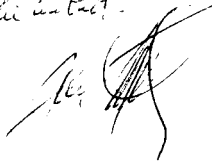


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Diptera (excluding Mycetophilidae s. str.) associated with fungi in Czech and Slovak Republics: a survey of rearing records from 1998–2000

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Abstract: New data on the biology of Diptera associated with fungi are presented in this paper based on the investigations in 1998–2000. Altogether 67 species of Diptera (excl. Mycetophilidae) belonging to 22 families were reared from 82 species of fungi collected in Czech and Slovak Republics. Five species of parasitoids from the families Braconidae and Eucolidae (Hymenoptera) reared from their hosts are also recorded. Thirteen species of Diptera and 4 species of Hymenoptera are recorded for the first time from Czech or Slovak Republics. The first record of a host fungus is given for the following species: *Keroplatus tuvensis* A.ZAITZEV, 1991; *Scatopsiara neglecta* MENZEL & MOHRIG, 1998; *Monardia modesta* (WILLISTON, 1896); *Spaniocera squanigera* WINNERTZ, 1863; *Psychomora vanharai* JEZEK, 1995; *Agathomyia antennata* (ZETTERSTEDT, 1819) and *Seri obscuripennis* (OLDENBERG, 1916)

INTRODUCTION

Many species from various families of Diptera develop as larvae in fungi. Most of them are mycetophagous (e.g. Bolitophilidae, Ditomyiidae, Mycetophilidae, Platypezidae, Phoridae) or mycosaprophagous (e.g. Psychodidae, Drosophilidae), while some groups are predaceous or polyphagous (e.g. Keroplatidae, Muscidae) but still regularly associated with fungi. Many authors have studied associations of Diptera, especially mycetophilids, with fungi in various parts of Europe (for a survey see YAKOVLEV 1994), but in both Czech and Slovak Republics these studies have been rather neglected up to the present. Although P. Laštovka was interested in rearing of insects from various species of fungi, his results remained mostly unpublished and only a few rearing records were published within the papers on the taxonomy and larval morphology of several genera of Mycetophilidae (LAŠTOVKA 1971, 1972a,b). The old published data (e.g. LANDROCK 1940) are usually out-of-date due to advance in the taxonomy of both fungi and insects.

In this paper, data on host fungi and habitat associations are given for 22 families of Diptera reared by the author from fungi collected in the territory of Czech and Slovak Republics. The family Mycetophilidae is not included and will be treated in a separate paper.

MATERIAL AND METHODS

The samples of fungi were collected by the author and the collaborators mentioned below from April to November in the years 1998, 1999 and 2000. Altogether, more than 300 samples of fungi infested by Diptera (mainly Mycetophilidae) were collected, out of which 122 samples are recorded in this paper. The method of rearing is principally described by LASTOVKA (1971). Most of the examined material of both the larvae and reared adults is preserved in the author's collection, its minor part also in the collections of particular specialists. The sampling localities, including habitats, are listed in Appendix 1. A systematic list of fungi species used for rearings is in Appendix 2.

RESULTS AND DISCUSSION

A total of 67 species belonging to 22 families of Diptera (excluding Mycetophilidae s. str.) were reared from 82 species of fungi in 1998–2000, see Tab.1. All rearing records are summarized below. The species new for the fauna of Czech or Slovak Republic are marked with an asterisk. Particular record is given in the following form: species name of insect – locality: collecting date/ emerging date, number of males/ number of females, and host fungus.

SURVEY OF SPECIES

Trichoceridae

Trichocera hiemalis (DE GEER, 1776) – M22: 29.10.1999/3.12.1999, 1/0, ex *Entoloma nidorosum*.

T.rufescens EDWARDS, 1921 – M29: 3.10.1999/5.11.1999, 0/1, ex *Lepiota aspera*.

T.hiemalis is a polyphagous species recorded from many species of fungi, as well as from other decaying matter. *T.rufescens* has been previously recorded only from *Hypholoma sublateritium* by BUXTON (1961).

Limoniidae

Achyrolimonia decemmaculata (LOEW, 1873) – M23: 10.10.1998/1.11.1998, 1/1, ex *Merulius tremellosus*; M23: 29.10.1999/23.–28.11.1999, 5/0, ex *Merulius tremellosus*.

Metalimnobia bifasciata (SCHRANK, 1781) – M3: 24.7.1999/13.8.1999, 1/0, ex *Lactarius vellereus*; M14: 17.9.2000/11.10.1999, 0/1, ex *Boletus edulis*; S4: 26.9.1999/28.10.1999, 0/1, ex *Lyophyllum loricatum*.

M.quadrifasciata (LINNAEUS, 1761) – M5: 13.6.1999/1.–4.7.1999, 0/2, ex *Bjerkandera adusta*; M23: 28.7.1999/15.8.1999, 0/2, ex *Abortiporus biennis*.

All these limoniid species are known to develop in fungi (YAKOVLEV 1994). Polypores *Abortiporus biennis* and *Bjerkandera adusta* are new host records for *M.quadrifasciata*, which has been hitherto known from 6 species of fungi, mainly Polyporaceae (YAKOVLEV 1994).

