

A constellation of fungus gnats (Diptera: Keroplatidae and Mycetophilidae) from caves of the Parc Natural dels Ports, Tarragona, Western Catalonia

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Abstract

A constellation of fungus gnats (Diptera: Keroplatidae and Mycetophilidae) from caves of the Parc Natural dels Ports, Tarragona, western Catalonia.— A preliminary approximation of the fungus gnat fauna (Diptera: Keroplatidae and Mycetophilidae) is presented, captured in caves of the Parc Natural dels Ports (Tarragona, Catalonia) following surveys conducted in the massif in 2012. We report a total of 11 species from ten prospected caves and provide data on the biology and images where possible. *Exechiopsis coremura* (Edwards) stands out due to few previous records of this species in the Iberian peninsula.

Key words: Cave Habitats, Diptera, Mycetophilidae, Keroplatidae, Ports, Catalonia

Resumen

Una constel·lació de moscas de los hongos (Diptera: Keroplatidae y Mycetophilidae) de cuevas del Parc Natural dels Ports, Tarragona, Cataluña Occidental.— Se presenta una primera aproximación a la fauna de moscas y mosquitos de los hongos (Diptera: Keroplatidae y Mycetophilidae) recolectada en las cuevas del Parc Natural dels Ports (Tarragona), como resultado de las prospecciones realizadas en el macizo durante el año 2012. Se citan un total de 11 especies recolectadas en las 10 cuevas prospectadas y, cuando es posible, se ofrecen datos sobre su biología así como imágenes de las especies citadas. La especie *Exechiopsis coremura* (Edwards) destaca especialmente debido a las escasas citas de la misma en la península Ibérica.

Palabras clave: Hábitat cavernícola, Diptera, Mycetophilidae, Keroplatidae, Ports, Cataluña

Resum

Una constel·lació de mosques dels fongs (Diptera: Keroplatidae i Mycetophilidae) de coves del Parc Natural dels Ports (Terra Alta, Baix Ebre, Montsià), Catalunya Occidental.— Es presenta una primera aproximació a la fauna de mosques i mosquits dels fongs (Diptera: Keroplatidae i Mycetophilidae) recol·lectada a les coves del Parc Natural dels Ports (Terra Alta, Baix Ebre, Montsià), com a resultat de les prospeccions practicades al massís durant l'any 2012. Se citen un total d'11 espècies recol·lectades a les 10 coves prospectades i, quan és possible, s'ofereixen dades sobre la seva biologia i imatges de les espècies esmentades. L'espècie *Exechiopsis coremura* (Edwards) destaca especialment perquè ha estat molt poc citada a la península Ibérica.

Paraules clau: Hàbitat cavernícola, Diptera, Mycetophilidae, Keroplatidae, Ports, Catalunya

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Introduction

Fungus gnat families (Keroplastidae and Mycetophilidae) in the Iberian peninsula include approximately 261 species (Chandler & Báez, 2002). They are mainly found in forest or wooded areas where they develop in fruiting bodies of large fungi or in rotting wood, with a few species developing in bryophytes and bird nests (Chandler, 2004). Keroplastidae larvae mostly live in slimy webs that they produce underneath the fruiting bodies of polypores or on dead wood (Evenhuis, 2006), although the larvae of some species are predaceous (Jakovlev & Siitonen, 2004). Mycetophilidae larvae usually develop inside fungal fruiting bodies, under bark, in sporophores, or on hyphae penetrating decaying wood or rotting organic matter and other plant material, above all in dead wood (Gammelmo & Søli, 2006; Søli et al., 2009).

Adults of both families are often found in dark, damp places (e.g. caves), resting under fallen decaying logs, wet rock shelters, and similar. Fungus gnat fauna from caves, mines and other cave systems in Europe has been widely studied (e.g. Tollet, 1955, 1959; Burghel-Balacesco, 1965, 1966, 1972; Hutson, 1978, 1980; Østbye et al., 1987; Plassmann & Weber, 1988; Weber et al., 2007), and with some exceptions, most of these species are considered troglonexes, occupying the caves during the hibernation period (Kjaerandsen, 1993).

