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Mycetophilous beetles (Coleoptera mycetophila) – indicators of well preserved ecosystems

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This paper deals with the distribution, ecology and ecosozological problems of mycetophilous beetles in Slovakia. Although these insects are less popular, a lot of rare, remarkable, and ecosozologically significant species belong in this group of beetles. Indicators of the best preserved ecosystems are ranked among this group as well, including the species *Lidopria serricornis*, *Derodontus macularis*, *Hendecatomus reticulatus*, *Mycetoma suturale*, *Ochodaeus chrysomeloides*, and species of the genera *Triplax* and *Mycetophagus*. Therefore mycetophilous beetles deserve more attention of entomologists and conservationists.

Key words: Coleoptera mycetophila, bioindication, insect protection, Slovakia.

Introduction

Mycetophilous beetles live on various kinds of ground or wood fungi. It is a relatively numerous group of insects, because about 500 truly or partially mycetophilous beetles occur only in Slovakia. They mostly belong to less known and "in-attractive" families (incl. Staphylinidae, Leiodidae, Erotylidae, Mycetophagidae, etc.). That is why they are ranked among the less popular groups of beetles. Despite this fact, a lot of mycetophilous beetles can be listed among rare and faunistically remarkable species with a high degree of endangerment. Some of them have a wide ecosozological applicability mainly as bioindicators of well preserved and valuable biotopes.

Endangerment of mycetophilous beetles

Mycetophilous beetles, mainly stenoecious ones, have often been threatened as a result of human activities. In red lists of several European countries mycetophilous beetles are listed based on systematic approach. In this paper, I refer to the red lists of Austria (FRANZ, 1983; GEISER, 1983), Germany (GEISER et al., 1984), Slovakia (JEDLIČKA (ed.), 1995) Great Britain (HYMAN & PARSONS, 1992, 1994), Sweden (EHNSTRÖM et al., 1993), Finland (RASSI, 1992) and of Danmark (ASBIRK & SOGAARD, 1991). Several red books including the red list of the former Czechoslovakia (ŠKAPEC, 1992) are worked out according to a model approach. They are usually illustrated, however, they comprise small number of species, mainly the best-known ones, and mycetophilous beetles are practically missing.

Material and methods

Mycetophilous beetles were obtained by current methods of collecting, especially by individual collecting from old and decaying fungi and under the bark of trees attacked by fungi.

Table 1. Mycetophilous beetles living on ground fungi and their ecosozological status (ESS).

Family Species	ESS in some European countries							
	A1	A2	G	GB	S	F	Sk	Dk
Staphylinidae								
Oxyporus rufus (LINNAEUS, 1758)								
Oxyporus maxillosus FABRICIUS, 1792								
Nitidulidae								
Pocadius ferrugineus (FABRICIUS, 1775)								
Thalycra fervida (OLIVIER, 1790)				N				
Cychramus variegatus (HERBST, 1792)								
Cryptophagidae								
Cryptophagus lycoperdi (SCOPOLI, 1763)								
Erotylidae								
Triplax melanocephala (LATREILLE, 1804)			E					
Endomychidae								
Lycoperdina succincta (LINNAEUS, 1767)	CD		V	V	CD	R		
Lycoperdina bovistae (FABRICIUS, 1792)	V	R	R	R	R			

Explanations: European countries: A1 – Austria (FRANZ, 1983), A2 – Austria (GEISER, 1983), G – Germany, GB – Great Britain, S – Sweden, F – Finland, Sk – Slovakia, Dk – Danmark. Endangerment categories: Ex – extinct, E – endangered, V – vulnerable, R – rare, D – decreasing, N – notable, CD – care demanding, I – indeterminate, IK – insufficiently known.

The beetles were collected in five types of biotopes (the geographical position of the localities is given in the part Results and discussion):

1) eolian sandy steppes and shrubby slopes: Hradište near Kováčovce (village), pastures near Gemerské Dechtáre (village) and NR (nature reservation) Hegyfarok near Štúrovo (town);

2) xerothermic oak forests and rocky steppes near Plášťovce and Horné Vestenice (villages), in the surroundings of Zvolen (town) and in NR Bagóova skala in the Cerová vrchovina mountains;

3) NR Vereš near Veľký Blh (village) – the former pasture forest with ancient solitary oaks has recently changed due to forest succession, because pasturing has been stopped there;

4) submountain beech forests with oaks, maples and lime trees: Urpín and Baranovo hills near Banská Bystrica (town); Žiarec hill in the Poľana mountains and Zálužná hill near Zvolen (town);

5) ancient mountain beech-and-fir forests (*Abieto-Fageta*): NR Hrončok and NR Pod Bútľavkou in the Poľana mountains, the southern slope of Krížna hill in the Veľká Fatra mountains, NR Badínsky prales near Badín (village) and Kulichova dolina valley in the Nízke Tatry mountains.