Family	No. of species recorded by this author	No. of species recorded in the literature (according to Yakovlev, 1994)
Trichoceridae	2	5
Limoniidae	3	17
Pediciidae	3	5
Bolitophilidae	6	24
Ditomyiidae	1	6
Keroplastidae	2	21
Mycetophilidae	55	252
Sciaridae	1	33
Cecidomyiidae	5	51
Psychodidae	3	3
Anisopodidae	1	2
Ceratopogonidae	2	11
Platypezidae	4	17
Phoridae	11	42
Syrphidae	1	4
Asteiidae	1	3
Chloropidae	2	7
Heleomyzidae	1	25
Sphaeroceridae	1	20
Drosophilidae	8	27
Anthomyiidae	2	37
Fanniidae	1	13
Muscidae	6	25
Total	122	650
Total (without Mycetophilidae)	67	398

Tab.1. Number of Palearctic species of Diptera recorded to develop in fungi.

Pediciidae

Ula bolitophila (LOEW, 1869) – M8: 20.7.2000/11.8.2000, 0/1, ex *Laetiporus montanus*; M10: 4.9.1999/22.9.1999, 1/0, ex *Peziza micropus*; M23: 10.10.1998/25.10.1998, 1/0, ex *Laetiporus sulphureus*; M23: 26.6.1999/18.7.1999, 1/0, ex *Bjerkandera adusta*.

U. mollissima HALIDAY, 1833 – M4: 24.9.2000/15.–16.10.2000, 15/6, ex *Polyporus squamosus*; M14: 17.9.2000/11.10.1999, 9/4, ex *Albatrellus ovinus*; M15: 25.9.1999/23.10.1999, 5/7, ex *Pleurocybella porrigens*.

U. sylvatica (MEIGEN, 1818) – M3: 24.7.1999/13.8.1999, 3/2, ex *Russula cyanoxantha*; M10: 4.9.1999/22.–26.9.1999, 5/7, ex *Peziza micropus*; M14: 17.9.1999/15.–17.10.1999, 2/1, ex *Sarcodon imbricatus*; M14: 17.9.2000/9.10.2000, 10/0, ex *Russula paludosa*; M14: 17.9.2000/9.10.2000, 4/0, ex *Albatrellus ovinus*; M14: 17.9.2000/8.10.2000, 3/1, ex *Hydnum repandum*; M21: 23.7.2000/13.–14.8.2000, 3/0, ex *Paxillus involutus*; S2: 30.9.2000/19.–20.10.2000, 6/0, ex *Paxillus filamentosus*; S3: 1.10.2000/21.10.2000, 2/0, ex *Lactarius deterrimus*.

The four above-mentioned species of fungi represent new host records for *Ula bolitophila*. The species *L. montanus* was recently separated from the closely related

L.sulphureus by the Czech mycologist A. Černý. The latter two species of *Ula* are more common in fungi, mainly *Ula sylvatica*, which has been recorded from more than 70 species of fungi (YAKOVLEV 1994).

Bolitophilidae

Bolitophila cinerea MEIGEN, 1818 – M10: 9.10.1999/19.–22.10.1999, 12/4, ex *Hypholoma sublateritium*; M23: 10.10.1998/22.10.1998, 1/3, ex *Hypholoma fasciculare*.

B.tenella WINNERTZ, 1863 – M7: 6.11.1999/19.–21.11.1999, 29/5, ex *Pholiota lenta*.

B.bimaculata ZETTERSTEDT, 1838 – S4: 26.9.1999/3.–9.10.1999, 12/6, ex *Lyophyllum loricatum*.

B.hybrida (MEIGEN, 1804) – M21: 23.7.2000/13.–14.8.2000, 3/1, ex *Paxillus involutus*; S1: 1.10.2000/10.10.2000, 3/1, ex *Paxillus filamentosus*; S2: 30.9.2000/8.–10.10.2000, 24/13, ex *Paxillus filamentosus*.

B.occlusa EDWARDS, 1913 – B3: 23.10.1999/4.–16.11.1999, 4/4, ex *Oligoporus caesius*; M6: 26.9.1998/10.10.1998, 1/0, ex *Oligoporus caesius*; M23: 10.10.1998/28.10.1998, 1/0, ex *Oligoporus tephroleucus*.

**B.rectangulata* LUNDSTRÖM, 1913 – M23: 26.5.1999/2.–8.6.1999, 9/2, ex *Laetiporus sulphureus*; M26: 25.8.1999/31.8.–4.9.1999, 18/11, ex *L. sulphureus*; M31: 20.6.1998/24.6.–13.7.1998, 6/5, ex *L. sulphureus*.

Most species of Bolitophilidae are oligophagous and often restricted to only one genus or family of fungi. A relatively large number of host fungi were recorded for *B.cinerea* and *B.tenella*, but they usually develop in *Hypholoma* or *Lepiota*. *B.bimaculata* has been reared from several species of *Tricholoma* and *Lyophyllum* (cf. YAKOVLEV 1994). *B.hybrida* is known to prefer *Paxillus involutus* and the closely related *P.filamentosus* is a new host record for this species. *B.occlusa* is specific to *Oligoporus*. *B.rectangulata* has been repeatedly reared from *L. sulphureus* (cf. YAKOVLEV 1994, KURINA 1998) and is apparently confined to this fungus.

