Fungus gnat species new to Luxembourg (Diptera: Keroplatidae, Mycetophilidae)

Olavi Kurina[1], Alexander M. Weigand[2,3] & Dieter Weber[2,3,4]

[1] Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi st 5, 51006 Tartu, Estonia · olavi.kurina@emu.ee https://orcid.org/0000-0002-4858-4629

[2] Musée national d'histoire naturelle, 25, rue Münster, L-2160 Luxembourg, Luxembourg · alexander.weigand@mnhn.lu https://orcid.org/0000-0001-7587-6531

[3] Fondation faune-flore, Musée national d'histoire naturelle, 25, rue Münster, L-2160 Luxembourg, Luxembourg

[4] Senckenberg Deutsches Entomologisches Institut, Eberswalder Straße 90, D-15374 Müncheberg, Germany · dieter.weber124@gmx.de https://orcid.org/0000-0001-7813-842X

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Abstract. Four fungus gnat species – *Macrocera crassicornis* Winnertz, 1864, *Macrorrhyncha flava* Winnertz, 1846, *Exechiopsis* (*E.*) *pseudindecisa* Lastovka & Matile, 1974, and *Mycetophila rudis* Winnertz, 1864 – are recorded from Luxembourg for the first time. The number of fungus gnat species in Luxembourg has risen to 80. *Mycetophila rudis* is documented for the first time from a subterranean environment.

Keywords. Cave fauna, *Exechiopsis* (*E.*) *pseudindecisa*, *Macrocera crassicornis*, *Macrorrhyncha flava*, *Mycetophila rudis*.

1. Introduction

Fungus gnats represent a diverse group of nematoceran flies (Diptera: Nematocera), predominantly inhabiting forest environments. Within Europe, the group incorporates members of five families, i.e., Diadocidiidae, Ditomyiidae, Bolitophilidae, Keroplatidae, and Mycetophilidae, numbering more than 1200 species (Chandler 2005). These diminutive insects, adorned in colours ranging from yellow and brown to black, exhibit a marked preference for damp and shaded environments. Their larvae are largely mycophagous, feeding on mycelium-infused litter or can also be predators (e.g., Ševčík 2010; Jakovlev 2012). During unfavourable weather conditions and for hibernation, they frequently use caves and artificial subterranean cavities, such as vaults and cellars, as shelters.

The exploration of fungus gnats in Luxembourg remains relatively superficial, with limited studies conducted so far. The Fauna Europaea database lists merely six species (Chandler 2005), but a more comprehensive insight emerges from the work of Plassmann & Weber (2013), who documented an additional 70 species within cave ecosystems across the country. Moreover, the Species Observation Database curated by MNHN Luxembourg (https://mdata.mnhn.lu/) includes 73 species of fungus gnat species, all of which are also covered by Chandler (2005) and/or Plassmann & Weber (2013). Comparatively, Luxembourg's neighbouring countries possess a more thorough understanding of fungus gnat diversity. There are 452 species known from France mainland and 673 species from Germany (Chandler 2005), whereas Belgium lists 332 species (Kurina & Grootaert 2023).

Recent collecting efforts in Luxembourg's caves have provided new insights into the diversity of fungus gnats, which are presented herewith.

2. Material and methods

Luxembourg harbours numerous caves, mostly in sandstone, but most of them are less than ten metres long. However, the country has an interesting and heterogeneous mining history with mines exploited for slate, gypsum, dolomite, copper, antimony and iron ore, some of which are several kilometres long (Weber 2013). Both caves and mines are frequently investigated biospeleologically in the context of a regular monitoring of subterranean sites. Opportunistic collecting, in which the objects are divided up and collected at 5 metre intervals, is combined with barber trapping. Depending on the size of the object, traps are set 5 metres or 10 metres from one another. All objects are surveyed once in summer and once in winter. The barber traps are emptied after 4-6 weeks. Specimens were collected and preserved in pure propylene glycol. In cases where a detailed study of male terminalia was necessary for identification, they were detached and treated in a hot 10% KOH solution for maceration, followed by neutralization in acetic acid and washing in distilled water. The remaining chitinous parts were then inserted into glycerine and preserved as glycerine preparations in small polyethylene microvials after examination. Habitus photos were compiled using LAS X software from multiple gradually focused images taken in alcohol medium by a Leica K5C camera attached to a Leica 205C stereomicroscope (see also Kurina et al. 2023). Adobe Photoshop CS5 was used for editing the figures and compiling the plate. The studied specimens are preserved in 2 ml plastic vials in isopropanol and deposited in the wet collection of the Musée national d'histoire naturelle de Luxembourg (MNHNL).

