; Osterøy, Skaftå, in mine galleries, 60°27'21"N, 5°37'21"E, 8 Nov 1990 (MZLU, Leg. J. Kjærandsen) — 2 females, 1 male; Osterøy, Skistad, in mine galleries, 60°30'6"N, 5°32'20"E, 8 Nov 1990 (MZLU, Leg. J. Kjærandsen) — 49 females, 39 males; Stord, Litlabø, in mine gallery, 59°47'29"N, 5°25'9"E, 11 Feb 1991 (MZLU, Leg. J. Kjærandsen) — 8 females, 5 males; Sveio, Førde, in scree-cave called "Islandshola", 59°36'14"N, 5°26'54"E, 4 Jan 1992 (MZLU, Leg. J. Kjærandsen) — 1 female, 1 male; Sveio, Førde, in screes and fissures, 59°36'45"N, 5°28'57"E, 2 Jan 1992 (MZLU, Leg. J. Kjærandsen) — 2 females, 1 male; Ølen, Dreganes, in mine galleries, 59°38'34"N, 5°47'32"E, 27 Dec 1990 (MZLU, Leg. J. Kjærandsen) — 5 females; 5 Jan 1992 (MZLU, Leg. J. Kjærandsen) — 2 males; **MRI**, Sunndal, Jordalsgrenda, Jordalsøra, Hamrene, 62°46'18"N, 008°19'12"E, 140 m a.s.l., 15 Sep–6 Oct 2005 (MZLU, Leg. J. B. Jordal) — 1 female; 23 Oct–11 Nov 2005 — 1 female; 11 Nov–1 Dec 2005 — 1 female, 1 male; **RY**, Haugesund, Vikse, in mine gallery, 59°28'44"N, 5°18'22"E, 11 Nov 1990 (MZLU, Leg. J. Kjærandsen) — 3 females, 1 male; 9 Feb 1991 (Leg. J. Kjærandsen) — 1 male; **TRY**, Tromsø, Tromsø, Folkparken, 69°38'11"N, 18°54'27"E, 26 Aug 1987 (MZLU, Leg. G. E. E. Søli) — 1 male; **SWEDEN**: **JÄ**, Åre, Mullfjället, 63°25'28"N, 12°55'39"E, 29 Jul 1840 (MZLU, Leg. J. W. Zetterstedt) — 1 male; **LU**,

Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE Vuollerim, 60 m a.s.l., 66°25'28"N, 20°40'17"E, 14 Apr–18 Oct 2003 (MZLU, Leg. M. Karström) — 1 male; 6 May–13 Aug 2004 (MZLU, Leg. M. Karström) — 1 female; 13 Aug–13 Oct 2004 (MZLU, Leg. M. Karström) — 1 female; 15 May–1 Jun 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female, 3 males; 1–16 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 2 females; Jokkmokk, Bombmurkleskogen VVO, 4 km SSE Messaure, 85 m a.s.l., 66°38'47"N, 20°22'49"E, 10 Jun 2006 (MZLU, Leg. J. Kjærandsen) — 1 male; **SK**, Häckeberga NR, 55°35'40.72"N, 13°25'14.56"E, 3 Oct 2004 (MZLU, Leg. J. Kjærandsen) — 1 female, 1 male; **RUSSIA**: **Vib**, Metsäpirtti, 6 Oct 1935 (MZH, Leg. Krogerus) — 1 female.

Pseudexechia monica Kjaerandsen & Chandler, 2006

(Figs 11A–D)

Pseudexechia monica Kjaerandsen & Chandler, 2006:46, figs 2 A–D

Diagnostic characters: *P. monica* forms together with *P. parallela* a group of small *Pseudexechia* species with dark brown mesoscutum with fused thoracic stripes and with reduced size of the gonostylus relative to the gonocoxite. It can be separated from *P. parallela* by unique characters in the male terminalia, including the ventral branch of the gonostylus being angled and widely club shaped, the hypandrial lobe being large subrectangular, elaborate and with a large diverging split apically, and the hypoproct forming a short, strongly downcurved cylindrical process. It shares the shape of the ventral branch of the gonostylus with *P. aurivernica* Chandler, 1978, but can easily be separated from this larger species by fused thoracic stripes and other details of the male terminalia such as shape of the hypandrial lobe and the widened apex of the dorsal branch of the gonostylus.

Description. Male (n = 2, except where otherwise stated). Total length 3.9–3.9 mm. Wing length 2.58–2.6 mm, or 2.77–3 x as long as profemur. Antenna 1.44–1.62 mm long.

Coloration (pinned specimen). A dull brown species with a distinct greyish dusting; mesonotal stripes fused into dark, broad medial band; humeral area forming broad pale band along margin mesonotum. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark, usually with triangular pale bands on tergite II–V, tergite VI all dark; terminalia yellow.

Head. Width / length to frontal tubercle 1.31–1.36. First flagellomere 1.87–2.03 times as long as second flagellomere. Second flagellomere 1.72–1.88 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.25–1.28. Antepenultimate segment 0.1–0.11 mm long, palpomere ratios 1: 1.32–1.44: 2.16–2.34.

Thorax. Mesonotum length 0.86–0.9 mm, or 0.33–0.35 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 2.26–2.32; wing length to length of R_5 1.7–1.71. Length of r-m to length of M-petiole 1.29–1.36. R_{4+5}-bending index 1.15–1.22. Fork length ratio 0.69–0.72. Fork width ratio 1.08–1.19. M-ratios 0.54–0.56 and 0.59–0.61. CuA-ratios 1.63–1.69 and 2.2–2.36. CuP length to length of wing 0.48–0.5. A_1 length to length of wing 0.33–0.33.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.15–1.16: 0.87–0.91: 0.65–0.66; SV 1.6–1.65: 1.97–2.02: 2.58–2.63; BV 1.53: 1.87–1.88: 2.67–2.76; TR 1.54–1.61: 1.66–1.68: 1.78–1.84.

Terminalia (Figs 11A–D). Gonocoxite deeply excavated, with distinct condyles; sternal sclerite forming longitudinal suture. Hypandrial lobe large, apically expanded and bi-lobed. Aedeagal guides absent or fused with hypandrial lobe. Gonostylus small, retracted; dorsal branch truncated, with distinctly angled and widely club shaped, whitish tip; dorsointernal branch forming small, subrectangular lamellate fan; medial branch present as small knob with two setae; ventral branch forming narrow, angular boot-shaped, without fan-tipped setae; internal branch forming large, striated cushion; anterior branch forming ventrally directed, subrectangular cushion with three tapered projections caudally. Tergite IX long subrectangular, divided

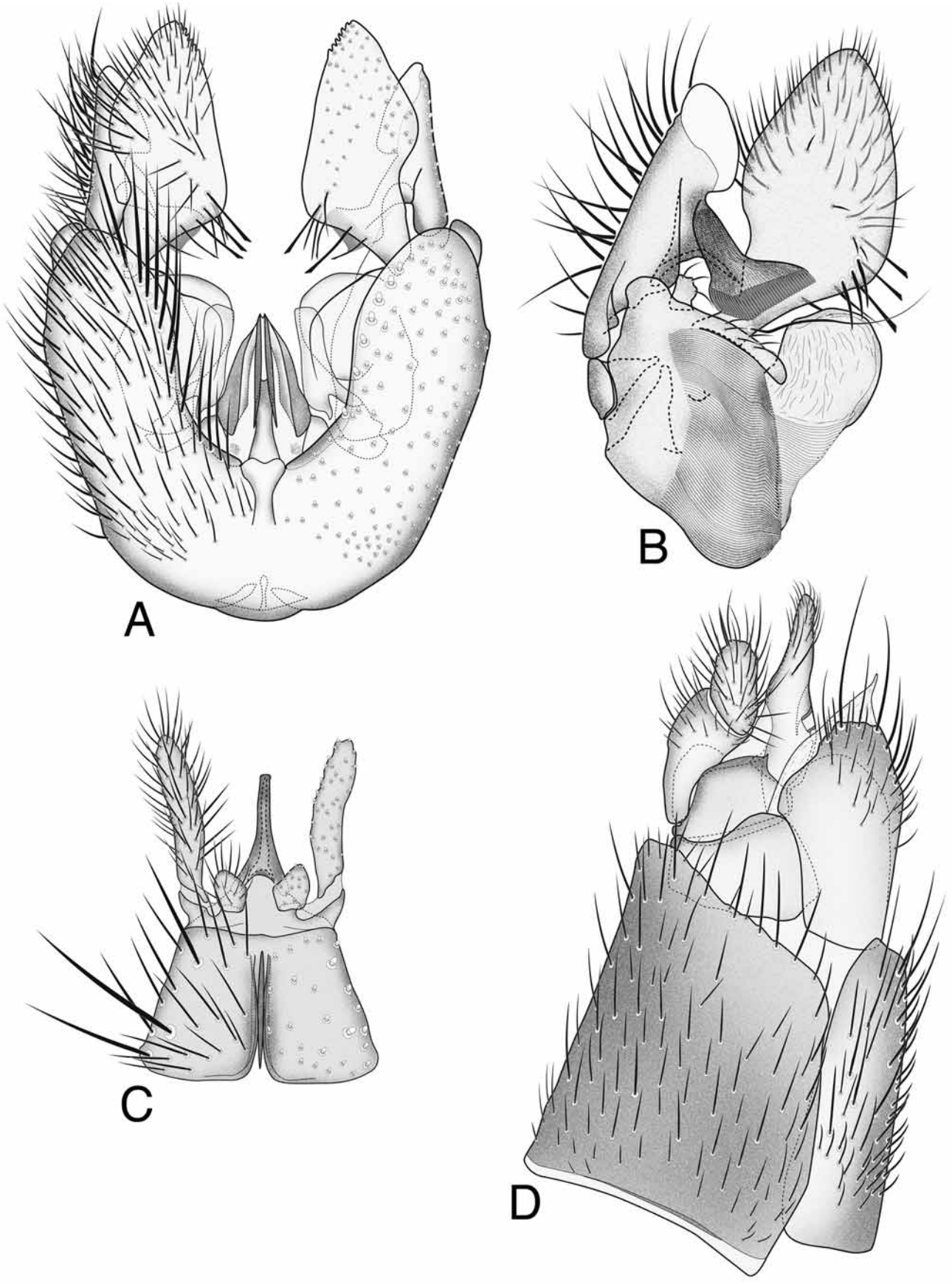


FIGURE 9. *Pseudexechia canalicula* (Johannsen, 1912). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

