Black fungus-gnats in deciduous forest habitat in northern Europe, with the description of *Bradysia arcula* sp. n. (Diptera: Sciaridae)

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The sciarid fauna of a deciduous forest in Kivijärvi Nature Reserve, southern Finland, was studied. In all, 58 species were found in a material of 247 specimens, collected with Malaise traps. The material included the following species new to the Finnish and North European fauna: *Corynoptera postforcipata* Rudzinski, *Leptosciarella juniperi* (Mohrig & Blasco-Zumeta), *Leptosciarella subcoarctata* Mohrig & Menzel, *Leptosciarella yerburyi* (Freeman), *Phytosciara macrotricha* (Lengersdorf) and *Sciara nursei* Freeman. *Bradysia arcula* sp. n., found also in two other localities in Finland, is described, and a key to the Finnish species of the *Bradysia praecox* group is provided.

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1. Introduction

Several papers have been published on Sciaridae of northern Europe, but these are almost entirely focused on taxonomy (Frey 1948, Tuomikoski 1960, Hippa & Vilkamaa 1991, 1994, 2004, 2006, Hippa *et al.* 2003, Vilkamaa *et al.* 2004, Vilkamaa & Hippa 2005, 2006). Salmela and Vilkamaa (2005) published faunistic-ecological data on the Sciaridae of central Finland, along with some taxonomic findings. That paper was focused on coniferous forests and mires, whereas the present paper deals with deciduous forest habitat, the sciarid fauna of which is poorly known in northern Europe. Furthermore, a new species of *Bradysia*, belonging to the *Bradysia praecox* group, is described here.

2. Material and methods

Kivijärvi Nature Reserve area is located in Urjala, south-western Finland (60°59'N 23°26'E; the square 6770:308 in the Finnish Uniform Grid System). The material was collected with two Malaise traps set in a herb-rich forest habitat on a small hill called Kalkkimäki. The site is characterized by deciduous trees (*Populus tremula, Tilia cordata, Acer platanoides*) but spruce (*Picea abies*) is also common. Several demanding and

rare vascular plants and bryophytes, indicating a base-rich, calcareous bedrock, are known to occur in the area (for details, see Salmela & Härmä 2004).

The traps were set in the field on 20.IV.2003 and emptied in about four week intervals; they were finally removed on 5.X.2003. We used 50% ethylene glycol as a preservative in the traps and transferred the collected insect material later into 70% ethanol. Additional Finnish specimens of the new species were similarly collected and treated. The specimen from Canada was pinned (collection method unknown).

Sciarid males were sorted from the material and mounted on microscope slides in Euparal. The drawings were made with the help of a camera lucida attached to a Leitz Diaplan compound microscope. The material is deposited in Zoological Museum, Finnish Museum of Natural History, Helsinki (MZH), one paratype of the new species in Deutsches Entomologisches Institut, Müncheberg (DEI), and one in Canadian National Collection, Ottawa (CNC). The nomenclature and classification follows that of Menzel and Mohrig (2000), except for genera *Claustropyga* (Hippa *et al.* 2003) and *Peyerimhoffia* (Vilkamaa & Hippa 2005).

3. Results and discussion

3.1. Faunistics

The identified material consisted of 247 male specimens belonging to 58 species (Table 1). The most species-rich genera were *Corynoptera* and *Leptosciarella* (Table 1). There are actually no earlier published faunistic data on the sciarid fauna of deciduous forests in northern Europe. For the most part, the species now found have been recorded also in coniferous forest sites in Finland (see Tuomikoski 1960, Salmela & Vilkamaa 2005) but many species, numerous in coniferous sites, were found here in very low numbers (e.g. *Corynoptera boletiphaga* (Lengersdorf), *Camptochaeta camptochaeta* (Tuomikoski) and *Ctenosciara hyalipennis* (Meigen).

Six species new to the Finnish fauna were found, including a new species which is described here.

Corynoptera postforcipata Rudzinski, 1993, was described from Bavaria, Germany, and has been later found in England (Menzel *et al.* 2006).