In 2012, staff of the Arthropods Department of the Museu de Ciències Naturals de Barcelona (MCNB) and the Societat Catalana de Bioespeleologia (Catalan Biospeleology Association, BIOSP) conducted a series of surveys in the Parc Natural dels Ports (Tarragona, western Catalonia) with the aim of studying the arthropod fauna present in the caves of this limestone massif (fig. 1). This 35,050 hectare natural park has 28% of its surface above 1,000 m altitude, reaching its peak of 1,441 m in the Caro mountain. The park has over 200 species of vertebrates and 1,370 taxa of vascular flora, with red pine forest (*Pinus sylvestris* Linnaeus) being the most abundant, occupying 32.4% of the territory (fig. 2). Despite the scientific community's interest in this park for its scenic and natural value and conservation status, very little is known about existing arthropod fauna, and attention has focused on very specific groups (e.g. Coleoptera and Lepidoptera) and species of special interest or endangered.

As a result of a survey of 10 caves with wide diversity in their topology and development, 10 species of seven genera of the family Mycetophilidae and one species of Keroplastidae were collected. We offer a portrait of all these species and their distribution in the studied caves.



Fig. 1. Parc Natural dels Ports (Tarragona, western Catalonia) and location of the 10 prospected caves (see Material and methods).

Fig. 1. Parc Natural dels Ports (Tarragona, Cataluña Occidental) y localización de las 10 cuevas prospectadas (ver Material y métodos).

Material and methods

The specimens were captured using several sampling methods both at the entrance to the caves and in the interior. We combined direct capture by entomological net and traps with attractant or bait (cheese and dried meat combined). Samples were preserved in 70% EtOH and are deposited in the general collection at MCNB. We used a Motic Stereomicroscopy SMZ-168 and all the images (field and lab) were taken with an iPhone4.

During the study a total of 10 caves were examined (fig. 1): 1. Avenc Ermets de Pas-samonte; 2. Cova del Conill; 3. Avenc del Sabarín; 4. Forat del Riu Algars; 5. Avenc del Polit (without samples); 6. Avenc dels Mamelons (without samples); 7. Avenc de la Crisi; 8. Avenc del Salany (without samples); 9. Avenc de la Barcina (without samples) and 10. Cova Trobada. Specimens were found in six caves (1, 2, 3, 4, 7 and 10) but not in the remaining four (5, 6, 8 and 9).

Results and discussion

During the preliminary sampling from April 19 to August 31 of 2012, a total of 107 specimens were obtained: a single specimen of Keroplatidae, belonging to the species *Macrocera fasciata* Meigen (fig. 3A), and 106 specimens of Mycetophilidae, distributed among 10 species: *Exechia fulva* Santos Abreu (fig. 3B), *Exechiopsis (Exechiopsis) coremura* (Edwards) (fig. 3C), *Exechiopsis (Exechiopsis) jenkinsoni* (Edwards) (fig. 4A), *Exechiopsis (Exechiopsis) pseudindecisa* (Laštovka & Matile) (fig. 4B), *Exechiopsis (Exechiopsis) unguiculata* (Lundström) (fig. 4C), *Mycetophila marginata* Winnertz (fig. 5A), *Mycomya cinerascens* (Macquart) (fig. 5B), *Phronia tenuis* Winnertz (fig. 5C), *Rymosia affinis* Winnertz (fig. 6A) and *Tarnania dziedzickii* (Edwards) (fig. 6B). Table 1 shows details of collection data.



Fig. 2. An exechiine (tribe Exechiini) in Avenc dels Mamelons, possibly an *Exechia* species, a representative of the arthropod fauna studied in 2012 (A), and the red pine forest, the most abundant tree species in the park (B).

Fig. 2. Un micetofílido (tribu Exechiini) en el Avenc dels Mamelons, possiblement de la espècie *Exechia*, un representant de la fauna de artròpodos estudiada en 2012 (A), y el bosque de pino rojo, el árbol más abundante en el parque (B).

The largest number of specimens were found at the cave entrances or within the first metre, where the cavities provide a gloomy environment. Caves with horizontal development (Ermets de Passamonte, Conill, Sabarín, Trobada) contained more specimens in deeper cavities —where there was total darkness— than caves with vertical development (Crisi, Barcina, Polit).

The Avenc del Sabarín cave had the highest number of specimens and the highest diversity, with 52 specimens from eight species. Six species were found only in this cave: *M. fasciata*, *E. fulva*, *E. coremura*, *E. unguiculata*, *M. marginata*, *M. cinerascens* and *P. tenuis*. One of these species, *E. coremura*, is of special interest for the Iberian fauna due to the scarcity of records. In findings to date it has been restricted to the western Mediterranean and its biology is unknown. *Rymosia affinis* showed the widest distribution in the area, being found in four of the caves.