Ditomyiidae

Ditomyia fasciata (MEIGEN, 1818) – B2: 23.10.1999/24.10.–9.11.1999, 14/9, ex *Trametes versicolor*; M7: 6.11.1999/13.11.1999, 1/0, ex *Trametes versicolor*; M10: 4.9.1999/13.–22.9.1999, 7/3, ex *Meripilus giganteus*; M23: 26.5.1999/12.–14.6.1999, 4/3, ex *Polyporus badius*; M23: 26.6.1999/9.7.1999, 0/1, ex *Bjerkandera adusta*; M23: 28.7.1999/10.8.1999, 1/2, ex *Abortiporus biennis*; M23: 29.10.1999/5.–21.11.2000, 6/4, ex *Inonotus radiatus*; M23: 22.10.2000/10.11.2000, 8/5, ex *Inonotus radiatus*; M30: 26.9.1999/11.10.1999, 2/1, ex *Trametes versicolor*.

Larvae of this species are common in various species of polypores.

Keroplastidae

Keroplastus testaceus (DALMAN, 1818) – M23: 5.9.1999/17.9.1999, 1/0, ex *Polyporus badius*.

**Keroplastus tuvensis* A. ZAITZEV, 1991 – M26: 10.6.2000/20.6.2000, 1/0, ex *Polyporus varius*.

The larvae of *Keroplastus* live individually on the surface of fruiting bodies of polypores and pupation takes place on the lower side of the fungus. There are only a few precise rearing records for both the above-mentioned species. The latter species was recently separated from the former species differing in small details on the male terminalia. This is the first record of *K.tuvensis* from a named species of fungi and also the first record of this species after its description.

Sciaridae

Scatopsciara neglecta MENZEL & MOHRIG, 1998 – M23: 10.10.1998/31.10.1998, 2/0, ex *Merulius tremellosus*.

This species has been confused with the closely related *S.pusilla* (MEIGEN, 1818), which was recorded from *Ganoderma applanatum*. This is a new host record for this species.

Cecidomyiidae

**Camptodiplosis boleti* (KIEFFER, 1901) – M10: 24.9.1998/4.10.1998, 0/1, ex *Meripilus giganteus*; M23: 26.5.1999/4.6.1999, 14/6, ex *Laetiporus sulphureus*; M23: 26.5.1999/7.6.1999, 10/7, ex *Polyporus badius*; M31: 20.6.1998/29.6.–1.7.1998, 5/2, ex *Laetiporus sulphureus*.

Lestodiplosis polypori (H. LOEW, 1850) – M10: 24.9.1998/4.–10.10.1998, 1/1, ex *Meripilus giganteus*; M13: 25.7.2000/4.–11.8.2000, 1/1, ex *Oligoporus stipticus*; M14: 17.9.2000/11.10.2000, 2/0, ex *Albatrellus confluens*; M23: 29.10.1999/7.12.1999, 0/1, ex *Inonotus radiatus*; M26: 10.6.2000/20.–28.6.2000, 0/3, ex *Bjerkandera adusta*; M28: 27.5.2000/9.–12.6.2000, 4/5, ex *Trametes hirsuta*.

**Monardia (Trichopteroymia) modesta* (WILLISTON, 1896) – M4: 24.9.2000/5.–18.11.2000, 4/2, ex *Hericium flagellum*.

**Peromyia fungicola* (KIEFFER, 1898) – M14: 17.9.2000/30.9.–3.10.2000, 2/7, ex *Ranaria* sp.

**Spaniocera squamigera* WINNERTZ, 1863 – S1: 1.10.2000/31.10.2000, 1/0, ex *Paxillus filamentosus*.

C.boleti is probably a mycophagous species and is known to develop in several species of fungi, including *M.giganteus*, while *L. sulphureus* and *P.badius* are apparently its new host records (cf. YAKOVLEV 1994). *Lestodiplosis polypori* is predaceous, attacking the other species living in fungi (SKUHRÁVÁ, in litt.). The biology of a cosmopolitan species *Monardia modesta* has not yet been recorded. *Spaniocera squamigera* is probably a phytosaprophagous species, which has not yet been reared from fungi (SKUHRÁVÁ, in litt.).

Psychodidae

Chodopsycha buxtoni (WITHERS, 1988) – M29: 30.5.1999/6.–11.6.1999, 10/10, ex *Pluteus atricapillus*; M29: 3.7.1999/10.–12.7.1999, 2/3, ex *Amanita rubescens*.

Ch.lobata (TONNOIR, 1940) – M2: 5.8.2000/14.8.2000, 2/0, ex *Amanita phalloides*; M10: 4.9.1999/14.9.1999, 8/4, ex *Amanita rubescens*; M14: 17.9.2000/27.9.2000, 8/3, ex *Amanita spissa*; M14: 17.9.2000/27.9.2000, 8/3, ex *Albatrellus ovinus*; M29: 10.10.2000/21.10.2000, 1/1, ex *Armillaria bulbosa*.

Psychomora vanharai JEZEK, 1995 – M2: 5.8.2000/14.8.2000, 2/0, ex *Amanita phalloides*.

Fungivorous larvae of this family develop mainly in decaying fruiting bodies of fungi. A preference of *Amanita* is apparent from the above-mentioned records. WITHERS (1988) stated *Boletus* sp. as a host fungus for *Ch.buxtoni*. The biology of recently described *P.vanharai* had not been recorded so far.

Anisopodidae

Sylvicola cinctus (FABRICIUS, 1787) – M4: 24.9.2000/15.–16.10.2000, 1/1, ex *Polyporus squamosus*.

Larvae of this species are found in a variety of rotting vegetable matter, especially roots of umbelliferous plants, sap runs etc. (cf. HANCOCK 1989). There are also several records from fungi, which do not appear to be typical breeding material for flies from this family. This is a new host record for *S.cinctus*.