Leptosciarella juniperi (Mohrig & Blasco-Zumeta, 1996), was described from Spain, and it has been found later in Canary Islands, Italy, Austria, Czech Republic and Turmenia (Menzel & Mohrig 1997).

Leptosciarella subcoarctata Mohrig & Menzel, 1997, has up to now been known only from the holotype, collected in Russia, Tuva.

Leptosciarella yerburyi (Freeman, 1983) was described from Scotland, subsequent records are from Ireland, Germany, Austria, Slovakia, Lithuania and Ukraine (Mohrig & Menzel 1997) and from England (Menzel *et al.* 2006), Hungary (Rulik *et al.* 2001), and the Czech Republic (Menzel *et al.* 2000).

Phytosciara macrotricha (Lengersdorf, 1926) was described from Austria, and the species has a wide distribution from Central Europe to the Baltic countries (Mohrig & Menzel 1994).

Sciara nursei Freeman, 1983 was described from England. The taxonomic and nomenclatural confusion regarding the complex '*nursei-marginata-flavomarginata-ulrichi*' was clarified by Menzel *et al.* (2006). *Sciara nursei* (mostly under *S. ulrichi*) has a wide Palaearctic distribution (Menzel 1998, 2000, 2001, 2002) but our record is the first from northern Europe.

3.2. Taxonomy

According to Menzel and Mohrig (2000), the *Bradysia praecox* group is characterized e.g. by short mesial setosity of the mesonotum, palpomere 1 with simple or only indistinctly demarcated sensory area (in some species a distinct pit), palpomere 2 without long lateral setae (seems to vary between species).

3.2.1. Key to the males of the Finnish species of the Bradysia praecox group

1. Bases of gonocoxites with area of dense setosity, apex of tegmen with minute teeth, aedeagal teeth in groups of two or three, sensilla of palpomere 1 in patch, not in pit
praecox (Meigen)

Table 1. Sciaridae collected with two Malaise traps in Kivijärvi Nature Reserve, southern Finland. I–V = sampling periods: I = 20.V.–3.VI, II = 3.VI.–6.VII, II = 6.VII.–3.VIII, IV = 3.VIII.–15.IX., V = 15.IX.–5.X. The species marked with an asterisk (*) are new to the Finnish fauna.