To protect the caves and artificial caverns, the 3rd decimal place of the WGS 84 coordinates was removed from the collecting list.

3. Results

The collected material comprises four species new to Luxembourg including two species of Keroplatidae and two species of Mycetophilidae.

3.1. Keroplatidae Rondani, 1856

Macrocera crassicornis Winnertz, 1864 (Fig. 1C)

Material. 1 ♂, Bitzmaschinn, a partly artificial cave of the Mamerlayen group, close to Schoenfels, south of Mersch, 49.76N, 6.10E. Leg. Dieter Weber, hand collecting 24 May 2022, 2-5 m from cave eaves. Inv.-Nr. 220524-29, collection number MNNHL129853.

A Palaearctic species, widespread in Europe. Recorded from neighbouring countries except Belgium (Chandler 2005; Kurina & Grootaert 2023). In Germany (Rhineland-Palatinate), earlier recorded also from subterranean environments (Weber et al. 2007).

Macrorrhyncha flava Winnertz, 1846 (Fig. 1D)

Material: 1 ♂, Salles Gregoire, a mainly artificial cavern of the Mamerlayen group, close to Schoenfels, south of Mersch, 49.73N, 6.08E. Leg. Dieter Weber, Barber trap, 24. May 2022 – 13. July 2022, 10 m from cave eaves. Inv.-Nr. 220713-116, collection number MNNHL129854.

A widely distributed European species. Recorded from neighbouring countries (Chandler 2005; Kurina & Grootaert 2023). In Germany (Rhineland-Palatinate), earlier recorded also from cave environments (Weber et al. 2007).

3.2. Mycetophilidae Newman, 1834

Exechiopsis* (*Exechiopsis*) *pseudindecisa Lastovka & Matile, 1974 (Fig. 1B)

Material: 1 ♂, Haascht (= Grande Fleur), fissure cave, close to Schoenfels, south of Mersch, 49.71N, 6.08E. Leg. Marie-Therese Majerus, Carmen Greisen, Dieter Weber, hand collecting, 11. January 2023, 45-50 m from cave eaves. Inv.-Nr. 230111-42-2, collection number MNNHL129855.

1 ♂, Untere Dolomitgrube Wasserbillig, dolomite rock mine close to Wasserbillig, 49.72N, 6.49E. Leg. Dieter Weber, hand collecting, 30 July 2012, 50-55 m from cave eaves. Inv.-Nr. pl 57733, in the collection of Eberhard Plassmann †, Bavarian State Collection for Zoology, Munich.

A Palaearctic species, widespread in Europe (Chandler 2005). Very similar to *E. (E.) indecisa* (Walker) and may have been confused with this species in earlier