The Mycetophilidae recorded are mostly known to develop in external fungi, either those growing on wood in the case of *Mycetophila marginata* and the *Mycomya* and *Phronia* species, or terrestrial agarics in the case of the *Exechia*, *Exechiopsis*, *Rymosia* and *Tarnania* species. These species enter caves for aestivation or hibernation as adults. Undoubtedly, further study directed towards this group of Diptera will increase the number of known species in the rest of the Ports caves.

The keroplatid *Macrocera fasciata* (fig. 3A) has been reared from larval webs under bark and in tree hollows (Jakovlev, 2011), but there are also records from webs on cellar walls. Edwards (1925) queried an earlier record from larvae said to have been feeding on fungal growth on a cellar wall (Enslin, 1906), but Laurence (1982) confirmed this occurrence when he found larval webs in a cellar, also inhabited by the cave fungus gnat *Speolepta leptogaster* (Winnertz) (Mycetophilidae). Laurence (ibid.) concluded that the larvae of *M. fasciata* were predators of adults of *Speolepta* that he found dead in their webs, predaceous larvae being known in some other Keroplatidae. It is feasible that *M. fasciata* occupies a similar niche within caves.

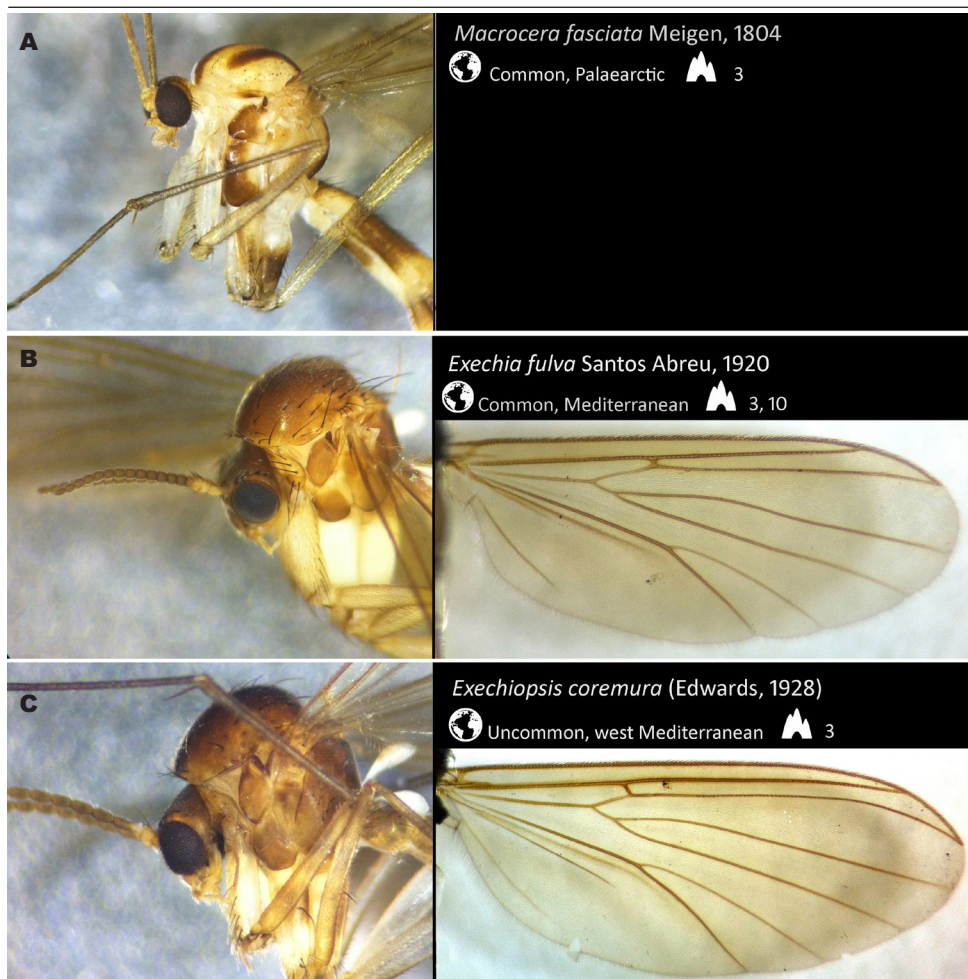


Fig. 3. Keroplatidae and Mycetophilidae specimens collected in the studied caves: *M. fasciata* (A), *E. fulva* (B) and *E. coremura* (C). We provide the status and distribution of each species, followed by the number of the cave where the species is confirmed.
 Fig. 3. Especímenes de Keroplatidae y Mycetophilidae recolectados en la cuevas estudiadas: *M. fasciata* (A), *E. fulva* (B) y *E. coremura* (C). Se indica el estatus y distribución de cada especie seguido del número de la cueva donde su presencia está confirmada.