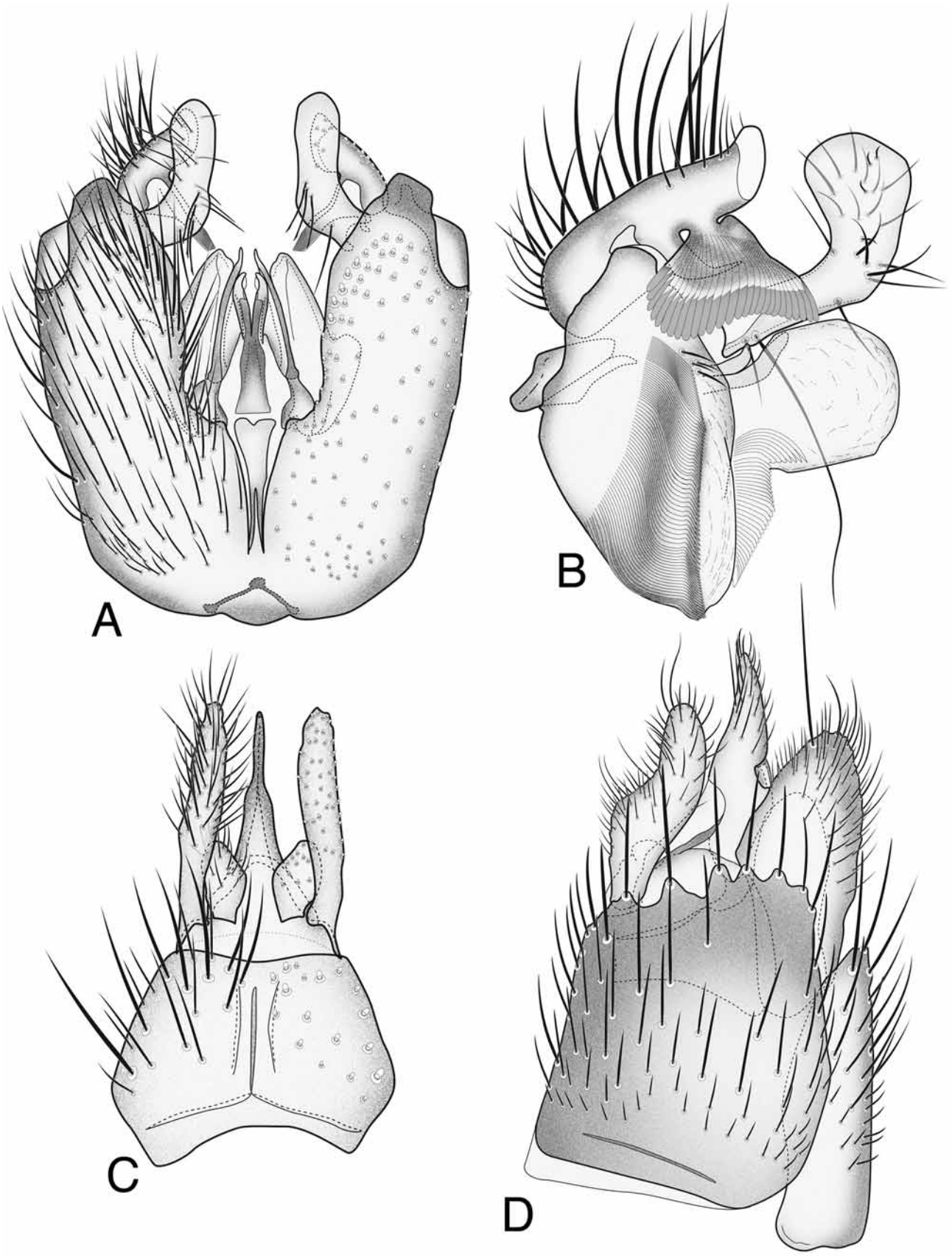


FIGURE 10. *Pseudexechia aurivernica* Chandler, 1978. —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

mesally. Pseudocercus short, setose. Cercus forming small knob, 2 (n = 1) times as long as wide in dorsal view. Hypoproct long, acuminate, strongly downcurved apically. Epiproct vestigial or absent.

Female unknown.

Distribution. Known only from Wales in Great Britain.

Biology unknown.

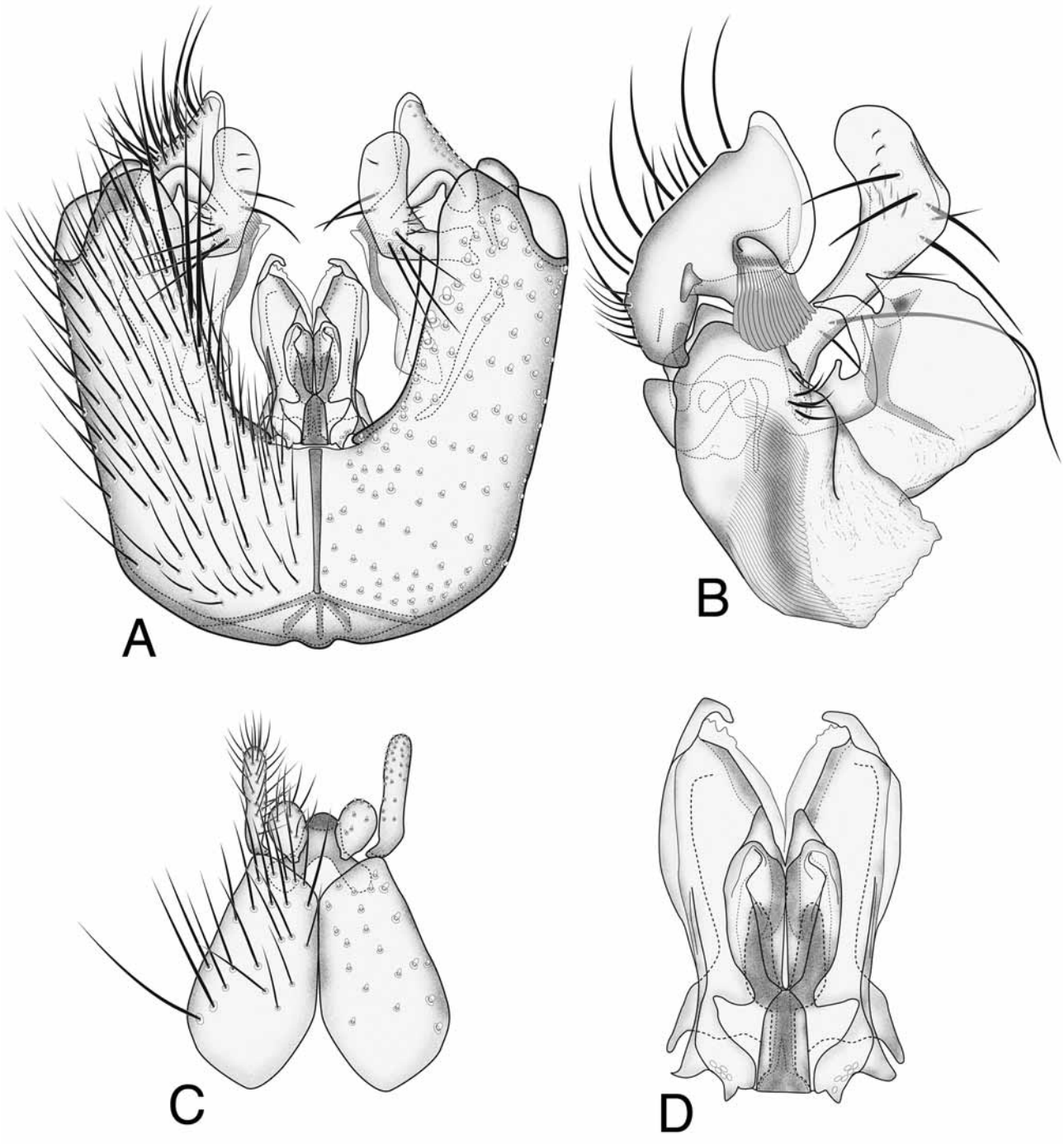


FIGURE 11. *Pseudexechia monica* Kjaerandsen & Chandler, 2006. —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Hypandrial lobe, ventral view, enlarged.

Type material examined: Holotype male, **GREAT BRITAIN** (**U.K.**): **WALES**, Anglesey, Cors Erddreiniog, 27 July 1988, NCC Peatland Survey, water trap 9, rank Schoenus flushes, [RSME, Leg. Holmes,

Boyce & Reed]. **Paratypes**: **GREAT BRITAIN** (**U.K.**): **WALES**, same data as holotype — 1 male; Anglesey, Cors Erddreining, NCC Peatland Survey (water trap 11), 27 July 1988 (Leg. Holmes, Boyce & Reed) — 1 male [MZLU, JKJ–SPM–011936, on slide]; Anglesey, Cors Bodeilio, NCC Peatland Survey (water trap 1—Phragmites bed), 26 July 1988 (Leg. Holmes, Boyce & Reed) — 3 males [2 males coll. P. Chandler, 1 male MZLU, JKJ–SPM–011937, on slide]; Anglesey, Cors Bodeilio, Mar 1990 (Coll. P. Chandler, Leg. A. Godfrey) — 1 male.

***Pseudexechia parallela* (Edwards, 1925)**
(Figs 3D, 12A–D)

Exechia parallela Edwards, 1925:596, fig. 64
Exechia parallela Stackelberg, 1948:102, figs 16–17
Exechia parallela Stackelberg, 1969:298 [452 in English translation], figs 185,1 a&b
nec *Pseudexechia parallela*; Krivosheina et al. 1986:155, figs 45,1 & 45,5
Pseudexechia parallela; Kjærandsen & Chandler 2006:42, figs 1 A–D
= *Pseudexechia hamulata* (Lackschewitz, 1937); Kjærandsen & Chandler 2006: 42

Diagnostic characters: *P. parallela* forms together with *P. monica* a group of small *Pseudexechia* species with dark brown mesoscutum with fused thoracic stripes, and with reduced size of the gonostylus relative to the gonocoxite. It can be separated from *P. monica* by unique characters in the male terminalia, including the ventral branch of gonostylus that is apicodorsally pointed, the hypandrial lobe being concave with a small, slightly diverging split apically, and the hypoproct forming a long, only slightly down-curved cylindrical process. The female can be distinguished by coloration, size and having two-segmented cercus.

Description. Male (n = 6, except where otherwise stated). Total length 3.7–4.8, 4.3 mm. Wing length 2.56–3.2, 2.82 mm, or 2.98–3.23, 3.14 x as long as profemur. Antenna 1.34–1.66, 1.51 mm long.

Coloration (pinned specimen). Moderately bi-coloured in brown and yellow; mesonotal stripes indistinct, diffusely defined, dark; humeral area less pale. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark with broad triangular, apical band on tergite I–V, tergite VI all dark; terminalia yellow.

Head. Width / length to frontal tubercle 1.4–1.48, 1.44. First flagellomere 1.67–2.04, 1.85 times as long as second flagellomere. Second flagellomere 1.29–1.94, 1.66 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.1–1.28, 1.18. Antepenultimate segment 0.1–0.11, 0.1 mm long, palpomere ratios 1: 1.11–1.44, 1.3: 1.83–2.62, 2.42.

Thorax. Mesonotum length 0.82–0.98, 0.9 mm, or 0.31–0.34, 0.32 x as long as wing. Proepisternum with 2 strong bristles.