Beetles were identified according to the keys by FREUDE et al. (1964–1979).

Results and discussion

This paper includes only findings and characteristics of true mycetophils; occurrence of partially mycetophilous beetles is not strictly limited. The three main ecological groups of mycetophilous beetles are dealt with separately. A review of bioindicatively significant species found in Slovakia, with their ecosozological status (ESS) assessment in some European countries is given in Tables 1–3.

1) *Beetles living on ground fungi* – occur in "typical" fungi, often edible ones, of the orders Agaricales, Boletales, Gasteromycetales, etc. This group of beetles is not very numerous (Tab. 1). The following species deserve special attention:

Triplax melanocephala – occurs locally and rarely in ground fungi (often Boletaceae) in warm deciduous forests and xerothermic biotopes. Only two old records from Slovakia are available: Inovec (7274),[1] Polentz lgt. and Modra – Píla (7670a), Roubal lgt. (ROUBAL, 1936). Recent findings: Plášťovce (7879b), in a rotten mushroom (*Xerocomus* sp.) 3 June, 1985, 4 specimens; Kováčovce – Hradište (7882d), swept on a steppe slope, 28 June, 1989; Gemerské Dechtáre (7786), in a decaying mushroom (*Boletus* sp.), 10 June, 1995. It indicates the best preserved biotopes.

Lycoperdina bovistae – occurs locally and rarely in well preserved warm deciduous forests. Only a few old records are available: Šášov (7479), Roubal lgt.; Banská Bystrica (7280) and Brusno (7282),

[1] Grid reference number, Databank of the fauna of Slovakia, given when the locality name is mentioned for the first time.

Table 2. Mycetophilous beetles living on wood fungi and their ecosozological status (ESS).

Family Species	ESS in some European countries							
	A1	A2	G	GB	S	F	Sk	Dk
Species of warm deciduous forests								
Scaphidiidae								
Scaphium immaculatum (OLIVIER, 1790)			R	IK			R	
Bostrichidae								
Hendecatomus reticulatus (HERBST, 1793)	V	E	Ex				V	
Anobiidae								
Dorcatoma dresdensis HERBST, 1792			R	N				D
Biphyllidae								
Biphyllus lunatus (FABRICIUS, 1972)	E	V	E		E	Ex		V
Erotylidae								
Triplax elongata LACORDAIRE, 1842	E		Ex					
Triplax pygmaea KRAATZ, 1871		E	E					
Triplax collaris (SCHALLER, 1783)		V	E	Ex				
Triplax rufipes (FABRICIUS, 1775)		CD	R	E		R		Ex
Triplax scutellaris CHARPENTIER, 1825		CD	V	E	R			Ex
Mycetophagidae								
Triphyllus bicolor (FABRICIUS, 1792)		R	R					
Mycetophagus ater (REITTER, 1879)	V	V					V	
Mycetophagus decempunctatus FABRICIUS, 1801		V	E		V			
Mycetophagus piceus (FABRICIUS, 1787)			R	N	CD			D
Mycetophagus quadriguttatus MÜLLER, 1821		R	R	N	V	Ex		
Mycetophagus fulvicollis FABRICIUS, 1792		V	E	Ex	V			Ex
Mycetophagus populi FABRICIUS, 1798		V	V	N	V			
Tetratomidae								
Tetratoma desmaresti LATREILLE, 1807			E	N	E		Ex	E
Melandryidae								
Eustrophus dermestoides (FABRICIUS, 1792)		R	V			R		
Hallomenus axillaris (ILLIGER, 1807)		V	V				R	D
Orchesia micans (PANZER, 1795)				N				
Tenebrionidae								
Eledonoprius armatus (PANZER, 1799)	V		Ex		E			Ex
Platydema violaceum (FABRICIUS, 1790)				E	V	E		Ex
Neomida haemorrhoidalis (FABRICIUS, 1787)	CD		E		V	V		Ex
Species of (sub)mountain mixed forests								
Leiodidae								
Lidopria serricornis (GYLLENHAL, 1813)			E		E	V	R	
Derodontidae								
Derodontus macularis (FUSS, 1850)		E	E				Ex	
Trogositidae								
Thymalus limbatus (FABRICIUS, 1787)			R			R		V
Nitidulidae								
Cyllodes ater (HERBST, 1792)					E	Ex		Ex
Mycetophagidae								
Mycetophagus multipunctatus FABRICIUS, 1792			V					
Tetratomidae								
Tetratoma fungorum FABRICIUS, 1790		R	R			R		
Mycetoma suturale (PANZER, 1797)	V	E	E					
Melandryidae								
Hallomenus binotatus (QUENSEL, 1790)		R		N				
Zilora sericea (STURM, 1807)	V	E	V				V	
Tenebrionidae								
Boletophagus interruptus ILLIGER, 1800	V		Ex					
Diaperis boleti (LINNAEUS, 1756)				V				D

For abbreviations see Table 1.