Ceratopogonidae

Atrichopogon rostratus (WINNERTZ, 1852) – M3: 24.7.1999/10.8.1999, 0/1, ex *Russula cyanoxantha*.

Culicoides scoticus DOWNES & KETTLE, 1952 – B1: 28.7.2000/18.–23.8.2000, ex *Boletus pinophilus*; B1: 28.7.2000/18.8.2000, 1/0, ex *Xerocornus badius*; M3: 24.7.1999/10.8.1999, 1/1, ex *Russula cyanoxantha*; M13: 25.7.2000/12.8.2000, 1/1, ex *Russula nigricans*; M14: 17.9.2000/6.10.2000, 2/4, ex *Albatrellus ovinus*; M30: 26.9.1999/17.10.1999, 5/1, ex *Bjerkandera adusta*; S3: 1.10.2000/19.10.2000, 1/0, ex *Lactarius deterrimus*; S4: 25.9.1999/20.10.1999, 1/2, ex *Lactarius scrobiculatus*.

YAKOVLEV (1994) did not state the genus *Atrichopogon* among fungivorous Ceratopogonidae. On the other hand, *C.scoticus* has so far been recorded from more than 15 species of fungi.

Platypezidae

Agathomyia antennata (ZETTERSTEDT, 1819) – M5: 13.6.1999/2.–4.7.1999, 4/4, ex *Bjerkandera adusta*; M23: 26.6.1999/18.7.1999, 2/4, ex *B.adusta*; M26: 10.6.2000/28.6.–6.7.2000, 3/1, ex *B.adusta*; M27: 10.6.2000/28.6.–8.7.2000, 1/1, ex *B.adusta*.

Bolopus furcatus (FALLEN, 1826) – M4: 24.9.2000/3.11.2000, 1/0, ex *Polyporus squamosus*.

Paraplatypeza atra (MEIGEN, 1804) – M18: 9.7.2000/20.–21.7.2000, 9/3, ex *Pluteus atricapillus*.

Seri obscuripennis (OLDENBERG, 1916) – M23: 26.5.1999/8.–9.6.1999, 18/5, ex *Polyporus badius*; M26: 10.6.2000/27.6.2000, 0/2, ex *Polyporus varius*.

Platypezids are known for their oligophagy with a tendency towards monophagy. It is evident also from the author's records. *Bjerkandera adusta* is the only fungus species reported for several *Agathomyia* species (cf. CHANDLER 1980). BUXTON (1961) first stated *P.squamosus* as larval food for *Bolopus furcatus*. *Pluteus atricapillus* is a typical host fungus for *Paraplatypeza atra*, but it has been reared also from several other species of fungi. *Seri obscuripennis* is probably restricted to *Polyporus*. The records of host fungi for *A. antennata* and *Seri obscuripennis* are new.

Phoridae

**Megaselia berndseni* (SCHMITZ, 1919) – M1: 29.5.1999/17.6.1999, 1/3, ex *Boletus impolitus*; M17: 27.4.2000/14.5.2000, 14/13, ex *Calocybe gambosa*;

**M.cinereifrons* (STROBL, 1910) – M14: 17.9.2000/7.10.2000, 8/3, ex *Albatrellus ovinus*.

M.flava (FALLEN, 1823) – M29: 15.8.1998/4.9.1998, 1/2, ex *Russula violeipes*.

**M.flavicans* SCHMITZ, 1930 – M29: 3.7.1999/24.7.1999, 1/0, ex *Russula grisea*.

**M.frameata* SCHMITZ, 1927 – M16: 19.9.1999/10.10.1999, 4/2, ex *Bondarzewia mesenterica*; M19: 4.6.2000/19.6.2000, 2/0, ex *Crepidotus mollis*; M23: 26.5.1999/14.–16.6.1999, 1/1, ex *Laetiporus sulphureus*; M23: 26.6.1999/13.7.1999, 4/0, ex *Bjerkandera adusta*; M29: 15.8.1998/3.9.1998, 1/0, ex *Pholiota squarrosa*; M31: 20.6.1998/6.7.1998, 1/0, ex *Laetiporus sulphureus*.

M.lata (WOOD, 1910) – B1: 28.7.2000/15.8.2000, 9/6, ex *Boletus edulis*; M12: 11.8.2000/23.–24.8.2000, 12/37, ex *Amanita muscaria*; M13: 25.7.2000/9.–11.7.2000, 1/2, ex *Boletus edulis*.

**M.latiior* SCHMITZ, 1936 – M19: 4.6.2000/20.6.2000, 1/0, ex *Psathyrella candolleana*.

M.lutea (MEIGEN, 1830) – M18: 30.7.2000/21.–22.8.2000, 2/4, ex *Stiilus granulatus*; M24: 22.5.2000/14.6.2000, 3/2, ex *Entoloma clypeatum*; M25: 9.9.1999/3.10.1999, 2/0, ex *Lactarius acerrimus*; M29: 3.7.1999/24.7.1999, 1/1, ex *Russula grisea*; S4: 25.9.1999/24.10.1999, 2/2, ex *Lactarius scrobiculatus*.

**M.maura* (WOOD, 1910) – M18: 9.5.1999/20.5.1999, 13/16, ex *Agrocybe praecox*.

M.nigra (MEIGEN, 1830) – M1: 5.8.2000/22.–24.8.2000, 4/12, ex *Agaricus bohusii*.