Wings (Fig. 3D). Wing length to length of R_1 2.24–2.4, 2.32; wing length to length of R_5 1.73–1.77, 1.75. Length of r-m to length of M-petiole 0.89–1.11, 1. R_{4+5}-bending index 1.14–1.28, 1.21. Fork length ratio 0.76–0.8, 0.78. Fork width ratio 0.8–1.2, 0.98. M-ratios 0.58–0.63, 0.6 and 0.64–0.7, 0.66. CuA-ratios 1.35–1.53, 1.45 and 1.81–2.11, 1.99. CuP length to length of wing 0.41–0.49, 0.45. A_1 length to length of wing 0.34–0.38, 0.36.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.11–1.17, 1.14: 0.81–0.86, 0.84: 0.63–0.68, 0.65; SV 1.61–1.69, 1.65: 2.04–2.15, 2.08: 2.52–2.68, 2.61; BV 1.51–1.65, 1.57: 1.87–2.05, 1.94 (n=5): 2.76–3.1, 2.98; TR 1.53–1.67, 1.58: 1.58–1.74, 1.67: 1.85–2.07, 1.96.

Terminalia (Figs 12A–C). Gonocoxite less deeply excavated, with indistinct condyles; sternal sclerite forming small, subsquare plate. Hypandrial lobe conic, triangular. Aedeagal guides present, elongated. Gonostylus small, retracted; dorsal branch truncated, with club-shaped, whitish tip; dorsointernal branch forming large, subsymmetric, broad lamellate fan; medial branch present as small knob with three setae; ventral branch forming medium sized spatula with acute angled apicodorsal corner, ventrolaterad with 2–4 fan-tipped setae; internal branch forming large, striated cushion; anterior branch ventrally directed,

subrectangular cushion. Tergite IX wide subrectangular, divided mesally. Pseudocercus medium sized, setose. Cercus forming small knob, 1.56–2, 1.75 as long as wide in dorsal view. Hypoproct long, acuminate, straight. Epiproct vestigial or absent.

1.56–2, 1.75

Female (n = 1). Total length 4.4 mm. Wing length 2.84 mm, or 3.23 x as long as profemur. Antenna 1.4 mm long.

Coloration. As in male except more extensively yellow markings on abdomen.

Head. Width / length to frontal tubercle 1.45. First flagellomere 1.67 times as long as second flagellomere. Second flagellomere 1.67 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.14. Antepenultimate segment 0.12 mm long, palpomere ratios 1: 1.18: 2.1.

Thorax. Mesonotum length 0.96 mm, or 0.34 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 2.29; wing length to length of R_5 1.67. Length of r-m to length of M-petiole 1.11. R_{4+5}-bending index 1.28. Fork length ratio 0.74. Fork width ratio 1. M-ratios 0.58 and 0.63. CuA-ratios 1.56 and 2.19. CuP length to length of wing 0.48. A_1 length to length of wing 0.35.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.14: 0.87: 0.67; SV 1.64: 2.03: 2.56; BV 1.56: 1.99: 2.96; TR 1.61: 1.79: 2.03.

Terminalia (Fig 12D). Tergite VII widely excavated dorsally, forming smooth, rounded posterior edge; apicolateral corner with nude area; setae along margin short, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus two-segmented, apical segment ovate, the two combined 3.12 as long as wide in lateral view. Postgenital plate (gonapophysis IX) elongated, with obtuse tip. Sternite VII slightly shorter than tergite VII. Sternite VIII acute. Gonapophysis VIII weak, broad.

Distribution. Holarctic, widely distributed in Europe.

Biology unknown.

Type material examined: Holotype female of *P. parallela*: **ENGLAND** (**U.K.**): Newmarket, Cambs [52°14'43"N, 0°24'12"E], 23 Sep 1888 [BMNH, Leg. G. H. Verrall, pinned with terminalia in balsam preparation mounted on pin, JKJ–SPM–005283]. **Holotype male** of *P. hamulata*: **LATVIA**: Paplacken, Kurl [56°52N, 024°36E], 7 Oct 1934 [ZMHB, Leg. P. Lackschewitz, pinned with terminalia in balsam preparation mounted on pin, JKJ–SPM–011949].

Other material examined: ENGLAND (**U.K.**) (Coll. Chandler unless otherwise stated, all NCC Wetland Survey. Leg. A. Foster and D. Procter): Cambridgeshire, Chippenham Fen, 10–24 Aug 1988 2 males (Coll. Chandler); Norfolk, 13 Jun–11 Jul 1988 — 5 males, 2 females (MZLU, 1 male & 1 female on slide); Reedham, 27 Jun–11 Jul 1988 — 1 male, 11 Jul–12 Aug 1988 — 1 male, 12 Aug–20 Sep 1988 — 2 males (MZLU, 1 male on slide), 26 Aug 1988 — 3 males; Brancaster, 1–15 Jul 1988 — 9 males (MZLU, 1 male, pinned); Stallode Wash, 29 Jun–8 Jul 1988 — 1 male; Catfield, 29 Sep–12 Oct 1988 — 1 male, 12 Oct 1988 — 1 male; Middle Harling, 26 Jun–17 Jul 1988 — 1 male; Wendling, 14–24 Sep 1988 — 1 male; Old Buckenham Fen, 28 Jun–12 Jul 1988 — 1 male; Thompson Common, 1988 — 1 male; Suffolk, Walberswick, 14–29 Aug 1988 — 4 males; **WALES** (all Coll. Chandler, NCC Peatland Survey, Leg. Holmes, Boyce & Reed): Anglesey, Cors Erddreiniog, 27 Jul 1988 — 2 males; Cors Bodeilio, *Molinia* / *Myrica* bog and Phragmites bed, 28 Jun 1988 — 1 female, 26 Jul 1988 — 1 female, 5 Oct 1988 — 1 male; Rhos-y-Gad, calcareous flush fen, 27 Jul 1988 — 1 male, 1 female; West Glamorgan, Fairwood Common, Juncus flush, 4 Oct 1989 — 1 female; Pant-y-Sais, among *Carex acutiformis* and in *Molinia* bog, 5 Oct 1989 — 2 males, 1 female; **SWEDEN**: **SK**, Häckeberga NR, 55°35'40.72"N, 13°25'14.56"E, 29 Sep 1988 (MZLU, Leg. L. Huggert) — 3 males (2 on slides); **ESTONIA**: **Tôrva**, Helme Cave [old refuge cave in sandstone, about 50 m deep], 58°01'00"N, 025°53'00"E, 19 Jan 1996 (MZLU, Leg. O. Kurina) — 2 males (on slides); **RUSSIA**: **Kamtschatka**, Bolscherjetsk, 52°53'34"N, 157°02'30"E, 1 Jul 1917 (Leg. Y. Wuorentaus) — 1 male (MZLU, pinned with cleared terminalia in glycerine); **USA**: **Minnesota**, Cook co., Hovland N. J., Min. F. S., 47°50'20"N, 089°58'19"W, 14 Jul 1968 (USNM, Leg. E. F. Cook) — 1 male (on slide).

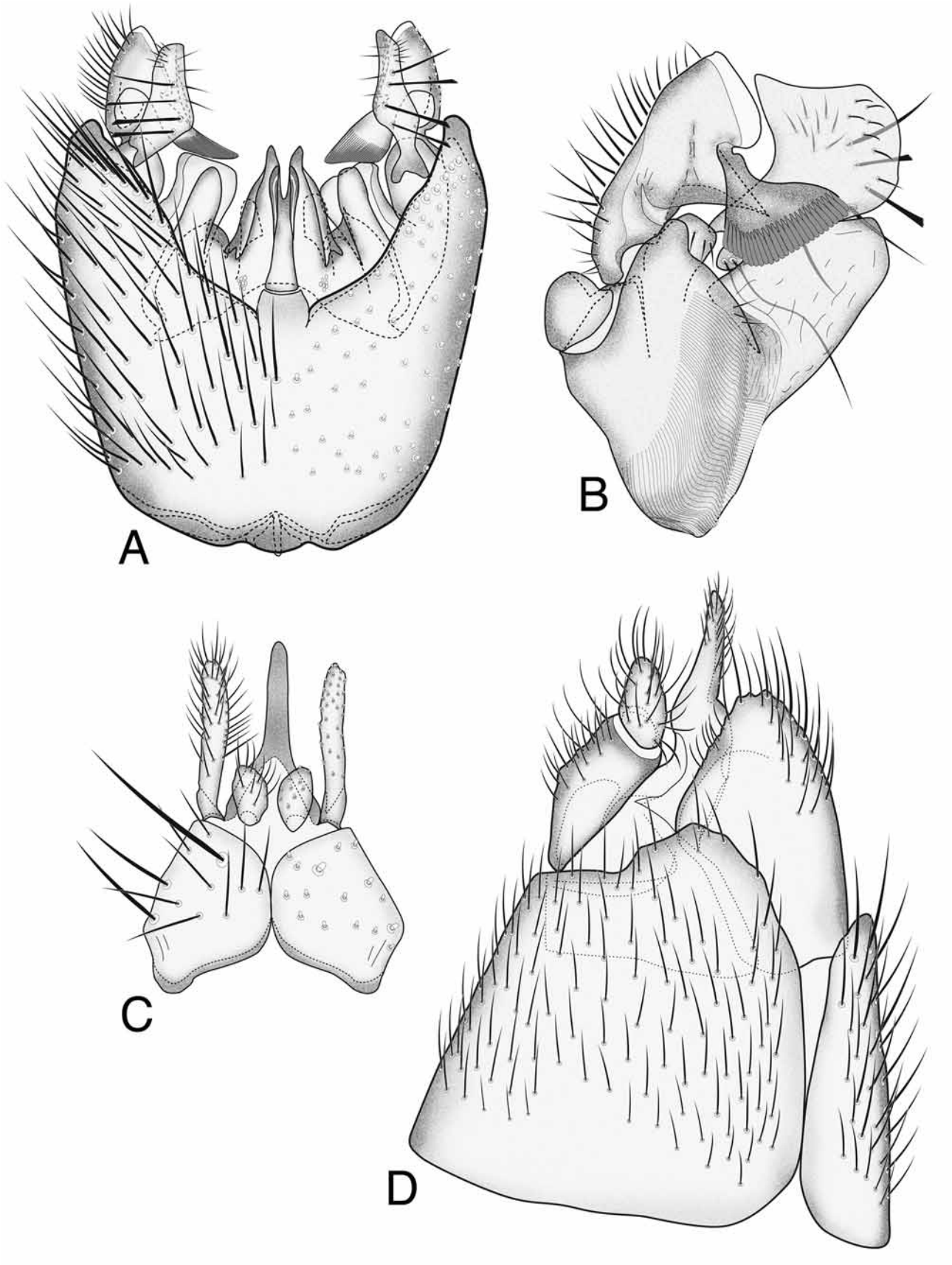


FIGURE 12. *Pseudexechia parallela* (Edwards, 1925). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

The *trivittata* group

***Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001**
(Figs 13A–D)

Pseudexechia latevittata Chandler & Blasco-Zumeta, 2001:21, figs 64–66

Diagnostic characters. From the two other European species of the *trivittata* group males are clearly distinguishable by having retained a narrow lamellate dorsointernal branch of the gonostylus, and by the sharp apical corners of the dorsal branch of the gonostylus. This species is, however, very close to *P. macrocantha* Kallweit, 1995, described from Nepal (not seen). Based on the illustrations of *P. macrocantha* provided by Kallweit & Martens (1995), *P. latevittata* can be separated by the dorsal branch of the gonostylus that seems to have a less pointed apex, by the ventral branch of the gonostylus bearing two strong setae (as opposed to one in *P. macrocantha*), and by the hypandrial lobe being more stretched with two long parallel branches medially (not truncated and converging apically like in *P. macrocantha*). The female is also very similar to *P. macrocantha*, but seems to have more rectangular, truncated sternite VIII and tip of the postgenital plate.