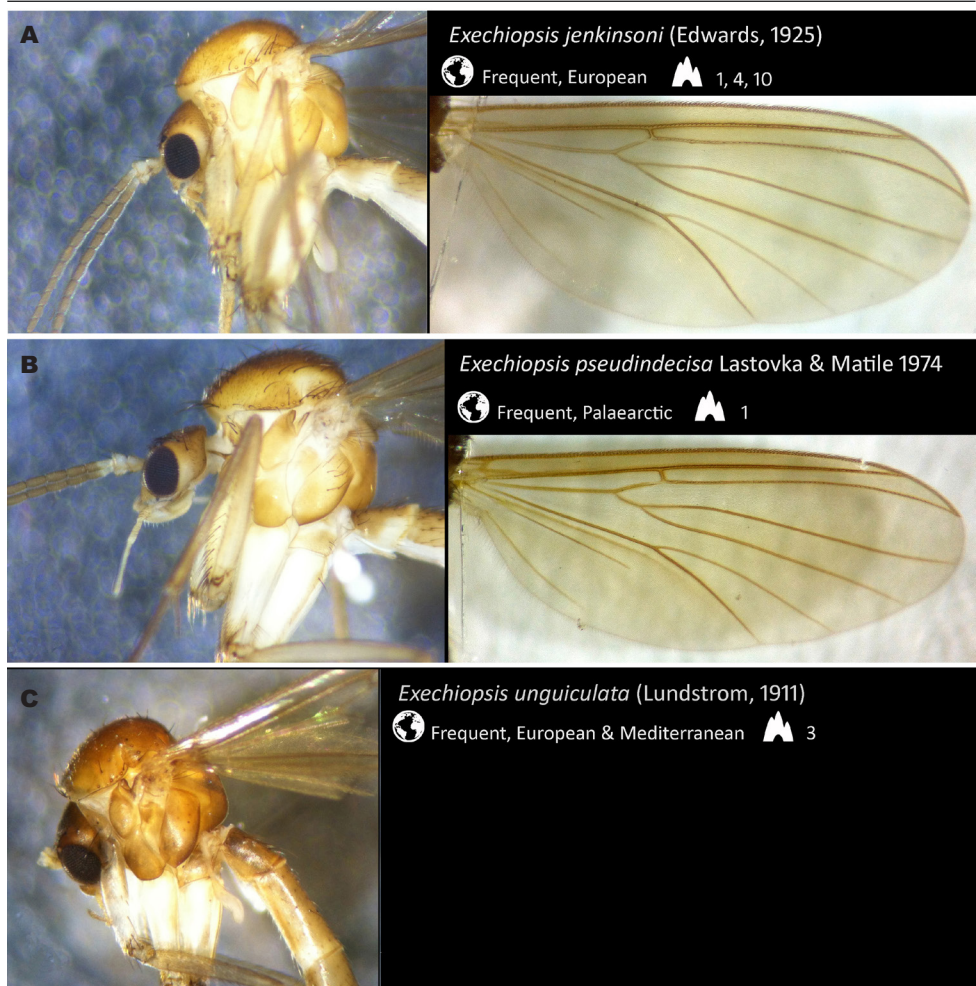


Fig. 4. Mycetophilidae specimens sampled in the studied caves: *E. jenkinsoni* (A), *E. pseudindecisa* (B) and *E. unguiculata* (C). We provide the status and distribution of each species, followed by the number of the cave where the species is confirmed.
 Fig. 4. Especímenes de Mycetophilidae recolectados en las cuevas estudiadas: *E. jenkinsoni* (A), *E. pseudindecisa* (B) y *E. unguiculata* (C). Se indica el estatus y distribución de cada especie seguido del número de la cueva donde su presencia está confirmada.