**M.uliginosa* (WOOD, 1909) – M12: 11.8.2000/24.8.2000, 7/5, ex *Lepista nuda*.

According to H. DISNEY (in litt.), the first identified phorids have been reared from the following species of fungi, which are thus new host records for relevant phorid

species: *Agaricus bohusii*, *Bjerkandera adusta*, *Boletus impolitus*, *Bondarzewia mesenterica*, *Crepidotus mollis*, *Entoloma clypeatum*, *Lactarius acerrimus*, *Lactarius scrobiculatus* and *Pholiota squarrosa*. *Agrocybe praecox* is a new host record for *M.maura*, hitherto known from *Hypholoma* and *Gymnopilus*.

Megaselia berndseni, *M.lutea*, *M.flava*, *M.flavicans* and *M.lata* are probably polymycophagous, known from many species of fungi. On the other hand, *M.lator* is apparently associated with Coprinaceae since it has been recorded from two species of *Coprinus* by YAKOVLEV (1994) and *P.candolleana* by DISNEY & EVANS (1999). *M.nigra* is known to be associated with *Agaricus*, being recorded from about 10 species of this genus; *M.uliginosa* has been so far recorded only from two closely related species of *Lepista* and *M.cinereifrons* has been reared from 2 species of *Albatrellus* and from *Meruliopsis corium* by YAKOVLEV (1994). *M.frameata* is probably associated with polypores and other wood-destroying fungi, such as *Pholiota* or *Pleurotus*.

Syrphidae

Cheilisia scutellata (FALLÉN, 1817) – M1: 29.5.1999/24.6.1999, 0/1, ex *Boletus impolitus*.

This is one of the three species of *Cheilisia* known to develop in fungi, especially in Boletaceae (YAKOVLEV 1994).

Asteiidae

Leiomyza dudai SABROSKY, 1956 – M22: 3.8./19.–28.8.2000, 1/4, ex *Amanita pantherina*; M26: 7.10.2000/29.10.2000, 0/2, ex *Clitocybe odora*.

This is a small family with about 3 fungivorous species. *L.dudai* is the most common, being recorded from many agarics.

Chloropidae

Tricimba lineella (FALLÉN, 1830) – M20: 22.5.1999/12.–13.6.1999, 1/2, ex *Calocybe gambosa*.

T.cincta (MEIGEN, 1830) – M3: 24.7.1999/16.8.1999, 1/0, ex *Lactarius vellereus*; M24: 22.5.2000/13.–14.6.2000, 1/2, ex *Entoloma clypeatum*.

The identification of several species of *Tricimba* is complicated and further revisionary work is needed. *T.lineella* is known from several species of agarics including *Calocybe gambosa*. *T.cincta* has also been reported from many species of fungi, mainly *Russula* and *Amanita* by YAKOVLEV (1994).

Heleomyzidae

Suillia sp. (cf. *quadrilineata* CZERNY, 1924) – S2: 30.9.2000/18.11.2000, 0/1, ex *Pasillus filamentosus*.

The exact identification of this species is based on the male terminalia. In any case, it is interesting that only this one specimen was reared during this study, in spite of the fact that *Suillia* species are known from more than 100 species of fungi. A possible reason may be that this research was primarily directed to mycetophilids and the fruiting bodies without mycetophilid larvae were usually not collected. HACKMAN & MEINANDER (1979) observed that the species of *Suillia* sometimes occur in fungi avoided by other Diptera.

Sphaeroceridae

Spelobia parapusio (DAHL, 1909) – M8: 20.7.2000/3.8.2000, 0/2, ex *Laetiporus montanus*; M14: 17.9.2000/30.9.2000, 0/1, ex *Amanita spissa*; M23: 10.9.1998/23.9.1998, 0/3, ex *Pluteus atricapillus*; M27: 10.6.2000/22.6.2000, 0/1, ex *Amanita rubescens*; M29: 30.5.1999/10.–11.6.1999, 0/4, ex *Pluteus atricapillus*; M31: 6.6.1999/22.6.1999, 0/2, ex *Collybia confluens*.

This is a parthenogenetic species, found in many species of fungi.

Drosophilidae

Drosophila busckii COQUILLET, 1901 – M29: 14.10.2000/30.10.2000, 7/1, ex *Armillaria bulbosa*.

D.kuntzei DUDA, 1924 – M18: 9.7.2000/22..7.2000, 0/1, ex *Russula amoenicolor*.

D.phalerata MEIGEN, 1830 – M3: 27.6.1999/8.–9.7.1999, 1/1, ex *Russula carpini*; M3: 24.7.1999/3.8.1999, 1/1, ex *Xerocomus chrysenteron*; M18: 9.5.1999/23.5.1999, 0/1, ex *Stropharia rugosoannulata*; M23: 5.9.1999/19.9.1999, 2/0, ex *Mycena galericulata*; M26: 25.8.1999/4.9.1999, 1/1, ex *Xerocomus rubellus*; M26: 8.9.1999/22.9.1999, 0/1, ex *Boletus aereus*; M26: 9.9.1999/24.9.1999, 1/0, ex *Tricholoma sejunctum*; M31: 6.6.1999/22.6.1999, 0/2, ex *Collybia confluens*.

D.transversa FALLÉN, 1823 – M18: 9.5.1999/23.5.1999, 0/1, ex *Stropharia rugosoannulata*.