Description. Male (n = 1). Body length 4.5 mm. Wing length 2.9 mm. Antenna length about 1.5 mm. Coloration (pinned specimen). Moderately bi-coloured in brown and yellow. Mesonotal stripes fused into dark, broad medial band; humeral area forming broad pale band along margin of mesonotum. Wings unmarked, yellowish tinted. Legs all pale. Abdomen dark with vague triangular, apical band on tergite II–IV, tergite V & VI all dark; terminalia yellow.

Head. Width / length to frontal tubercle 1.22–1.46. First flagellomere 3 times as long as second flagellomere. Second flagellomere 1.8 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.2.

Thorax. Mesonotum length 0.94 mm, or 0.32 x as long as wing. Proepisternum with 1 strong bristle.

Wings. Wing length to length of R_1 2.22; wing length to length of R_5 1.63. Length of r-m to length of M-petiole 1.08. R_{4+5}-bending index 1.54. Fork length ratio 0.77. Fork width ratio 0.87. M-ratios 0.6 and 0.67. CuA-ratios 1.46 and 2.15. CuP length to length of wing 0.54. A_1 length to length of wing 0.37.

Legs. Leg ratios not measured.

Terminalia (Figs 13A–C). Gonocoxite subrectangular, with distinct condyles; sternal sclerite forming elongated plate. Hypandrial lobe long, parallel sided, with sharp apices, deeply split. Aedeagal guides triangular. Gonostylus medium sized, elongated; dorsal branch subrectangular, with sharply truncated, whitish tip; dorsointernal branch forming narrow, elongated lamellate fan; medial branch reduced or fused with internal branch; ventral branch forming slender lobe with two strong setae a apex, covered with strong seta and 2 apical spines; internal branch forming large, striated cushion; anterior branch forming hyaline, irregular plate with one sclerotized projection caudally. Tergite IX long subrectangular, fused with weak mesal suture. Pseudocercus medium sized, setose. Cercus forming small knob, 1.67 as long as wide in dorsal view. Hypoproct reduced, hyaline. Epiproct vestigial or absent.

Female (not seen, re-description based on original description). Wing length 3.2 mm.

Coloration. As in male except, with vaguely yellow bands on all abdominal tergites.

Terminalia (Fig. 13D). Tergite VII widely excavated dorsally, with smooth, rounded posterior edge; apicolateral corner without nude area; setae along margin long. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, short sinusoid with obtuse tip. Postgenital plate (gonapophysis IX) short subsquare, with truncated tip. Sternite VII distinctly shorter than tergite VII. Sternite VIII subrectangular, truncate. Gonapophysis VIII not described.

Distribution. Known only by type material from Spain.

Biology unknown.

Type material examined: Holotype male, **SPAIN**: **Zaragroza**, Montenegros region, near Pina de Ebro, Retuerta de Pina, *Juniperus thurifera* wds., # 4225, 20 Nov 1991, Malaise trap [BMNH, Leg. Blasco-Zumeta,

JKJ–SPM–033621]. Pinned specimen in fairly good condition, with left wing partly damaged and both hind legs lost. Abdomen and terminalia mounted on separate slide.

***Pseudexechia tristriata* (Stackelberg, 1969)**
(Figs 14A–D)

Exechia tristriata Stackelberg in Ostroverkhova & Stackelberg, 1969:299 [in English translation page 453, figs 185, 3a & 3b]
Pseudexechia tristriata; Ostroverkhova, 1979:168, fig. 32,3
Pseudexechia tristriata; Krivosheina et al. 1986:155, figs 45,3 & 45,4
Pseudexechia tristriata; Zaitzev 1999:188, figs 109,2 & 109,3
Pseudexechia tristriata; Zaitzev 2003:193, figs 43,2 & 43,6

Diagnostic characters. A distinctly bi-coloured species in dark greyish brown and yellow, often with a reddish tinge, with distinct, sharply defined thoracic stripes. Distinctive features of the male terminalia include having the ventral branch of the gonostylus larger than the dorsal branch, the former being covered with seta on the medial surface while the latter is almost devoid of medial setae. Females have almost identical terminalia with *P. trivittata*, but can be distinguished by the vivid coloration.

Description. Male (n = 3, except where otherwise stated). Total length 4.5–5.2 (n=4) mm. Wing length 3.36–3.48 mm, or 3.23–3.29 x as long as profemur. Antenna 1.4–1.46 mm long.

Coloration (specimen in alcohol). Distinctly bi-coloured in dark greyish brown and yellow, often with a reddish tinge; mesonotal stripes distinct, sharply defined, dark; humeral area narrowly pale. Wings unmarked, yellowish tinted. Legs pale, sometimes with indistinct dark spots on femur. Abdomen dark with triangular, gradually smaller, apical bands on tergite II–VI; terminalia dark yellow.

Head. Width / length to frontal tubercle 1.4–1.44. First flagellomere 1.87–2.07 times as long as second flagellomere. Second flagellomere 1.35–1.75 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 0.83–1.08. Antepenultimate segment 0.11–0.12 mm long, palpomere ratios 1: 1.18–1.34: 2.63–3.06.

Thorax. Mesonotum length 1–1.06 mm, or 0.29–0.32 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 2.24–2.4; wing length to length of R_5 1.76–1.83. Length of r-m to length of M-petiole 1–1.25. R_{4+5}-bending index 0.96–1.09. Fork length ratio 0.8–0.83. Fork width ratio 1–1.25. M-ratios 0.59–0.66 and 0.67–0.77. CuA-ratios 1.45–1.69 and 1.79–2.37. CuP length to length of wing 0.45–0.48. A_1 length to length of wing 0.31–0.36.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.09–1.11: 0.81–0.82: 0.64–0.68; SV 1.65–1.66: 2.11–2.13: 2.54–2.66; BV 1.62–1.69: 2.07–2.12: 3.1–3.17; TR 1.51–1.59: 1.63–1.7: 1.91–1.97.

Terminalia (Figs 14A–C). Gonocoxite subrectangular, with indistinct condyles; sternal sclerite forming longitudinal suture. Hypandrial lobe long, parallel sided, with blunt apices and small split. Aedeagal guides elongated, lying dorsad of internal branch of gonostylus. Gonostylus large, elongated; dorsal branch elongated, lanceolate, without whitish tip; dorsointernal branch reduced to hyaline knob basally on dorsal branch; medial branch reduced or fused with internal branch; ventral branch forming large, angular, lanceolate lobe, densely covered with short setae on both sides; internal branch forming small, striated cushion; anterior branch forming hyaline, irregular plate with many small, blunt projections caudally. Tergite IX long subrectangular, fused, with weak mesal suture. Pseudocercus medium sized, setose. Cercus forming small knob, 1.33–1.62 (n=2) as long as wide in dorsal view. Hypoproct triangular, apiculate. Epiproct vestigial or absent.

Female (n = 1). Total length 5.1 mm. Wing length 3.18 mm, or 3.18 x as long as profemur. Antenna 1.38 mm long.

Coloration. As in male except larger triangular pale apical bands on tergite II–VII.

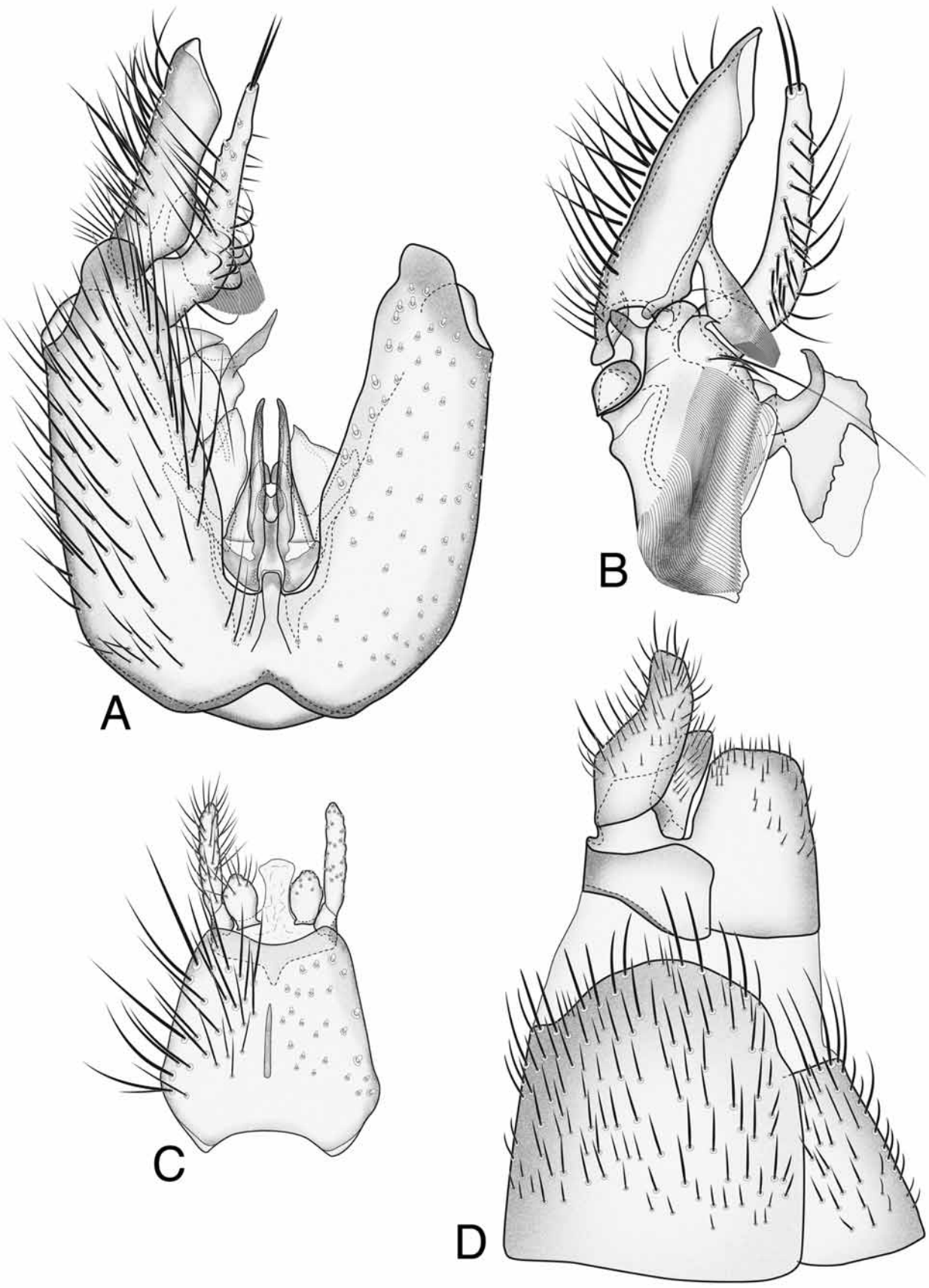


FIGURE 13. *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001. —A. Male terminalia, ventral view. —B. Male gonostylus, internal view, enlarged. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia (redrawn from Chandler & Blasco-Zumeta 2001), lateral view.