	I	II	III	IV	V
Bradysia exselsa Menzel & Mohrig, 1998		1		1	
Bradysia hilariformis Tuomikoski, 1960		12			
Bradysia lobulifera Frey, 1948			1		
Bradysia nitidicollis (Meigen, 1818)		7			
Bradysia rectinervis Frey, 1948		1			
Bradysia fungicola gr. sp.				2	
**Bradysia arcula* sp. n.		2			
Camptochaeta camptochaeta (Tuomikoski, 1960)		3			
Camptochaeta fallax Hippa & Vilkamaa, 1994		2			
Camptochaeta hirtula (Lengersdorf, 1934)		1			
Camptochaeta uniformis (Mohrig & Menzel, 1990)			2		
Claustropyga heteroclausa (Rudzinski, 1991)					2
Claustropyga subcorticis (Mohrig & Krivosheina, 1985)		1			
Corynoptera bicuspidata (Lengersdorf, 1926)		1			
Corynoptera bistrispina Tuomikoski, 1960		1	3	2	1
Corynoptera boletiphaga (Lengersdorf, 1940)		1		1	
**Corynoptera postforcipata* Rudzinski, 1993			1		
Corynoptera furcifera Mohrig & Mamaev, 1987			1		
Corynoptera hypopygialis (Lengersdorf, 1926)			1		
Corynoptera inexspectata Tuomikoski, 1960				1	
Corynoptera luteofusca (Bukowski & Lengersdorf, 1936)			2	1	
Corynoptera membranigera (Kieffer, 1903)			2	1	
Corynoptera obscuripila Tuomikoski, 1960		4	15	2	
Corynoptera subdentata Mohrig, 1985		11	1		
Corynoptera saccata Tuomikoski, 1960		2	1		1
Corynoptera subtilis (Lengersdorf, 1929)				2	
Corynoptera triacantha Tuomikoski, 1960			2		
Corynoptera unidentata (Hippa & Vilkamaa, 1994)			3	3	
Ctenosciara hyalipennis (Meigen, 1804)		1			
Epidapus atomarius (De Geer, 1778)		4	6		
Leptosciarella dimera (Tuomikoski, 1960)	5	5			
Leptosciarella fuscipalpa (Mohrig & Mamaev, 1979)		10	1		
**Leptosciarella juniperi* (Mohrig & Blasco-Zumeta, 1996)		1			
Leptosciarella rejecta (Winnertz, 1867)		1	11	1	
Leptosciarella scutellata (Staeger, 1840)		1	2		
**Leptosciarella subcoarctata* Mohrig & Menzel, 1997	1	12			
Leptosciarella trochanterata (Zetterstedt, 1851)		7			
**Leptosciarella yerburyi* (Freeman, 1983)		5	1		
Lycoriella globiceps (Becher, 1886)	1		1		
Lycoriella ingenua (Dufour, 1838)					
Lycoriella lundstromi (Frey, 1948)				1	
Lycoriella sp.		1			
Peyerimhoffia crassistylata (Frey, 1948)		5	1		
Peyerimhoffia vagabunda (Winnertz, 1867)		2	3		
Phytosciara macrotricha (Lengersdorf, 1926)			2		
Pseudolycoriella brunnea (Bukowski & Lengersdorf, 1936)		1		1	6
Scatopsciara tricuspidata (Winnertz, 1867)		4	2	2	
**Sciara nursei* Freeman, 1983					1
Scythropochroa radialis Lengersdorf, 1926		3	3		
Trichosia acroricha Tuomikoski, 1960			1	1	
Trichosia confusa Menzel & Mohrig, 1997			1		
Trichosia flavicoxa Tuomikoski, 1960		1			
Trichosia morio (fabricius, 1794)		4	4	5	
Trichosia splendens Winnertz, 1867			3		
Xylosciara heptacantha Tuomikoski, 1957		1			
Xylosciara longiforceps (Bukowski & Lengersdorf)		1			
Xylosciara misella (Frey, 1948)		1			
Zygoneura sciarina Meigen, 1830		2			
Total (247)	7	124	76	28	12

- Bases of gonocoxites with normal setosity, apex of tegmen without minute teeth, aedeagal teeth solitary, sensilla of palpomere 1 in pit 2
2. Wing length 1.7–2.0 mm, anal lobe of wing strong *nitidicollis* (Meigen)
- Wing length > 2.3 mm, anal lobe of wing weak 3
3. Gonostylus broadest subapically, apical megasetae as thick and longer than apical tooth *vernalis* (Zetterstedt)
- Gonostylus broadest at about its middle, apical megasetae more slender and at most as long as apical tooth 4
4. Sensory pit of palpomere 1 small, ca. 1/3 of width of palpomere 1; setosity of gonocoxite short and dense, area between apical tooth and apical megasetae setose *iridipennis* (Zetterstedt)
- Sensory pit of palpomere 1 large, more than ½ of width of palpomere 1, setosity of gonocoxite long and sparse, area between apical tooth and apical megasetae non-setose *arcula* sp. n.

3.2.2. Bradysia arcula sp. n.

Material studied. Holotype male: FINLAND, *Ta* (Tavastia australis), Urjala, Kivijärvi Nature Reserve, Kalkkimäki (60°59'N 23°26'E (= 6770: 308), grove, Malaise trap, 3.VI.–6.VII.2003, J. Salmela & O. Härmä (MZH). *Paratypes*: same data as holotype, 1 ♂ (MZH); *Obb* (Ostrobothnia borealis), Rovaniemi, Kivalo 73587:34881, 3.VIII.2004, J. Salmela, 1 ♂ (MZH); *Obb,* Tervola, Pihlajakuru W (7354251:3412039), 3.VII.–2.VIII.2004, J. Salmela, 1 ♂ (DEI); *Ta,* Lahti, Mukkula, (676:92), 19.–25.VI.2002, O. Blomster, 1 ♂ (MZH); *Tb* (Tavastia borealis), Konnevesi, Teerimäki, (6941:468), 21.VI.2003, J. Salmela, 1 ♂ (MZH); *Tb* (Tavastia borealis), Saarijärvi, Pyhä-Häkki N.P., E Poika-Aho farm (62.51 N 25.26 E), spruce-pine forest, Malaise trap, 7.VI.–4.VII.2004, M. & C. Jaschhof, 1 ♂ (MZH); CANADA, Nova Scotia, CBHNt. Pk. Beulach Ban Fls. PG813869, wet rock face, 1.VII.1984, H.J. Teskey, 1 ♂ (CNC).