Hirtodrosophila confusa (STAEGER, 1844) – M3: 24.7.1999/9.8.1999, 2/1, ex *Lactarius vellereus*; M4: 24.9.2000/10.10.2000, 1/0, ex *Polyporus squamosus*; M26: 25.8.1999/10.9.1999, 2/1, ex *Polyporus squamosus*; M29: 30.5.1999/8.–11.6.1999, 1/1, ex *Pluteus atricapillus*.

H.trivittata (STROBL, 1893) – M23: 26.5.1999/10.–11.6.1999, 3/4, ex *Polyporus badius*; M29: 30.5.1999/13.–15.6.1999, 37/43, ex *Pleurotus pulmonarius*.

Leucophenga maculata (DUFOUR, 1839) – M23: 26.5.1999/10. 6.1999, 1/1, ex *Polyporus badius*; M23: 28.7.1999/11.8.1999, 1/0, ex *Abortiporus biennis*; M29: 30.5.1999/17.–18.6.1999, 1/1, ex *Ustulina deusta*.

Mycodrosophila poecilogastra (LOEW, 1874) – M23: 26.5.1999/10.–11.6.1999, 3/4, ex *Polyporus badius*; M23: 28.7.1999/11.8.1999, 0/1, ex *Abortiporus biennis*.

Drosophila phalerata is the most common fungicolous representative of the family with more than 150 known fungus hosts (YAKOVLEV 1994). *D.busckii* is polysaprophagous and was reared from about 30 species of fungi, but also from other decaying material. On the other hand, *H.trivittata* is oligomycetophagous species apparently associated with *Pleurotus*. Similarly, *Leucophenga maculata* is usually associated with Polyporaceae. The host fungi of the comparatively rare *M.poecilogastra* are poorly known and this species is not included in the survey by YAKOVLEV (1994).

Anthomyiidae

Pegomya geniculata (BOUCHÉ, 1834) – M29: 14.10.2000, 0/1, collected when ovopositing between gills of *Stropharia aeruginosa*.

Ppulchripes (LOEW, 1857) – M26: 25.8.1999/13.9.1999, 1/0, ex *Oudemansiella radicata*.

Larvae of most species of this family are phytophagous, but there are several fungicolous species of *Pegomya*. *P.geniculata* is apparently polyphagous, while *Ppulchripes* is reported as being associated with *Leccinum* by YAKOVLEV (1994). *O.radicata* is a new host record for this species.

Fanniidae

Fannia canicularis (LINNAEUS, 1761) – M3: 24.7.1999/29.8.1999, 1/0, ex *Lactarius vellereus*.

This is a saprophagous species, reported from many species of fungi as well as from other decaying material.

Muscidae

***Muscina levida* (HARRIS, 1780)** – M18: 9.7.2000/24.–28.7.2000, 1/1, ex *Russula amoenicolor*; M22: 29.5.1999/17.6.1999, 1/1, ex *Boletus reticulatus*; M29: 3.7.1999/19.7.1999, 1/0, ex *Leccinum carpini*.

***M.stabulans* (FALLEN, 1817)** – M22: 17.5.1999/10.6.1999, 0/1, ex *Calocybe gambosa*.

***Mydaea corni* (SCOPOLI, 1763)** – M3: 24.7.1999/11.8.1999, 1/0, ex *Russula nigricans*; M25: 1.8.1999/22.8.1999, 0/1, ex *Russula luteotacta*; M14: 17.9.1999/14.10.1999, 0/1, ex *Lactarius deterrimus*.

***Mydaea humeralis* ROBINEAU-DESVOIDY, 1830** – M25: 1.8.1999/22.8.1999, 1/0, ex *Russula luteotacta*; M29: 3.7.1999/27.8.1999, 1/0, ex *Russula grisea*; S4: 26.9.1999/28.10.1999, 0/1, ex *Lyophyllum loricatum*.

***Phaonia pallida* (FABRICIUS, 1787)** – M12: 11.8.2000/10.9.2000, 0/1, ex *Clitocybe nebularis*.

***Phaonia rufiventris* (SCOPOLI, 1763)** – M23: 7.11.1998/9.12.1998, 1/0, ex *Merulius tremellosus*.

According to CHANDLER (1980), HACKMAN & MEINANDER (1979) and other authors, at least the last larval instar of *Muscina*, *Mydaea* and *Phaonia* is carnivorous. It is interesting that only *Lactarius* and *Russula* are reported as host fungi of *Mydaea corni* and this has been confirmed by the above-mentioned records. *Muscina levida* and *Mydaea humeralis* are known from more than 100 species of fungi (YAKOVLEV 1994).

Attractiveness of particular groups of fungi to insects

The fungi poisonous for humans are usually used as larval food by insects. Most poisonous species of *Amanita*, such as *A.pantherina* and *A.muscaria*, are regularly infested mainly by mycetophilid larvae, especially the polyphagous *Cordyla brevicornis*, *Allodia ornatcollis* and *Mycetophila fungorum*. The fresh fruiting bodies of strongly poisonous *Amanita phalloides* are apparently less attractive for insects than in other *Amanita* species, but decaying fruiting bodies are sometimes infested by Psychodidae. HACKMAN & MEINANDER (1979) stated that 13 species of Diptera have been reared from *A.phalloides* by various authors.