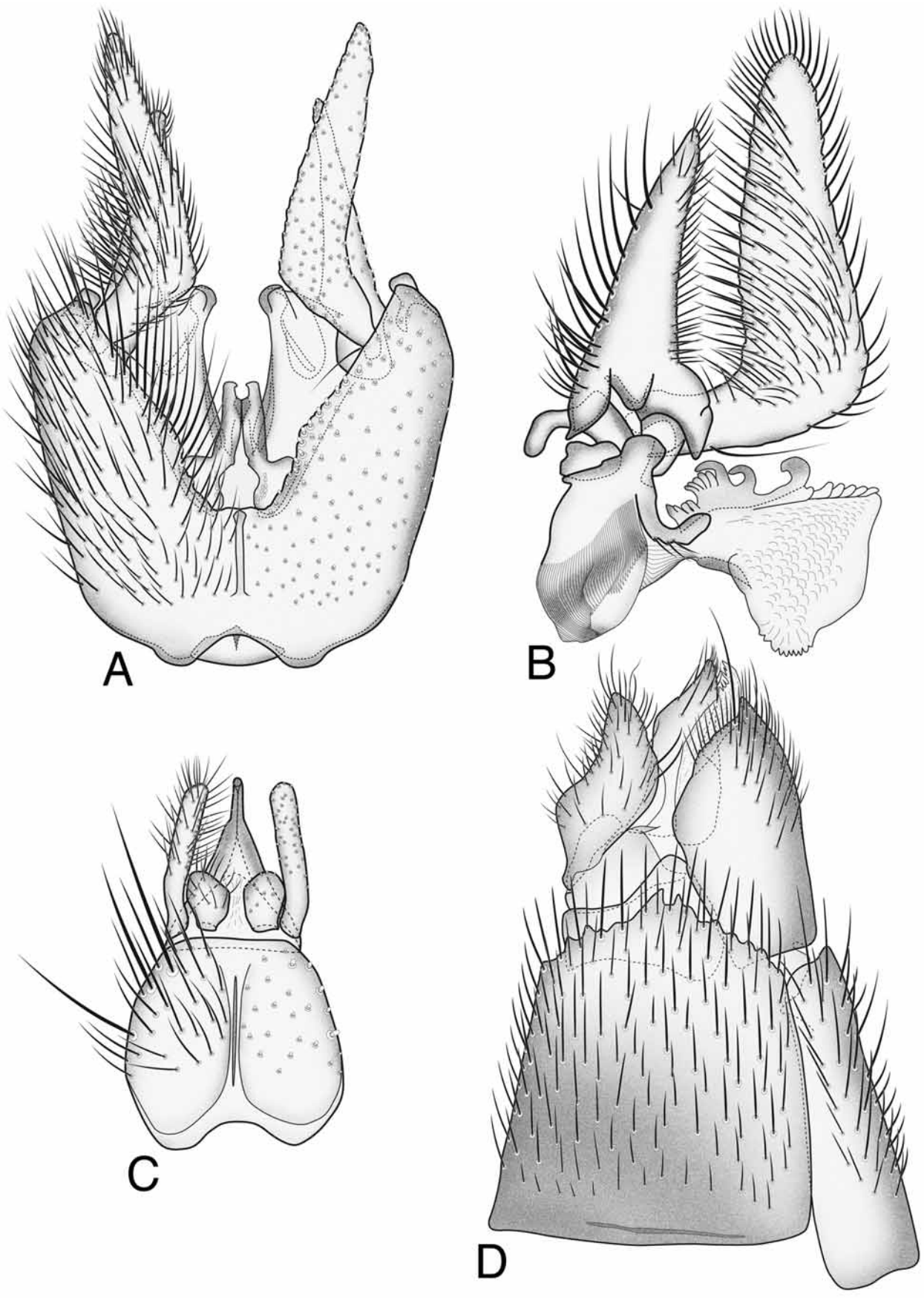


FIGURE 14. *Pseudexechia tristriata* (Stackelberg, 1969). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

Head. Width / length to frontal tubercle 1.5. First flagellomere 1.77 times as long as second flagellomere. Second flagellomere 1.76 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1.18. Antepenultimate segment 0.11 mm long, palpomere ratios 1: 1.49: 3.09.

Thorax. Mesonotum length 1.06 mm, or 0.33 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 2.27; wing length to length of R_5 1.71. Length of r-m to length of M-petiole 1.33. R_{4+5}-bending index 1.19. Fork length ratio 0.79. Fork width ratio 1. M-ratios 0.56 and 0.63. CuA-ratios 1.31 and 1.8. CuP length to length of wing 0.42. A_1 length to length of wing 0.32.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.11: 0.83: 0.66; SV 1.62: 2.12: 2.6; BV 1.72: 2.1: 3.08; TR 1.6: 1.65: 1.91.

Terminalia (Fig. 14D). Tergite VII excavated dorsally, with slightly dentate to laciniate, acute posterior edge; apicolateral corner without nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, short sinusoid with acute tip, 2.5 as long as wide in lateral view. Postgenital plate (gonapophysis IX) short, broad, with acute tip. Sternite VII subequal in length to tergite VII. Sternite VIII acute. Gonapophysis VIII strong, broad.

Distribution. Palaearctic, mainly easterly in Europe.

Biology. Adults have been reared form *Thelephora terrestris* (Yakovlev 1994).

Material examined. FINLAND: **N**, Esbo, Bodom, 60°15'58"N, 24°41'25"E, 9 Oct 1962 (MZH, Leg. W. Hackman) — 1 male; Helsinki, Nordsjö, [60°12'26"N, 25°8' 5"E] 22 Apr 1962 (MZH, Leg. R. Tuomikoski) — 1 male; Vihti, Vihtijärvi, 60°31'32"N, 24°32'22"E, 26 Apr 1964 (MZH, Leg. R. Tuomikoski) — 1 male; **Ta**, Lammi, Trailing area Evo [61°11'34"N, 25°6'29"E], Old-growth spruce-dominated forest, Evo, trap no. 1, 18 Aug–2 Sep 2003 (MZH, Leg. J. Jakovlev) — 1 male; Trailing area Evo, Burnt clear-cut area with retention trees, Evo, trap no. 7, 15 Sep–3 Oct 2003 (MZLU, Leg. J. Jakovlev) — 1 male; **SWEDEN**: **LU**, Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE Vuollerim, 66°25'28"N, 20°40'17"E, 60 m a.s.l., 13 Aug–13 Oct 2004 (MZLU, Leg. M. Karström) — 1 female.

Pseudexechia trivittata **(Staeger, 1840)**

(Figs 3C 15A–D)

Mycetophila trivittata var. a Staeger, 1840:261
= *Exechia pulchrigaster* Santos Abreu, 1920:90. Syn. by Chandler & Ribeiro (1995)
Exechia trivittata dark form; Lundström 1909:41, fig 68b
Exechia trivittata; Dziedzicki 1915:14, figs 240–242
Exechia trivittata; Stackelberg, 1969:299 [in English translation page 453, figs 185,2a&b]
Pseudexechia trivittata; Chandler 1978:44, figs 4 & 7
Pseudexechia trivittata; Ostroverkhova, 1979:169, fig. 32,4
Pseudexechia trivittata; Chandler & Ribeiro 1995:67, figs 40a–c
Pseudexechia trivittata; Krivosheina et al. 1986:155, figs 45,2 & 45,8
Pseudexechia trivittata; Zaitzev 2003:193, figs 43,3 & 43,5

Diagnostic characters. A dull brown species with a distinct greyish dusting and fused, hardly discernable thoracic stripes. Distinctive features of the male terminalia include the ventral branch of the gonostylus being smaller than the dorsal branch, the former being almost devoid of seta on the medial surface while the latter is covered with medial setae. Females have almost identical terminalia with *P. tristriata*, but can be distinguished by the dull coloration.

Description. Male (n = 5, except where otherwise stated). Total length 3.5–5.4, 4.5 (n=10) mm. Wing length 3.1–3.44, 3.27 mm, or 3.15–3.52, 3.26 x as long as profemur. Antenna 1.34–1.6, 1.48 mm long.

Coloration (specimen in alcohol). A dull brown species with a distinct greyish dusting, mouthparts dark; mesonotal stripes fused, hardly discernable, dark; humeral area dark. Wings with an indistinct spot at base of

posterior fork and greyish tinted towards tip. Legs pale with dark spots on coxae and femur. Abdomen dark with narrow to slightly triangular pale bands on tergite II–V, tergite VI all dark; terminalia dark yellow.

Head. Width / length to frontal tubercle 1.35–1.64, 1.47. First flagellomere 1.78–2.15, 1.93 times as long as second flagellomere. Second flagellomere 1.5–2.06, 1.75 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 0.92–1.21, 1.08. Antepenultimate segment 0.09–0.12, 0.11 mm long, palpomere ratios 1: 1.28–1.61, 1.44: 2.69–3.65, 3.03.

Thorax. Mesonotum length 0.92–1.08, 1.02 mm, or 0.3–0.32, 0.31 x as long as wing. Proepisternum with 2 strong bristles.

Wings (Fig. 3C). Wing length to length of R_1 2.28–2.4, 2.34; wing length to length of R_5 1.73–1.8, 1.76. Length of r-m to length of M-petiole 1–1.2, 1.11. R_{4+5}-bending index 1.04–1.32, 1.14. Fork length ratio 0.77–0.81, 0.8. Fork width ratio 0.8–1.21, 1. M-ratios 0.58–0.63, 0.62 and 0.65–0.71, 0.69. CuA-ratios 1.39–1.51, 1.45 and 1.88–2.14, 2.01. CuP length to length of wing 0.44–0.49, 0.47. A_1 length to length of wing 0.31–0.36, 0.34.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.13–1.15, 1.13: 0.84–0.87, 0.86: 0.65–0.7 (n=4); SV 1.6–1.66, 1.62: 2.01–2.08, 2.04: 2.49–2.63 (n=4); BV 1.62–1.7, 1.66: 2.07–2.15, 2.1: 2.88–3.05 (n=4); TR 1.53–1.66, 1.58: 1.69–1.74, 1.72: 1.85–2 (n=4).