Description (male). Head. Eye bridge with 2–3 rows of facets. Interfacetal setae present. Antennal scape and pedicel dark brown. Antennal flagellum pale brown, long. Antennal flagellomeres becoming slightly longer towards apex of flagellum; length/width of flagellomere 4 2.30–2.90 (Fig. 1a). Flagellomeres with rather densely placed setae and sensilla, longest setae about as long as flagellomeral width. Flagellomeral necks distinct, concolorous with flagellomeral bodies, shorter than wide. Prefrons and clypeus dark brown. Prefrons with 57–92 setae, short but among them some stronger ones. Clypeus with 1–8 long and strong setae. Maxillary palpus (Fig. 1b) with 3 palpomeres. Palpomere 1 long and thick, with large distinct sensillar pit with ca. 20 hyalinous sensilla densely placed; with 3–7 long setae, one of which distinctly longer than others. Palpomere 2 slightly shorter and more slender than palpomere 3, with some long and shorter sharp setae and some truncate short sensilla. Palpomere 3 possibly as long as palpomere 2 (Fig. 1b may be misleading due to the orientation of the palp), with some truncate sensilla, two distal longest.

Thorax. Dark to medium brown. Thoracic setae pale and relatively fine. Acrocentrals in indistinct rows, dorsocentrals in indistinct rows of 1–3 setae, laterals in indistinct rows of 4–5 setae. Posterior pronotum bare, anterior pronotum with 10–18 setae, episternum 1 with 17–29 setae. Scutellum with numerous short, and two longer and stronger setae.

Wing. Fumose brown. Length 2.3–2.9 mm, width/length 0.40–0.45. Anal lobe normal, small; c/w 0.65–0.75, R1/R 0.75–0.85. Fork of M shorter than stM. R5 with numerous dorsal and a few ventral setae, r-m with 3–6 dorsal setae, bM with 2–4 dorsal setae. stM, M and Cu non-setose. Halteres pale, with short stalk.

Legs. Pale brown, tarsi slightly darker brown; long and strong. Setae pale. Femora normal, not thickened. Length of basitarsomere 1/tibia 1 0.55–0.60. Tibiae, in addition to normal socketed and non-socketed setae, with some spinose setae on all sides except dorsally, T1 with a subapical prolateral comb of 4–6 (7) spinose setae (Fig. 1c). T3 with indistinct row of spinose setae ventrally at apical half, and distinct apical retrolateral row of spinose setae. Tibial spurs 1+2+2, longer than apical diameter of tibiae, subequal in length in T2 and T3. Tarsal claws simple, without teeth.