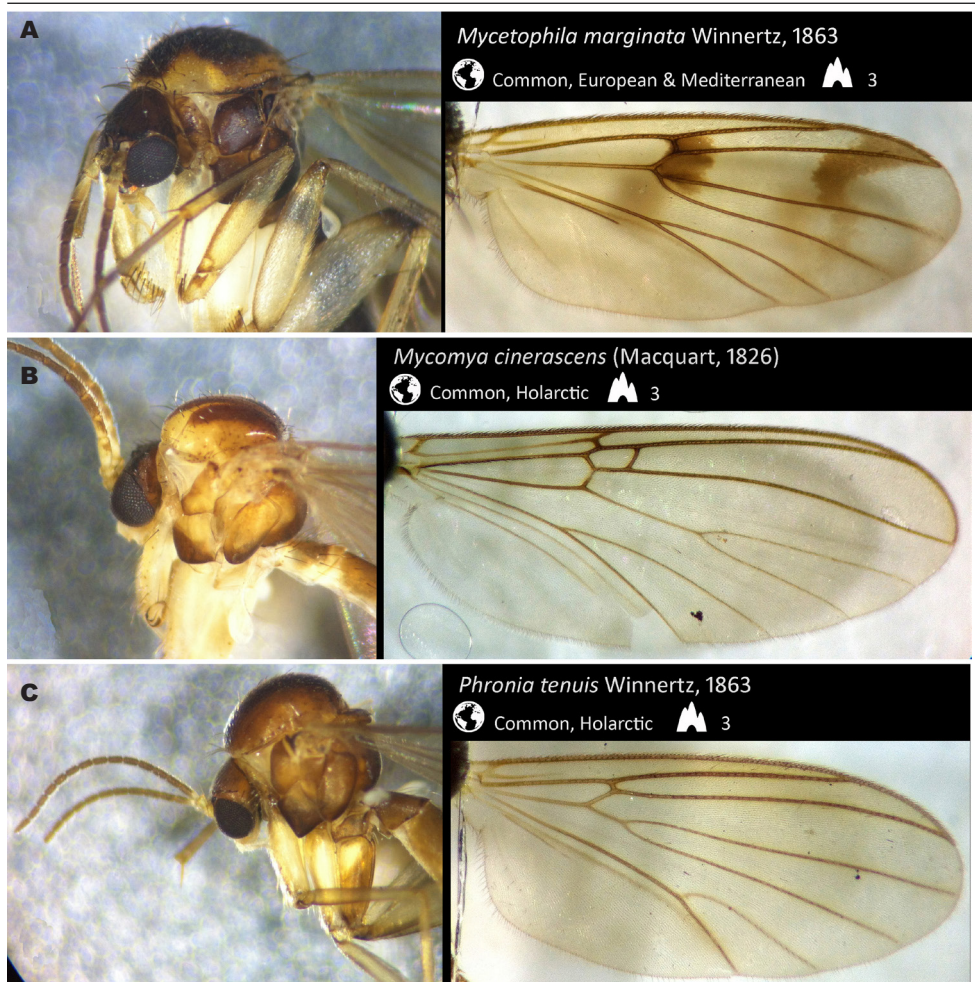


Fig. 5. Mycetophilidae specimens sampled in the studied caves: *M. marginata* (A), *M. cinerascens* (B) and *P. tenuis* (C). We provide the status and distribution of each species, followed by the number of the cave where the species is confirmed.

Fig. 5. Especímenes de Mycetophilidae recolectados en la cuevas estudiadas: *M. marginata* (A), *M. cinerascens* (B) y *P. tenuis* (C). Se indica el estatus y distribución de cada especie seguido del número de la cueva donde su presencia está confirmada.



Fig. 6. Keroplatidae and Mycetophilidae specimens sampled in the studied caves: *R. affinis* (A) and *T. dziedzickii* (B). We provide the status and distribution of each species, followed by the number of the cave where the species is confirmed.

Fig. 6. Especímenes de Keroplatidae y Mycetophilidae recolectados en las cuevas estudiadas: R. affinis (A) y T. dziedzickii (B). Se indica el estatus y distribución de cada especie seguido del número de la cueva donde su presencia está confirmada.

Table 1. Species of Keroplatidae and Mycetophilidae in each cave, number of identified specimens and sex (N), collection date (Cd) and registration number of each sample in the MCNB collection (Man. Museum accessing number).

Tabla 1. Especies de Keroplatidae y Mycetophilidae en cada cueva, número y sexo de los especímenes identificados (N), fecha de recolección (Cd) y número de registro de cada muestra en la colección del MCNB (Man. Museum accessing number).