Terminalia (Figs 15A–C). Gonocoxite subrectangular, with indistinct condyles; sternal sclerite forming longitudinal suture. Hypandrial lobe long, parallel sided, with blunt apices and small split. Aedeagal guides elongated, lying dorsad of internal branch of gonostylus. Gonostylus large, elongated; dorsal branch elongated, oblong, without whitish tip; dorsointernal branch reduced to hyaline, bifurcate knob basally on dorsal branch; medial branch reduced or fused with internal branch; ventral branch forming slender, curved spatula, covered with setae on lateral side, apex with some tight short spines forming a brush, devoid of setae mesally; internal branch forming small, striated cushion; anterior branch forming hyaline, irregular plate with many small, blunt projections caudally. Tergite IX long subrectangular, fused, with weak mesal suture. Pseudocercus medium sized, setose. Cercus forming small knob, 1.44–1.83, 1.58 as long as wide in dorsal view. Hypoproct triangular, acute. Epiproct vestigial or absent.

Female (n = 5, except where otherwise stated). Total length 4.2–5, 4.6 (n=10) mm. Wing length 2.82–3.68, 3.29 mm, or 3.2–3.41, 3.32 x as long as profemur. Antenna 1.1–1.44, 1.32 mm long.

Coloration. As in male except tergite VII dark with subapical pale spot.

Head. Width / length to frontal tubercle 1.28–1.46, 1.39. First flagellomere 1.78–2.15, 1.91 times as long as second flagellomere. Second flagellomere 1.44–1.82, 1.55 times as long as wide. Median ocellus vestigial or absent, lateral ocellus touching compound eye. Length / width of clypeus 1–1.23, 1.14. Antepenultimate segment 0.08–0.12, 0.11 mm long, palpomere ratios 1: 1.23–1.5, 1.38: 2.5–3.68, 3.

Thorax. Mesonotum length 0.88–1.14, 1.02 mm, or 0.3–0.55, 0.36 x as long as wing. Proepisternum with 2 strong bristles.

Wings. Wing length to length of R_1 1.33–2.35, 2.09; wing length to length of R_5 0.99–1.76, 1.59. Length of r-m to length of M-petiole 0.92–1.27, 1.11. R_{4+5}-bending index 1–1.19, 1.1. Fork length ratio 0.72–0.88, 0.8. Fork width ratio 0.9–1.12, 1.02. M-ratios 0.57–0.64, 0.59 and 0.64–0.71, 0.66. CuA-ratios 0.88–1.76, 1.35 and 1.58–2.55, 1.93. CuP length to length of wing 0.45–0.79, 0.52. A_1 length to length of wing 0.31–0.52, 0.37.

Legs. Leg ratios given for fore, mid and hind leg: LR 1.07–1.14, 1.1: 0.71–0.88, 0.81: 0.63–0.71, 0.66; SV 1.61–1.68, 1.65: 2.01–2.46, 2.16: 2.43–2.68, 2.58; BV 1.67–1.74, 1.71: 2.11–2.31, 2.17: 2.9–3.13, 3.02; TR 1.51–1.63, 1.59: 1.47–1.78, 1.69: 1.79–2.08, 1.9.

Terminalia (Fig. 15D). Tergite VII excavated dorsally, with slightly dentate to laciniate, acute posterior edge; apicolateral corner without nude area; setae along margin long, slender. Tergite VIII wide, subrectangular. Tergite IX fused with postgenital plate. Cercus one-segmented, short sinusoid with obtuse tip, 2.7–2.88 (n=4) as long as wide in lateral view. Postgenital plate (gonapophysis IX) short, broad, with acute tip. Sternite VII subequal in length to tergite VII. Sternite VIII acute. Gonapophysis VIII strong, broad.

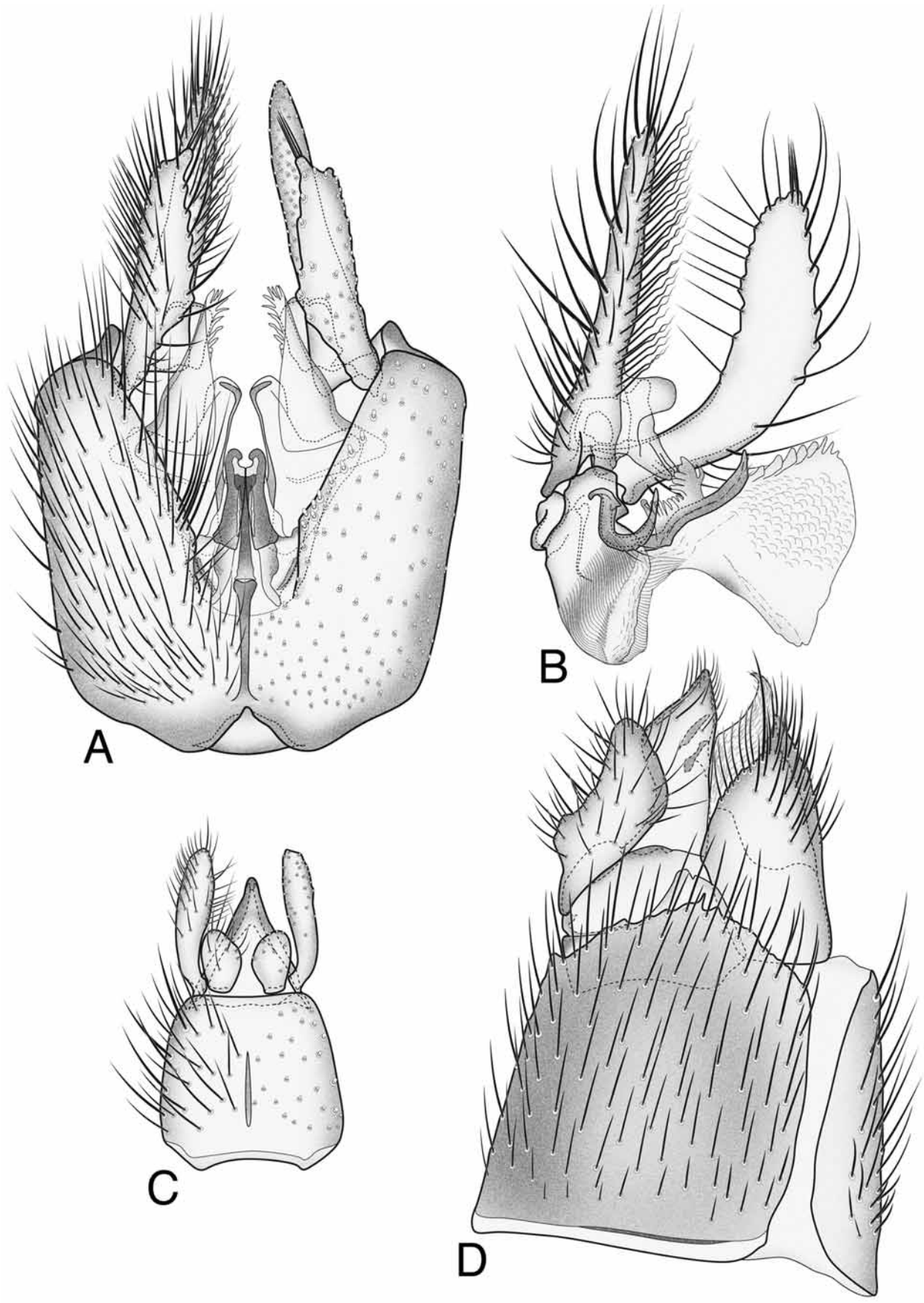


FIGURE 15. *Pseudexechia trivittata* (Staeger, 1840). —A. Male terminalia, ventral view. —B. Male gonostylus, internal view. —C. Male tergite IX and cerci, dorsal view. —D. Female terminalia, lateral view.

Distribution. Palaearctic, widely distributed in Europe.

Biology. *P. trivittata* has been reared from fruiting bodies of coprophilous agarics like *Coprinus*, *Psathyrella* and *Panaeolus* (Jakovlev et al. 2008).

Lectotype designation. The (remaining) type material in Staeger's type collection at ZMUC consists of 5 males and 7 females. Three of the males and five of the females are *P. trivittata* according to the prevailing usage of the name, while two males belong to *P. tuomikoskii* **sp. n.**, one female belongs to *P. aurivernica* and one female belongs to *Exechia* cf. *fusca* Meigen, 1804. The name *P. trivittata* conforms to var. a as described by Staeger (with one labelled exception), while the other species in the type series can be attributed to var. b as described by Staeger. In order to secure stability of the name I hereby designate a lectotype for a male in good condition (lacking only parts of some legs) of which I have cleared the abdomen and terminalia and placed glycerine in a microvial on the same pin as the rest of the specimen. In addition one male in the Zetterstedt collection at MZLU is clearly marked as coming form Staeger's collection (Kjærandsen 2005), belongs to *P. trivittata* and is regarded to belong to the syntype series, hereafter this specimen is accordingly regarded as a paralectotype.

Type material examined: Lectotype male, **DENMARK**: Unlabelled, undated, with cleared abdomen in glycerine [ZMUC, JKJ–SPM–033623, Leg. C. Staeger]. **Paralectotypes**: same as lectotype — 2 males [ZMUC, JKJ–SPM–033624–25]; same as lectotype except labelled "♀ var. b, Fredrbg" [= Frederiksberg] — 1 female [ZMUC, JKJ–SPM–033626]; same as lectotype — 4 females [ZMUC, JKJ–SPM–033627–30]; same as lectotype except with white tag on which "29" is written, labelled: "*M. trivittata* Stæg. ♂ Dania a Staeger" (Leg. C. Staeger) — 1 male [MZLU, in coll. Zetterstedt, JKJ–SPM–005229].