Abdomen. Normal, pale brown, paler than

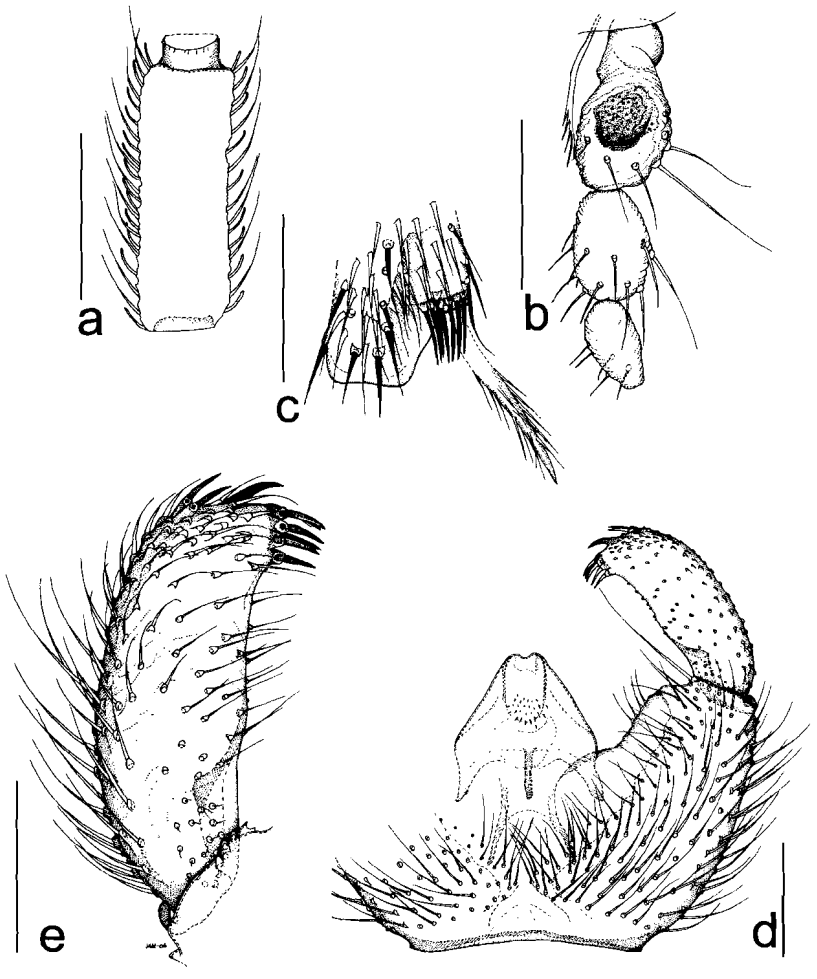

Fig. 1. *Bradysia arcula* sp. n. (holotype). – a. Antennal flagellomere 4, ventral view. – b. Maxillary lacinia and palp, dorsal view. – c. Apex of fore tibia, prolateral view. – d. Part of hypopygium, ventral view. – e. Part of gonostylus, ventral view. Scale 0.10 mm.

thorax, concolorous with femora and tibiae. Setae pale, slender, rather densely placed on sclerites.

Hypopygium (Fig. 1d). Pale brown. Gonocoxites separate, intercoxal area with non-setose stripe, without lobes or groups of densely placed setae. Gonocoxite non-modified, longer than broad, with a distinct long and strong seta at ventral and dorsal apicomesial corner, setae long; mesial membranous area non-setose.Tegmen about as long as wide, widest sub-basally, tapering slightly towards apex: apodemes strong and well sclerotized; parameres weakly sclerotized; apex of tegmen with membraneous area; tegmen with dorsal sclerotized oval ridge, interrupted apically. Aedeagal stalk short, strongly sclerotized, aedeagal plate with ca. 20 elongate, separate teeth. Sternite 9 with 1–2 setae.

Gonostylus (Fig. 1e). Narrow and elongate, widest submedially, slightly tapering towards apex. Apical tooth strong and curved, placed high on lateral side of apex of gonostylus. Gonostylus with two apical (lateral) and 5–6 subapical megasetae, the latter separated from apical tooth by a non-setose area. Lateral setae of gonostylus relatively short, longest ones about as long as gonostylar width.

Discussion. Bradysia arcula belongs to the *Bradysia praecox* group of Menzel and Mohrig (2000). Of those species of the group, which have been found in Finland (*B. iridipennis, B. nitidicollis, B. praecox* and *B. vernalis*), *B. arcula* is most similar to *B. iridipennis* by having the gonostylus broadest near its middle. *B. arcula* differs by its relatively narrower gonostylus, by having the area between the apical tooth of gonostylus and the apical megasetae non-setose, by

having the setosity of gonocoxite sparser but longer and by having the tegmen with a dorsal sclerotized ring and by having a much larger sensillar pit on palpomere 1.

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