Cave	Municipality	Lat WGS84	Long WGS84	Scientific name	N	Cd	Man
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Macrocera fasciata</i> Meigen	1♀	2012-06-07	MZB 2012-0557
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Mycomya cinerascens</i> (Macquart)	1♂	2012-06-07	MZB 2013-0030
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Exechia fulva</i> Santos Abreu	2♂, 4♀	2012-06-07	
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Exechiopsis coremura</i> (Edwards)	1♂	2012-06-07	MZB 2013-0031
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Exechiopsis unguiculata</i> (Lundström)	1♂	2012-06-07	MZB 2013-0032
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Rymosia affinis</i> Winnertz	1♀	2012-06-07	MZB 2013-0033
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Mycetophila marginata</i> Winnertz	1♂	2012-06-07	MZB 2013-0034
Avenc del Sabarin	Alfara de Carles	40.81731330	0.31770509	<i>Phronia tenuis</i> Winnertz	1♂, 1♀	2012-06-07	MZB 2013-0035
Cova Trobada	La Sénia	40.75079560	0.24434402	<i>Exechiopsis jenkinsoni</i> (Edwards)	1♀	2012-04-19	MZB 2012-0341
Cova Trobada	La Sénia	40.75079560	0.24434402	<i>Exechiopsis jenkinsoni</i> (Edwards)	1♂	2012-04-19	MZB 2012-0363
Cova Trobada	La Sénia	40.75079560	0.24434402	<i>Exechia fulva</i> Santos Abreu	4♂, 6♀	2012-08-28	MZB 2012-0539
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Exechiopsis pseudindecisa</i> (Laštovka & Matile)	1♂	2012-04-18	MZB 2012-0223
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Exechiopsis jenkinsoni</i> (Edwards)	1♂	2012-04-18	MZB 2012-0247
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Exechiopsis pseudindecisa</i> (Laštovka & Matile)	1♂	2012-04-18	MZB 2013-0036
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Rymosia affinis</i> Winnertz	2♂	2012-04-18	MZB 2012-0249
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Tarnania dziedzickii</i> (Edwards)	1♂	2012-04-18	MZB 2012-0250
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Exechiopsis jenkinsoni</i> (Edwards)	1♂	2012-04-18	MZB 2013-0037
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Exechiopsis pseudindecisa</i> (Laštovka & Matile)	2♂	2012-04-18	MZB 2012-0254
Avenc Ermets Passamonte	Prat del Comte	40.94295264	0.37285969	<i>Tarnania dziedzickii</i> (Edwards)	1♂	2012-04-18	MZB 2012-0255
Avenc Riu Algars	Alfara de Carles	40.81320263	0.27873730	<i>Exechiopsis jenkinsoni</i> (Edwards)	5♂, 1♀	2012-05-07	MZB 2012-0376
Avenc de la Crisi	Tortosa	40.81382105	0.30429539	<i>Rymosia affinis</i> Winnertz	3♂	2012-05-31	MZB 2012-0242
Avenc de la Crisi	Tortosa	40.81382105	0.30429539	<i>Tarnania dziedzickii</i> (Edwards)	1♀	2012-05-31	MZB 2012-0577
Cova del Conill	Horta de Sant Joan	40.94118720	0.34144103	<i>Rymosia affinis</i> Winnertz	3♂, 1♀	2012-08-31	MZB 2012-0578
Cova del Conill	Horta de Sant Joan	40.94118720	0.34144103	<i>Tarnania dziedzickii</i> (Edwards)	1♀	2012-08-31	MZB 2013-0029