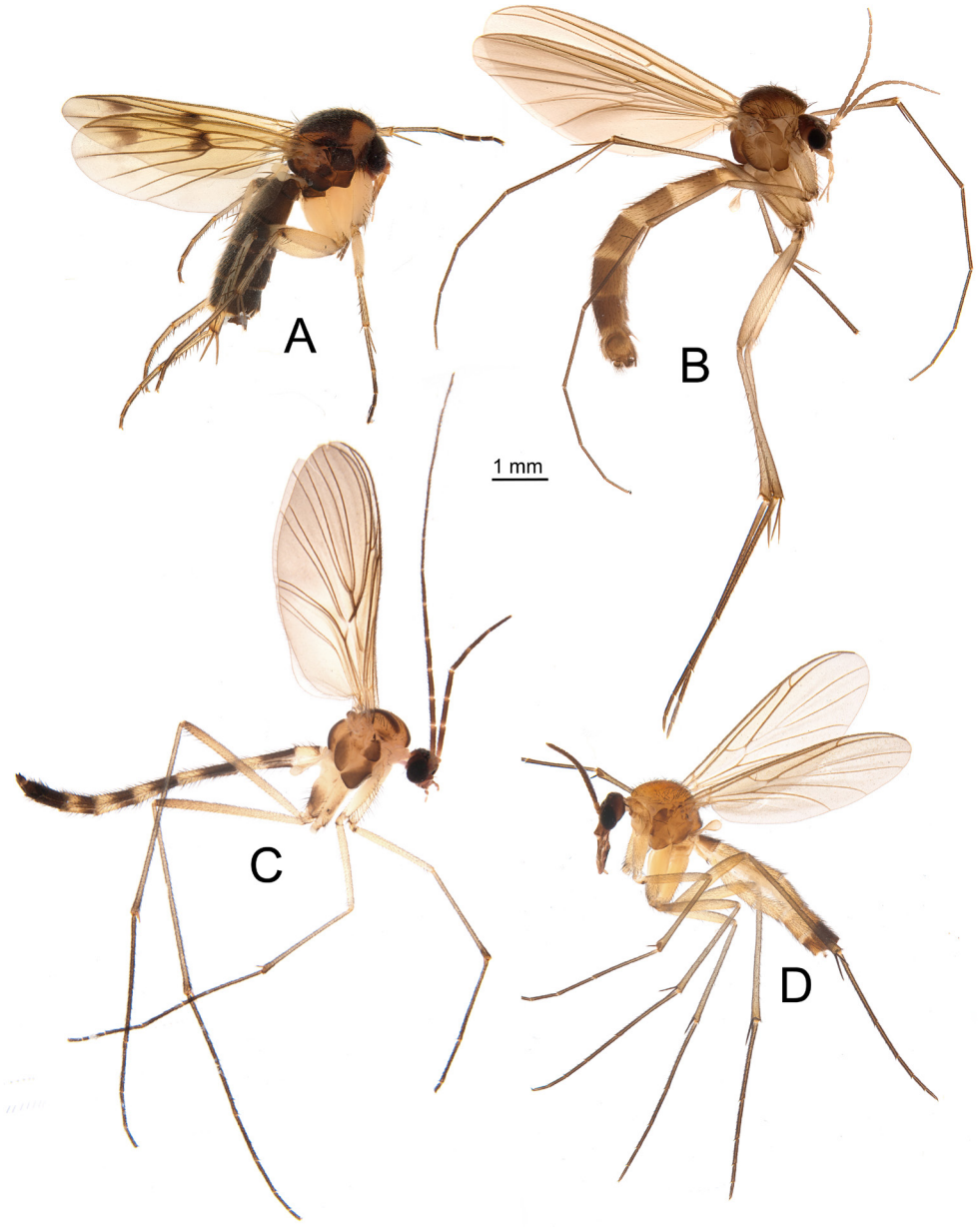


Figure 1. Habitus of fungus gnats new to Luxembourg. A: *Mycetophila rudis* Winnertz, 1864, terminalia detached B: *Exechiopsis* (*E.*) *pseudindecisa* Lastovka & Matile, 1974. C: *Macrocera crassicornis* Winnertz, 1864. D: *Macrorrhyncha flava* Winnertz, 1846, terminalia detached.

studies (Chandler 2022). Recorded from neighbouring countries except Belgium (Chandler 2005; Kurina & Grootaert 2023). Recorded also from subterranean environments throughout Europe (Weber et al. 2007).

Mycetophila rudis Winnertz, 1864 (Fig. 1A)

Material: 1 ♂, Gipsminn Walfer, gypsum mine close to Walferdange, 49.66N, 6.15E. Leg. Alexander Weigand, Dieter Weber, hand collecting, 17. February. 2023, 45-50 m from cave eaves. Inv.-Nr. 230217-87, collection number MNNHL129856.

A Western Palaearctic species, widespread in Europe and also found in the Oriental Region (Chandler 2005). Recorded from the neighbouring countries except France (Chandler 2005; Kurina & Grootaert 2023). This is the first record of *M. rudis* from a subterranean environment.

4. Discussion

Together with earlier recorded species (Chandler 2005; Plassmann & Weber 2013), the current count of fungus gnats in Luxembourg stands at 80 species. However, this number only scratches the surface of the true species diversity. For comparison, a comprehensive survey of fungus gnats in a small botanic garden in Brussels, Belgium, yielded as many as 206 species (Kurina & Grooteart 2023). The majority of fungus gnat species in Luxembourg have been documented from subterranean environments such as caves and mines. Consequently, several species-rich genera, such as *Mycomya* Rondani, *Boletina* Staeger, *Mycetophila* Meigen, and *Trichonta* Winnertz, which are not typically associated with caves, are evidently underrepresented in the list of Luxembourg's fungus gnats. Due to the fact that none of the listed species is rare, but all four species were found in caves or artificial caverns with an extremely low number of individuals, they are all categorised as eutrogloxenes.

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