Other material examined: FINLAND: **Ab**, Karislojo (MZH, Leg. R. Frey) — 2 males; Runsala (MZH, Leg. W. Hellén) — 1 male; **Kb**, Koli, 18 May 1964 (MZH, Leg. R. Tuomikoski) — 6 females, 5 males; Le, Enontekis (MZH, Leg. R. Frey) — 1 female; **N**, Sibbo, Kitö (MZH, Leg. G. Stenius) — 1 female; **Oa**, Wasa (MZH, Leg. R. Frey) — 1 female; **ObS**, Uleåborg (MZH, Leg. W. Uorentaus) — 1 male; **Ta**, Kalvola, 21 Jun 1943 (MZH, Leg. V.G. Borg) — 1 male; Torhola, Skogsbybruk, 1 Oct 1965 (MZH, Leg. K. Mikkola) — 1 male; Urjala, 16 Oct 1965 (MZH, Leg. R. Tuomikoski) — 3 males; Lammi, Trailing area Evo, Burnt clear-cut area with retention trees, Evo, trap no. 7, 3–15 Oct 2003 (MZH, Leg. J. Jakovlev) — 1 male; Evo, trap no. 9 (MZH, Leg. J. Jakovlev) — 1 male; **NORWAY**: **AK**, Nesodden, Fagerstrand, 59°44'17"N, 010°35'43"E, 29 Sep 1990 (MZLU, Leg. S. Kobro) — 1 male; Oslo, Gjelleråsen, Svarttjern, 59°58'42"N, 010°56'39"E, 19 Sep 1992 (MZLU, Leg. J. Kjærandsen) — 1 female; **SWEDEN**: **DR**, Säter, Säterdalen, Näsåkerspussen, 67°32'47"N, 015°37'45"E, trap id. 10–401, 16 Sep–14 Oct 2003 (Leg. Swedish Malaise Trap Project, NHRS) — 1 male; **LU**, Jokkmokk, Porsitjärn/Porsi VVO, 1.5 km SE Vuollerim, 60 m a.s.l., 14 Apr–18 Oct 2003 (MZLU, Leg. M. Karström) — 1 male; 13 Aug–13 Oct 2004 (MZLU, Leg. M. Karström) — 1 female, 3 males; 1–15 May 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female; 15 May–1 Jun 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 male; 16 Sep–1 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 1 female; 1–16 Oct 2005 (MZLU, Leg. K. Hedmark & M. Karström) — 4 females, 4 males; **HA**, Enslöv, Årnilt, 12 May 1972 (MZLU, Leg. H. Andersson) — 1 male; **SK**, Blentarp, Stampenbäcken, 55°35'53"N, 13°33'12"E, 11 Oct 1969 (MZLU, Leg. B. W. Svensson) — 1 male; 6 Nov 1969 (MZLU, Leg. B. W. Svensson) — 1 male; Häckeberga NR, 55°35'35"N, 13°25'32"E, 29 Sep 1988 (MZLU, Leg. L. Huggert) — 1 male; **SÖ**, Haninge, Tyresta National Park, 59°10'44"N, 18°18'51"E, 5 Jun–14 Jul 2000 (NHRS, Leg. B. Viklund, L. O. Wikars & H. Ahnlund) — 1 female. **FRANCE**: Val d´Orha miniére (S. O.) au pied d'une haie (PJ), 9 Jul 1968 (MNHN, Leg. Couturier) — 3 females, 1 male; **RUSSIA**: Kamtschatka, Bolscherjetsk, 52°53'34"N, 157°02'30"E, 26–27 Jun 1917 (MZH, Leg. Y. Wuorentaus) — 1 male.

Morphometric analysis

Descriptions of species in taxonomic reviews follow very different standards with respect to inclusion of morphometric measurements. If morphometric measurements are standardised in descriptions they may

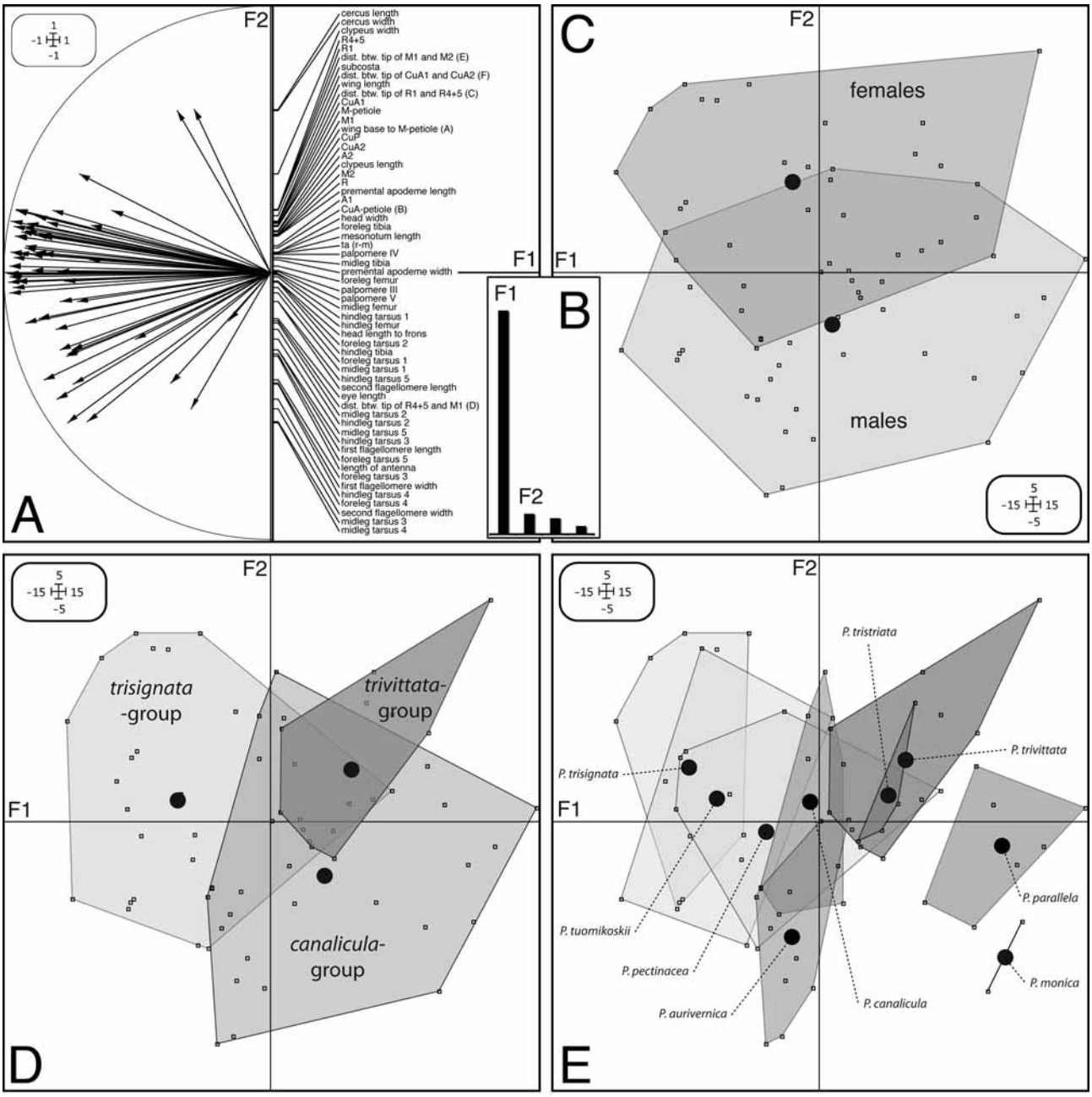


FIGURE 16. Normalized principal components analysis of 59 morphological measurements in 65 specimens of European *Pseudexechia* species. The species *Pseudexechia latevittata* Chandler & Blasco-Zumeta, 2001 is excluded due to too many missing values. Other missing values (0.9%) are replaced by averages for the species and sex. Position of taxa and sexes are displayed as centre of gravity (black circles) and range (convex hulls as shaded areas) on the F1xF2 factorial plane. —A. Correlation circle displaying individual measures on the F1xF2 factorial plane. Most measures are correlated to size along the F1-axis. Labels of individual measures are ordered and displayed at their vertical position along the F2-axis. —B. Histogram of eigenvalues. —C. Morphometric separation of the sexes. —D. Morphometric separation of the three European species groups; viz. the *trisignata* group, the *canalicula* group and the *trivittata* group. —E. Morphometric separation of European species. Included species are: the *trisignata* group: *P. trisignata* (Edwards, 1913), *P. pectinacea* (Ostroverkhova, 1979) and *P. tuomikoskii*, **sp. n.**; the *canalicula* group: *P. canalicula* (Johannsen, 1912), *P. aurivernica* Chandler, 1978, *P. monica* Kjaerandsen & Chandler, 2006, *P. parallela* (Edwards, 1925); and the *trivittata* group: *P. trivittata* (Staeger, 1840) and *P. tristriata* Stackelberg, 1969.

reveal hidden diagnostic and even phylogenetically informative characters (e.g. Smith & Gutberlet 2001). Numerous measurements are sometimes included in taxonomic reviews of fungus gnats (e.g. Søli 1997b, Kjærandsen 2006), but the informative value of such measurements is seldom addressed or analysed statistically. As there appear to be no standard for measuring fungus gnats, one aim of the present study was to carry out a rather wide range of measurements and explore if the morphometric variation is taxonomically informative among *Pseudexechia* species. Hence, a normalised principal component analysis (PCA) was carried out on the morphometric measurements to search for taxonomically informative characters. The PCA (Fig. 16) was based on 59 measurements (listed in Fig. 16A), and reveals a strong overall size effect of most variables (Fig. 16A) as reflected by the large F1 eigenvalue (Fig. 16B). The F2 axis provide a partly separation of the sexes (Fig. 16C), and reveals a few measurements that seem to be sex-related, viz. shape of cercus and clypeus. The morphometrics fail to give a clear separation of the different species groups (Fig. 16D), but the *trisignata* group seems to be partly separated from the other two on size-related characters along the F1 axis, while the *canalicula* group and *trivittata* group are partly separated by flagellomeres- and tarsal-lengths along the F2 axis. Individual species, however, are mostly partly to completely overlapping on the factorial plane (Fig. 16E), and the only clear separation is *P. parallela* and *P. monica* that are distinctly smaller than other species. Except for overall size and some diffuse differences in flagellomere and tarsus lengths the present study failed to reveal morphometric characters that are clearly taxonomically informative, and species identity must rest primarily on structural differences in the terminalia with aid of coloration patterns. In the descriptions the measurements are mainly given as ratios in order to remove the size effect, and some, like the R_{4+5}-bending index and the length to width ratio of clypeus, appear to be informative at species group level. Moreover, although the intrageneric variation seems largely uninformative the same morphometric data will probably give more fruitful and informative signals on intergeneric level to separate genera.

Acknowledgements

The study was financially supported by the Swedish Taxonomy Initiative (see Miller 2005), and partly by the European Commission's Research Infrastructure via the SYNTHESYS programme. The Zoological Museum in Lund (MZLU) and curator R. Danielson are acknowledged for giving me the opportunity to study their rich source of material of fungus gnats. I am also much obliged to P. Chandler and to the curators M. Bylac (MNHN), R. Gagné (USNM), E. R. Hoebeke (CUIC), D. Notton (BMNH), T. Pape (ZMUC), W. Schacht (ZSMC), P. Sihvonen (MZH), G. E. E. Søli (ZMUN), and B. Viklund (NHRS) for the opportunity to work with the collections and for the loan of material.

References

Chandler, P. J. (1978) Notes on the Holarctic Species of *Pseudexechia* Tuomikoski (Diptera: Mycetophilidae), with the Description of a New British Species. *Entomologist's Record and Journal of Variation*, 90, 44–51.