On the other hand, several species edible for humans are not attractive for Diptera and other insects. For example, most species of *Agaricus* are rarely infested by larvae and then usually by Phoridae or Platypezidae. Also some genera of Ascomycetes (*Morchella*, *Helvella*) and Gasteromycetes (*Lycoperdon*) are rarely used as food by insect larvae.

Polyporaceae, Amanitaceae, Boletaceae and Russulaceae principally belong to the most attractive fungi for Diptera. For example, during this study 9 species of Diptera belonging to 8 families (including Mycetophilidae) were reared from *Bjerkandera adusta*, 7 species belonging to 5 families from *Pluteus atricapillus* and 11 species from 8 families were associated with various species of *Amanita*.

Parasitoids reared

Hymenoptera: Braconidae: Alysiinae

****Aspilota caudata* THOMSON, 1895** – B1: 28.7.2000/17.–18.8.2000, 1/1, ex *Boletus edulis*. reared together with *Megaselia lata* (Phoridae); M12: 11.8.2000/5.9.2000, 0/1, ex *Amanita muscaria*. reared together with *Megaselia lata* (Phoridae) and *Mycetophila fungorum* (Mycetophilidae).

In this case it is evident that the host of this braconid wasp was the fly of the genus *Megaselia*. The author has dissected several puparia of *Megaselia lata* from the first sample to confirm this host and found a developing braconid inside one of them.

**Orthostigma sculpturatum* TOBIAS, 1962 – M25: 25.8.1999/15.–17.9.1999, 9/0, ex *Leccinum scabrum*, reared together with *Megaselia flavicans* (Phoridae) and *Allodia grata* (Mycetophilidae).

In this case it is not certain which fly species was the real host. DISNEY (1994) listed two *Orthostigma* species among the parasitoids of *Megaselia*.

**Synaldis globipes* FISCHER, 1962 – M12: 11.8.2000/5.9.2000, 0/1, ex *Amanita muscaria*, reared together with *Megaselia lata* (Phoridae) and *Mycetophila fungorum* (Mycetophilidae).

Also in this case it is not clear which fly was the host of this braconid wasp, but considering the fact that the *Mycetophila fungorum* larvae are considerably larger than those of *Megaselia*, it is probable that this small braconid wasp developed in *Megaselia* larvae which are of similar size. YAKOVLEV & TOBIAS (1992) described a new species of *Synaldis* reared from two species of *Russula*, together with *Megaselia rubella* and *Chodopsycha lobata*.

Hymenoptera: Cynipoidea: Eucolidae

Kleidotoma fornicaria (KIEFFER, 1902) – M29: 30.5.1999/29.6.–2.7.1999, 1/1, ex *Pluteus atricapillus*, reared together with *Chodopsycha buxtoni* (Psychodidae), *Hirtodrosophila confusa* (Drosophilidae), *Spelobia parapusio* (Sphaeroceridae) and *Allodia grata* (Mycetophilidae).

**Kleidotoma bicolor* (KIEFFER, 1902) – M29: 30.5.1999/29.6.–2.7.1999, 1/1, ex *Pluteus atricapillus*, the same possible hosts as above.

The real host of both these parasitoid species is not clear from the above mentioned records. According to J. Macek (pers. comm.), the usual hosts of *Kleidotoma* are acalyptrate Diptera.

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Appendix 1 – List of localities and associated habitats

(Grid mapping codes, according to PRUNER & MIKA 1996, are given in parentheses)

CZECH REPUBLIC. **Bohemia**. B1: Nový Vojšův near Nová Bystřice, coniferous forest (6956); B2: Trutnov, town park (5461); B3: Žaclěf, spruce forest (5361). **Moravia & Silesia**. M1: Bartošovice, pond dam with oak trees (6374); M2: Bartošovice, hornbeam forest (6374); M3: Brumovice-Pocheň, mixed forest (5972); M4: Dolní Lomná, fir-beech forest (6578); M5: Hněvošice, deciduous forest (5974); M6: Hrubá Voda, mixed forest (6370); M7: Hradec nad Moravicí, beech forest (6173); M8: Hrubý Jeseník Mts., Mt. Praděd, spruce forest (5969); M9: Hrubý Jeseník Mts., Vidly, beech forest (5869); M10: Hrubý Jeseník Mts., Vrbno pod Pradědem, Jelení Bučina Nature Reserve, maple-beech forest (5869); M11: Jistebník, pond dam with oak trees (6274); M12: Karlov pod Pradědem, spruce forest (5969); M13: Krnov-Cvilín, coniferous forest (5972); M14: Moravskoslezské Beskydy Mts., Bílá env., Velká Smradlavá Valley, mixed forest (6476); M15: Moravskoslezské Beskydy Mts., Ostravice env., spruce-beech forest (6476); M16: Oldřichovice, mixed

forest (6377); M17: Ostrava, town park (6175); M18: Ostrava-Michálkovice, recultivated mine dump (6176); M19: Ostrava-Svinov, deciduous forest (6175); M20: Ostrava-Třebovice, town park (6175); M21: Podvihov near Opava, mixed forest (6173); M22: Polanka nad Odrou, pond dam with oak trees (6275); M23: Polanka nad Odrou, Blücherův les, floodplain forest (6275); M24: Rychvald, garden (6176); M25: Studénka, Kotvice Nature Reserve, pond dam with oak trees (6274); M26: Studénka, pond dam with hornbeam and oak trees (6274); M27: Studénka, floodplain forest (6274); M28: Suchdol nad Odrou, floodplain forest (6373); M29: Šilheřovice, Černý les Nature Reserve, beech forest (6075); M30: Úvalno, mixed forest (5972); M31: Vítkov-Podhradí, mixed forest (6172).