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References

- Burghele–Balacesco, A., 1965. Specii noi de Mycetophilidae cavernicole din România. *Lucr. Inst. Speol. 'E. Racovita' Acad. Repub. Pop. Rom.*, 4: 171–179.
- 1966. Les Mycetophilidae (Diptères) cavemicoles de la collection Biospeologica (IV–VIII séries des "Grottes visitées"). *International Journal of Speleology*, 2: 319–334.
- 1972. Contribution à l'étude de Mycetophilidae des grottes de Roumanie avec la description de deux espèces nouvelles. *International Journal of Speleology*, 3–4: 387–395.
- Chandler, P., 2004. Fungus gnats (Diptera, Sciaroidea: Ditomiyidae, Keroplatidae and Mycetophilidae). In: *Invertebrati di una Foresta della Pianura Padana, Bosco della Fontana, Secondo Contributo. Conservazione Habitat Invertebrati*, 3: 197–203 (P. Cerretti, F. Mason, G. Nardi, M. Tisato & M. Zapparoli, Eds.). Cierre Grafica Editore, Verona.
- Chandler, P. J. & Báez, M., 2002. Keroplatidae p. 52–53, Mycetophilidae p. 59–64. In *Catálogo de los Díptera de España, Portugal y Andorra (Insecta). Monografías Sociedad Entomológica Aragonesa*, 8 (M. Carles–Tolrà Hjorth–Andersen, Coord.). Sociedad Entomológica Aragonesa (SEA), Zaragoza.
- Edwards, F. W., 1925. British fungus–gnats (Diptera, Mycetophilidae). With a revised generic classification of the family. *Transactions of the Royal Entomological Society of London*, 1924: 505–670.
- Enslin, E., 1906. Die Lebensweise von *Macrocera fasciata* MEIG. *Zeitschrift für Wissenschaftliche Insektenbiologie*, 2: 251–253.
- Evenhuis, N. L., 2006. Catalog of the Keroplatidae of the world. *Bishop Museum Bulletin in Entomology*, 13: 1–177.
- Gammelmo, Ø. & Søli, G., 2006. Norwegian fungus gnats of the family Mycetophilidae (Diptera, Nematocera). *Norwegian Journal of Entomology*, 53: 57–69.
- Hutson, A. M., 1978. Caves. In: *A Dipterist's Handbook. The Amateur Entomologist*, 15: 134–137 (A. Stubbs & P. Chandler, Eds.). The Amateur Entomologists' Society, Hanworth, London, UK.
- Hutson, A. M., Ackland, D. M. & Kidd, L. N., 1980. Mycetophilidae (Bolitophilinae, Ditomiyinae, Diadocidiinae, Keroplatinae, Sciophilinae and Manotinae). *Handb. Ident. Br. Insects*, 9(3): 1–111.
- Jakovlev, J., 2011. Fungus gnats (Diptera, Mycetophiloidea) associated with dead wood and wood growing fungi: new rearing data from Finland and Russian Karelia and general analysis of known larval microhabitats in Europe. *Entomologica Fennica*, 22: 157–189.
- Jakovlev, J. & Siitonen, J., 2004. Finnish fungus gnats (Diptera, Mycetophilidae etc): faunistic, habitat requirements and threat status. *Lammi Notes*, 30: 1–12.
- Kjaerandsen, J., 1993. Diptera in mines and other cave systems in southern Norway. *Entomol. Fennica*, 4: 151–160.
- Laurence, B. R., 1982. A cave dwelling mycetophilid in central London. *Entomologist's monthly Magazine*, 117(1981): 198.
- Østbye, E., Lauritzen, S.–E., Fjellberg, A., Hauge, E., Leinaas, H. P., Ottesen, P. & Solhøy, T., 1987. Invertebrates of Norwegian caves I. Gastropoda, Oligochaeta, Araneae, Acari,

- Amphipoda, Collembola, Coleoptera, Lepidoptera and Diptera. *Fauna norvegica* (Series A), 8: 43–64.
- Plassmann, E. & Weber, D., 1988. Die Pilzmückenfauna des Brunnenstollens (6612/18) bei Trippstadt / Pfälzerwald. *Pfälzer Heimat*, 3: 137–139.
- Søli, G., Rindal, E. & Hansen, L. O., 2009. New records of fungus gnats for Norway (Diptera: Mycetophilidae). *Norwegian Journal of Entomology*, 56: 69–73.
- Tollet, R., 1955. Etudes Biospéologiques XXXVI Révision des Mycetophilidae cavernicoles de Transylvanie (Diptera Nematocera), recueillis par R. Leruth. *Mém. Soc. R. Entomol. Belg.*, 27: 443–465.
- 1959. Contribution à l'étude des Diptères cavernicoles des grottes d'Italie et de Suisse et description de deux Mycetophilidae nouveaux. *Bull. Ann. Soc. R. Entomol. Belg.*, 95: 205–231.
- Weber, D., Zaenker, S. & Plassmann, E., 2007. Pilzmücken in Höhlen und künstlichen Hohlräumen (Diptera Sciaroidea: Ditomyiidae, Bolitophilidae, Diadocidiidae, Keroplatidae, Mycetophilidae). *Entomofauna*, 28(11): 125–140.