Chandler, P. J. (1993) New rearing records of fungus gnats (Diptera: Mycetophilidae and allied families). *Dipterists Digest (Second series)*, 13, 29–35.

Chandler, P. J. & Blasco-Zumeta, J. (2001) The fungus gnats (Diptera, Bolitophilidae, Keroplatidae and Mycetophilidae) of the Monegros region (Zaragoza, Spain) and five other new European species of *Pyratula* Edwards and *Sciophila* Meigen. *Zapateri, Revista Aragonesa de Entomologia*, 9, 1–24.

Chandler, P. J. & Riberio, E. (1995) The Sciaroidea (Diptera) (excluding Sciaridae) of the Atlantic islands (Canary Islands, Madeira and the Azores). *Boletim do museu municipal do funchal (historia natural), Suplemento*, 3, 1–170.

Colwell, R. K. (2007) Biota 2 – the biodiversity database manager. Version 2.04 [computer software]. Sinauer Associates, Sunderland MA. Available from http://viceroy.eeb.uconn.edu/biota (accessed July 14. 2008).

Dziedzicki, H. (1915) Atlas des organes génitaux (Hypopygium) des types de WINNERTZ et des genres de sa collection de Mycetophiles. *Publications de la Société des Sciences de Varsovie*, 3, 1–16.

Edwards, F. W. (1913) Notes on British Mycetophilidae. *Transactions of the Royal Entomological Society of London*, 1913, 334–382.
Edwards, F. W. (1925) British Fungus-Gnats (Diptera, Mycetophilidae). With a revised Generic Classification of the Family. *Transactions of the Entomological Society of London*, 73, 505–670.
Evenhuis, N. L. (2008). The insect and spider collections of the world website. Available from: http://hbs.bishopmuseum.org/codens/ (accessed January 13. 2009).
Jakovlev, J., Kjærandsen, J. & Polevoi, A. V. (2006) Seventy species of fungus gnats new to Finland (Diptera: Mycetophilidae). *Sahlbergia*, 11, 22–39.
Jakovlev, J., Kjærandsen, J. & Viklund, B. (2008) Fungus gnats (Diptera: Bolitophilidae, Diadocidiidae, Ditomyiidae, Keroplatidae & Mycetophilidae) from Tyresta National Park and Nature Reserve in Sweden. *Sahlbergia*, 14, 29–52.
Johannsen, O. A. (1912) The Mycetophilidae of North America. Part IV (Conclusion). *Maine Agricultural Experimental Station Orono, Bulletin No. 200*, 57–146.
Kallweit, U. & Martens, J. (1995) Pilzmucken aus Blutenstanden von Aronstabgewachsen (Araceae) des Nepal-Himalaya (Insecta: Diptera: Keroplatidae, Mycetophilidae). *Entomologische Abhandlungen (Dresden)*, 56, 233–258.
Kjærandsen, J. (1993) Diptera in mines and cave systems in southern Norway. *Entomologica Fennica*, 4, 151–160.
Kjærandsen, J. (1994) Three new species of *Pseudexechia* Tuomikoski from Tanzania and Thailand (Diptera: Mycetophilidae). *Tijdschrift voor Entomologie*, 137, 325–350.
Kjærandsen, J. (2005) A review of fungus gnats in the tribe Exechiini (Diptera, Mycetophilidae) from the J. W. Zetterstedt collection at the Museum of Zoology in Lund, Sweden. *Zootaxa*, 856, 1–35.
Kjærandsen, J. (2006) Review of fungus gnats of the genus *Tarnania* Tuomikoski, with a phylogeny of the *Rymosia* s.l. genus group (Diptera: Mycetophilidae). *Insect Systematics & Evolution*, 37, 121–148.
Kjærandsen, J. & Bengtson, S.-A. (2005) Svampmyggor — artrik insektsgrupp som trivs så in i Norden. *Fauna och Flora (Stockholm)*, 100, 26–34.
Kjærandsen, J. & Chandler, P. J. (2006) On the identity of *Pseudexechia parallela* (Edwards, 1925) and description of a new related species from Great Britain (Diptera, Mycetophilidae). *British Journal of Entomology and Natural History*, 19, 41–49.
Kjærandsen, J., Hedmark, K., Kurina, O., Polevoi, A., Økland, B. & Götmark, F. (2007) Annotated checklist of fungus gnats from Sweden (Diptera: Bolitophilidae, Diadocidiidae, Ditomyiidae, Keroplatidae and Mycetophilidae). *Insect Systematics & Evolution Supplement*, 65, 1–128.
Krivosheina, N. P., Zaitzev, A. I. & Yakovlev, E. B. (1986) *Insects as decomposers of fungi in the forest of the European part of USSR. [Insects inhabiting fruiting bodies of macrofungi in the forest zone of the European part of USSR.]*. Moscow.
Lackschewitz, P. (1937) Die Fungivoriden des Ostbaltischen Gebietes. *Naturforscher-Verein zu Riga, Arbeiten [Neue Folge]*, 21, 1–47.
Lundström, C. (1909) Beiträge zur Kenntnis der Dipteren Finlands. IV. Supplement Mycetophilidae. *Acta Societatis pro Fauna et Flora Fennica*, 32, 1–67.
Matile, L. (1971) *Pseudexechia* de la région éthiopienne (Diptera, Mycetophilidae). *Bulletin de la Societe Entomologique de France*, 75, 209–214.
Miller, G. (2005) Linnaeus's Legacy Carries On. *Science*, 307, 1038–1039.
Ostroverkhova, G. P. (1979) *Fungus-gnats (Diptera, Mycetophiloidea) of Siberia.* Tomsk.
Rindal, E. & Søli, G. E. E. (2006) Phylogeny of the subfamily Mycetophilinae (Diptera: Mycetophilidae). *Zootaxa*, 1302, 46–59.
Rindal, E. & Søli, G. E. E. & Bachmann, L. (*in press*) On the systematics of the fungus gnat subfamily Mycetophilinae (Diptera); a combined morphological and molecular approach. *Zoological Systematics and Evolutionary Research*.
Rindal, E., Søli, G. E. E., Kjærandsen, J. & Bachmann, L. (2007) Molecular phylogeny of the fungus gnat tribe Exechiini (Mycetophilidae. Diptera). *Zoologica Scripta*, 36, 327–335.
Sasakawa, M. & Ishizaki, H. (1999) Fungus gnats of the genera *Exechiopsis* Tuomikoski and *Pseudexechia* Tuom. in Japan (Diptera: Mycetophilidae). *Entomological Science*, 2, 147–156.
Scotland, R. W., Olmstead, R. G. & Bennet, J. R. (2003) Phylogeny reconstruction: The role of morphology. *Systematic Biology*, 52, 539–548.
Shaw, F. R. & Fisher, E. G. (1952) Guide to the insects of Connecticut. Part VI. The Diptera or true flies of Connecticut. Fifth fascicle : Midges and gnats. Family Fungivoridae (=Mycetophilidae). *Bulletin of the State Geological and Natural History Survey , Hartford*, no. 80, pp. 177–231.
Smith, E. N. & Gutberlet, J. (2001) Generalized frequency coding: A method of preparing polymorphic multistate characters for phylogenetic analysis. *Systematic Biology*, 50, 156–169.
Søli, G. E. E. (1997a) The adult morphology of Mycetophilidae (s.str.), with a tentative phylogeny of the family (Diptera, Sciaroidea). *Entomologica Scandinavica Supplement*, 50, 5–55.

Søli, G. E. E. (1997b) The systematics and phylogeny of *Coelosia* Winnertz, 1863 (Diptera, Mycetophilidae). *Entomologica Scandinavica Supplement*, 50, 57–139.
Søli, G. E. E. & Kjærandsen, J. (2008) Additions to the fauna of Norwegian fungus gnats (Diptera, Mycetophilidae). *Norwegian Journal of Entomology*, 55, 31–41.
Stackelberg, A. A. (1948) New and poorly known species of Fungivoridae (Diptera) from Leningrad District. *Entomologicheskoe Obozrenie*, 30, 94–102.
Stackelberg, A. A. (1969) Family Bolitophilidae. *In:* G. Y. Bei-Bienko (Ed), *Key to the Insects of the European Part of the USSR. Volume V Diptera and Siphonaptera Part I.*, Leningrad, pp. 247–257.
Staeger, R. C. (1840) Systematisk fortegnelse over de i Danmark hidtil fundne Diptera. *Naturhistorisk Tidskrift*, 3, 228–288.
Stearn, W. T. (1991) *Botanical Latin. History, Grammar Syntax, Terminology and Vocabulary* (Third edition, revised ed.). Brunel House, Newton Abbot & Devon: David & Charles.
Thioulouse, J. (2003) ADE-4 MacOS X version. Topics documentation. Available from http://pbil.univ-lyon1.fr/ADE-4-old/volume1.html (accessed June 12. 2008).
Thioulouse, J., Chessel, D., Dole´dec, S. & Olivier, J.-M. (1997) ADE-4: a multivariate analysis and graphical display software. *Statistics and Computing*, 7, 74–83.
Tuomikoski, R. (1966) Generic taxonomy of the Exechiini (Dipt., Mycetophilidae). *Annales Entomologici Fennici*, 32, 159–194.
Wheeler, Q. D. (2008) Undisciplined thinking: morphology and Hennig's unfinished revolution. *Systematic Entomology*, 33, 2–7.
Wu, H. & Yang, C. (2003) Mycetophilidae. *Fauna of insects in Fujian Province of China*, Vol. 8, 146–175.
Yakovlev, E. B. (1994) *Palearctic Diptera associated with fungi and myxomycetes.* Petrozavodsk: Karelian Research Centre, Russian Academy of sciences, Forest Research Institute.
Zaitzev, A. I. (1982) New and little-known species of fungus gnats (Diptera, Mycetophiloidea) of the USSR fauna. *Vestnik Zoologii*, 5, 31–35.
Zaitzev, A. I. (1988) The new data of mycetophiloid fauna (Diptera, Mycetophilidoidea) in mountain Altai. *Bulletin of Moscow Society of Naturalists. Biological series*, 93, 72–78.
Zaitzev, A. I. (1999) 15. Family Bolitophilidae.; 16. Family Diadocidiidae.; 17. Family Ditomyiidae.; 18–19. Family Keroplatidae.; 20. Family Mycetophilidae. *In:* P. A. Ler (Ed), *Key to the insects of Russian Far East. Vol 6. Diptera and Siphonaptera*. Dalnauka, Vladivostok, pp. 134–239.
Zaitzev, A. I. (2003) Fungus gnats (Diptera, Sciaroidea) of the fauna of Russia and adjacent regions. Part II. *An international Journal of Dipterological Research*, 14, 77–386.
Zetterstedt, J. W. (1852) Diptera scandinaviae disposita et descripta. *Lundae*, 11, xii + 4091–4545.