SLOVAKIA. S1: Nová Bystrica, alder forest; S2: Oravské Veselé, alder growth in a spruce forest; S3: Trstená, spruce forest; S4: Važec, meadows.

Appendix 2 – Systematic list of fungi examined (including some common synonyms)

Ascomycetes. Xylariaceae: *Ustulina deusta* (Hoffm.) Lind. Pezizaceae: *Peziza micropus* Pers.

Basidiomycetes.

APHYLLOPHORALES. Corticaceae: *Merulius tremellosus* Schrad. Gomphaceae: *Ramaria* sp. Thelephoraceae: *Hydnum repandum* L.; *Sarcodon imbricatus* (L.) P. Karst. Hericiaceae: *Hericium flagellum* (Scop.) Pers. Hymenochaetaceae: *Inonotus radiatus* (Sowerby) P. Karst. Bondarzewiaceae: *Bondarzewia mesenterica* (Schaeff.) Kreisel / = *B.montana* (Quél.) Singer/. Polyporaceae: *Oligoporus* (= *Postia*, = *Tyromyces*) *caesius* (Schrad.) Gilb. & Ryvarden; *O.stipticus* (Pers.) Gilb. & Ryvarden; *O.tephroleucus* (Fr.) Gilb. & Ryvarden; *Abortiporus biennis* (Bull.) Singer; *Bjerkandera adusta* (Willd.) P. Karst.; *Laetiporus montanus* Černý; *L.sulphureus* (Bull.) Murrill; *Tiametes hirsuta* (Wulfen) Pilát; *T.versicolor* (L.) Pilát; *Fomitopsis pinicola* (Sowerby) P. Karst.; *Meripilus giganteus* (Pers.) P. Karst.; *Albatrellus confluens* (Alb. & Schwein.) Kotl. & Pouzar; *A.ovinus* (Schaeff.) Murrill; *Polyporus badius* (Pers.) Schwein.; *P.squamosus* (Huds.) Fr.; *P.varius* (Fr.) P. Karst.

AGARICALES. Pleurotaceae: *Pleurotus pulmonarius* (Fr.) Quél. Tricholomataceae: *Pleurocybella porrigens* (Pers.) Sing.; *Lyophyllum loricatum* (Fr.) Kühner; *Calocybe gambosa* (Fr.) Singer; *Clitocybe nebularis* (Batsch) P. Kumm.; *C.odora* (Bull.) P. Kumm.; *Armillaria bulbosa* (Barla) Kile & Watling; *Lepista nuda* (Bull.) Cooke; *Tricholoma sejunctum* (Sowerby) Quél.; *Collybia confluens* (Pers.) P. Kumm.; *Oudemansiella radicata* (Rehhan) Singer; *Mycena galericulata* (Scop.) Grey. Amanitaceae: *Amanita muscaria* (L.) Pers.; *A.pantherina* (DC.) Krombh.; *A.phalloides* (Fr.) Link; *A.rubescens* Pers.; *A.spissa* (Fr.) Opiz; *Pluteus atricapillus* (Batsch) Fayod / = *P.cervinus* (Schaeff.) P. Kumm./ . Agaricaceae: *Lepiota aspera* (Pers.) Quél.; *Agaricus bohussii* Bon.; *Agaricus xanthoderma* Genev. Coprinaceae: *Psathyrella candolleana* (Fr.) Maire. Bolbitiaceae: *Agrocybe praecox* (Pers.) Fayod. Strophariaceae: *Stropharia aeruginosa* (M. A. Curtis) Quél.; *S.rugosoannulata* Farlow; *Hypholoma fasciculare* (Huds.) P. Kumm.; *H.sublateritium* (Schaeff.) Quél. Cortinariaceae: *Crepidotus mollis* (Schaeff.) Staudé; *Pholiota lenta* (Pers.) Singer; *P.squarrosa* (Weigel) P. Kumm. Entolomataceae: *Entoloma clypeatum* (L.) P. Kumm.; *Entoloma nidorosum* (Fr.) Quél. Paxillaceae: *Paxillus filamentosus* (Scop.) Fr.; *P.involutus* (Batsch) Fr. Boletaceae: *Boletus aereus* Bull.; *B.edulis* Bull.; *B.impolitus* Fr.; *B.pinophilus* Pilát & Dermek; *B.reticulatus* Schaeff.; *Leccinum carpini* (Schulzer) M. M. Moser; *L.scabrum* (Bull.) Grey; *Suillus granulatus* (L.) Roussel; *Xerocomus badius* (Fr.) J.-P. Gilbert; *X.chryserteron* (Bull.) Quél.; *X.rubellus* (Krombh.) Quél. Russulaceae: *Lactarius acerrimus* Britz.; *L.determinus* Gröger; *L.scribiculatus* (Scop.) Fr.; *L.vellereus* (Fr.) Fr.; *Russula amoenicolor* Romagn.; *R.carpini* Gir. & Heinem.; *R.cyanoxantha* (Schaeff.) Fr.; *R.grisea* Pers. (Fr.); *R.luteotacta* Rea; *R.nigricans* (Bull.) Fr.; *R.paludosa* Britz.; *R.violeipes* Quél.