Čejka lgt. (ROUBAL, 1936) and Lozorno (7668), Sept. 1936, 5 specimens, Kodym & Matejka lgt. (HAVELKA, 1964). Recent findings: Starohorské vrchy – Baranovo (7280b), in the puffball, *Geastrum sessile* (SOW.) POUZ., 28 Sept., 1991, 3 specimens; Poľana – Žiarec (7382), also in *Geastrum*, 25 Sept., 1994, 3 specimens.

2) *Beetles living on wood fungi* – occur in various species of wood fungi growing mainly on damaged and decaying trees and trunks (mainly the orders Polyporales and Agaricales). It is the most numerous group of mycetophilous beetles (Tab. 2). Several species deserve a note:

Lidopria serricornis – occurs locally and rarely in well preserved ancient forests of (sub)mountain areas. Only a few records are available: Giraltovce (7895), 27 Apr., 1928, 3 specimens (DEPTA, 1952), Ružín (7192), Machulka lgt. (ROUBAL, 1930), and Remata (7278), July 1958 (HAVELKA, 1964). It occurs in old rotten stems attacked by fungi and can be collected by sweeping of the forest vegetation in warm afternoons. Recent findings: Poľana – Hrončok (7382b), 17 July, 1986; Poľana – Pod Bútľavkou (7382), 17 July, 1993; Veľká Fatra – Krížna (7180), 1 Aug., 1993. JÁSZAY (in litt.) found it near Spišské Vlachy: "Za horou" (7090), 19 July, 1990, 2 specimens.

Derodontus macularis – occurs utmost locally and rarely in well preserved ancient mountain forests. Only three old records are available: "mountains in the surroundings of Snina" (69-7098-99), Kuthy lgt. and Vlára (6974), Richter lgt. (ROUBAL, 1936) and Levočské vrchy mountains (670), April 1959 (GOTTWALD, 1963). Recent findings: the NR Badínsky prales (7380), on *Ischnoderma benzoinum* (WAHLENB.) P. KARST. growing on a fallen down beech, 25 Oct., 1989 and 6 Nov., 1994, 3 specimens (V. Kubinec lgt. et coll.); Nízke Tatry – Kulichova dolina (7183a), on *Ischnoderma* growing on a dying fir, 25 May, 1992. In the ecosozological check list of the beetles of Slovakia [JEDLIČKA (ed., 1995] it is considered to be an extinct species. Our findings have proved its recent occurrence in Slovakia.

Hendecatomus reticulatus – occurs sporadically and scarcely in well preserved warm deciduous forests. Only two historical records are available: Košice (7293), Jázsay lgt. before 1868, and Zvolen (7480), 27 May, 1932, several specimens, Roubal lgt. (ROUBAL, 1936). The recent finding: Plášťovce, on the bracket fungus *Xanthochrous radiatus* (SOW. ex FR.) PAT. under the bark of an old dying oak, 16 May, 1992, 5 specimens.

Biphyllus lunatus – occurs scatteringly and scarcely in well preserved warm deciduous forests. Only two old records are available: Banská Bystrica – Urpín and Zvolen (ROUBAL, 1936). Recent records: Horné Vestenice, on *Daldinia concentrica* (BOLT. ex FR.) CES. et DE NOT. on a partially burnt oak stem, 23 April, 1994 (Franc lgt. et coll.); Štúrovo – Hegyfarok, shaken down from old oak branches, 30 April, 1994 (Kubinec lgt. et coll.). In Slovakia it should be listed among rare (R) species.

Triplax elongata – occurs sporadically and scarcely in well preserved submountain forests. Only two old records are accessible: Zvolen (ROUBAL, 1936) and Remetské Hámre (7199a), July 1955, 3 specimens, Rektořik lgt. et coll. (HAVELKA, 1964). Recent finding: Banská Bystrica – Urpín, on bracket fungi (*Pleurotus* sp.) on a fallen down beech, 5 June, 1982. In Slovakia it should be listed at least among rare species (R).

Triplax pygmaea – occurs extremely rarely in warm deciduous forests. This mediterranean species is known only from three old records: Rimavská Sobota (7686a), 29 Apr., 1928; Zvolen (ROUBAL, 1936) and Remetské Hámre, June 1959 (GOTTWALD, 1963). The recent record: Plášťovce, on bracket fungi (*Polyporus* sp.) on a damaged cherry tree, 30 May, 1988, 2 specimens. It is the fourth record from Slovakia, where the species should be ranked among vulnerable species (V).

Mycetophagus ater. Recent records: Plášťovce, on drying bracket fungi (*Pleurotus* sp.) growing on an old willow, 24 July, 1983 [referred to as a new species for the fauna of the former Czechoslovakia (FRANC, 1989)]; Veľký Blh – Vereš, under the bark of an old oak stem attacked by fungi, 17 May, 1993, 2 specimens. A scarce Eurosiberian species.

Tetratoma desmaresti – occurs extremely rarely in well preserved deciduous (often pasture) forests. Only one old record is accessible: Zvolen, July 1955, Olexa lgt. et coll. (NOHEL, 1975). Recent finding: the surroundings of Zvolen, on *Stereum hirsutum* (WILLD. ex FR.) FR. growing under the bark of an old solitary oak, 29 Oct., 1994, 4 specimens. In the ecosozological check list of the beetles of Slovakia it is listed among extinct species. This finding has proved its occurrence in Slovakia.

Mycetoma suturale – occurs locally and rarely in well preserved old (sub)mountain forests. Only a few records are available: Vihorlat (710), Chyzer lgt., Veľká Fatra (150), Roubal lgt., Tovarníky (7195), Kuthy lgt., Inovec, Čepelák lgt., Vranov nad Topľou (7196), Steidl lgt., Vlára, Richter & Roubal lgt. and Šalková (7281), Čejka lgt. (ROUBAL, 1936). Recent findings: NR Badínsky prales, on *I. benzoinum* growing on a broken fir, 20 Oct., 1985, more than 10 specimens; Zvolen – Sekier (7481c), *Ischnoderma* sp. on a fallen down

Table 3. Mycetophilous beetles living on underground fungi and their ecosozological status (ESS.)

Family Species	ESS in some European countries							
	A1	A2	G	GB	S	F	Sk	Dk
Leiodidae								
Leiodes cinnamomea (PANZER, 1793)			V	N			V	
Agaricophagus cephalotes SCHMIDT, 1841			V	IK	CD			
Triarthron märkeli MÄRKEL, 1840			V	N				
Geotrupidae								
Bolbelasmus unicornis (SCHRANK, 1789)	V		Ex				V	
Ochodaeidae								
Ochodaeus chrysomeloides (SCHRANK, 1781)			E				I	

For abbreviations see Table 1.

beech 10 Oct., 1986, 3 Oct., 1989 and 10 Nov., 1995, many specimens; Poľana – Žiarec, *Ischnoderma* sp. on an old beech, 6 Nov., 1994, 2 specimens. It seems to be a monophagous species living on the referred fungus.

Hallomenus axillaris – occurs scatteringly and rarely, mainly in well preserved warm deciduous forests. Only a few old records are available: Banská Bystrica, Čejka lgt., Hronec (7283a), Slovenská Ľupča (7281), Roubal lgt. and Vysoké Tatry (182), Richter lgt. (ROUBAL, 1936). Recent finding: Cerová vrchovina – Bagóova skala, in *Daedalea quercina* (L.) ex FR. growing on an old oak stump, 24 May, 1996, 3 specimens.

3) *Beetles living on underground fungi* – are highly specialised. They occur mainly on fungi of the order Tuberales that grow in deeper layers of the soil. This group is not very numerous and is represented mainly by species of the family Leiodidae the identification of which is very difficult. This limits the bioindicative applicability of this family. Other species occurring on underground fungi are easily distinguishable and rank among the most significant bioindicators (Tab. 3).

The following two species deserve special attention:

Triarthron märkeli – occurs sporadically and rarely in well preserved forests growing from hilly to mountainous areas. It can be collected by sweeping the vegetation of forest meadows in warm summer evenings. Only a few records are available: Sitno (7579c), 29 June, 1935, Roubal lgt.; Banská Bystrica, Čejka lgt. (ROUBAL, 1937–1941); Bratislava (7868), July 1942 and 1943 (DEPTA, 1952) and Ďumbier (7083d), Fleisher lgt. (ŠVEC, 1990). Recent record: Banská Bystrica – Urpín (7280d), swept from the vegetation of a forest margin in a warm evening, 17 June, 1993. Brutovský found it in Poľana – Vrchdobroč (7483b) in a pheromone trap set for *Ips typographus* (LINNAEUS, 1758), 10 June, 1990. In Slovakia the species should be listed among rare (R) species.

Ochodaeus chrysomeloides – occurs sporadically and rarely in warm deciduous forests and xerothermic biotopes. Only a few old records are available: Bratislava, Roubal lgt., Zlatovce (7174a), Polentz lgt., Devín (7867b), Kavan lgt. and. Trenčín (7174a), Čepelák & Korbel lgt. (ROUBAL, 1936). Recent finding: Štúrovo – Hegyfarok (8178), swept from xerothermic vegetation in a warm evening, 30 April, 1994.

The practical bioindicative utility of mycetophilous beetles from other families, such as Staphylinidae, Cryptophagidae or Cisidae, is limited because they are hardly identifiable.

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