

Myrmecophilous beetles of Slovakia with special reference to their endangerment and perspectives for protection

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Abstract. The author gives a survey of myrmecophilous beetles (Coleoptera myrmecophila) of Slovakia. It is the result of his research during the last 12 years that was confronted with data of older papers and collections. He mentions 104 species of evidently myrmecophilous beetles in Slovakia, three of them are new species for Slovakia. They are often rare and remarkable species at a high level of endangerment. The paper includes the original system for evaluation of potential endangerment indexes and an outline of the ways in which the future improvement of their conservation could be achieved.

INTRODUCTION AND METHODS

Myrmecophily is one of very remarkable and interesting ecological adaptations of animals. The majority of myrmecophiles belongs to the class of insects, especially to beetles. Mutual relations between ants and beetles may be very diverse. I cannot give a particular analysis of ecological relationships in the myrmecophilous beetle's synusias; it is not the matter of extent-limitation, but also of insufficient level of the knowledge concerning details in bionomy, trophic relations, etc.

In this paper I would like to deal with the essential ecological relations, to sum up the dispersion of myrmecophiles in Slovakia and mainly to emphasize their general decrease and to suggest assumptions and ways of their protection.

My research of the Slovak myrmecophilous beetles was carried out during the last 12 years. I applied current methods of collecting, especially individual collecting under the bark of trees and under stones, and sieving of detrital ant nests in soil and tree-hollows. All findings listed are mine, except where different collectors are given in brackets. The material was determined according to Freude, Hardé et Lohse (1964, 1967, 1971, 1974). The taxonomic conception is based on the modern system of R. A. Crowson (in: Lohse et Lucht, 1989). Literary data and further findings are added only in the case of rare and faunistically significant species.

No systematic attention the study of myrmecophilous beetles has been devoted till now. We can remark only a few titles that deal with this topic. These are several older papers in entomological journals, for example Lokay (1905), Roubal (1937); and also some monographs: Roubal (1930, 1936, 1941), Smetana (1958), where we can find a lot of remarks about myrmecophiles. A little interest in this group is caused by often difficult methods of their collecting and also by one-sided preference of applied entomology.

There are about 100 species of myrmecophilous beetles living in Slovakia. But it is not easy to state the strict number because no exact boundary exists between myrmecophily and hemimyrmecophily. More than one-half of myrmecophiles belong in the family Staphylinidae, more than ten belong in Pselaphidae and Scydmaenidae, five in Histeridae and Cholevidae; in the further 10 families myrmecophiles occur rarely. Myrmecophiles include three main symbiotic types:

1. **Synecthricans** (about 20 in Slovakia) have a symbiotic relation that is more or less one-sided, it has a predatory character. They usually live in nearby surroundings of ant colonies. We can define three bionomical subtypes:

- **prosynecthricans**: they are the species of the beginning synecthric symbiotic relation. They live together with several ant species and sometimes out of them (*Zyras fulgidus* Grav.);
- **synecthricans** (in the closer meaning): they live only in colonies of a few ant species. They feed on ants, especially weak and hurt ones [*Quedius brevis* Er., *Zyras funestus* (Grav.)];
- **hyposynecthricans**: their symbiotic relation is approaching hypersymbiosis. They are mainly smaller species of the subgenus *Lepla* Tott. [*Zyras laticollis* (Märk.)], that live together with larger species of the subgenus *Pella* Steph. The true predators of the subgenus *Pella* feed on ants directly, and species of the subgenus *Lepla* feed on residuals of ant bodies (Dvořák, 1980).

2. **Synoecious myrmecophiles** (about 70 in Slovakia) have a symbiotic relation of a more or less indifferent character, it approaches commensalism. They feed on detritus, various residuals, mildews, etc. (*Euryusa sinuata* Er., *Thiasophila* Kr. spp., some *Oxyopoda* Mannh. spp.). Some of them live as micropredators and feed on tiny acarids (*Batrisus formicarius* Aubé, *Batrisodes* Reitt. spp.).

3. **Symphillic myrmecophiles** (about 15 in Slovakia) are the most specialized group of an advanced symbiotic relation. They are mostly fed by ants and they render the sweet secretion of special glands to their hosts (*Lomechusoides strumosus* (F.), *Claviger* Preyssl. spp., etc.).

We can deal also with several intermediate stages between these main symbiotic types. Thus we can define for example synoecio-symphillic species, etc.

Myrmecophilous beetles in Slovakia occur in colonies of roughly 30 species of host-ants. It is necessary to deal with at least three main bionomic groups:

1. The species living in the ground (terricolous) and understone colonies of the following host-ants: *Messor* For. spp., *Myrmica* Latr. spp., *Tetramorium caespitum* (L.), *Tapinoma erraticum* (Latr.), some *Lasius* F. spp., etc. They prefer mainly meadow-and-steppe biotopes.

2. The species living in colonies of arboricolous ants (*Liometopum microcephalum* (Panz.), *Lasius fuliginosus* (Latr.), *L. brunneus* (Latr.) and *Camponotus* Mayr spp.).

3. The species living in the 'classic' ant hills that are built from detritus and conifer needles (*Formica rufa* L., *F. polyctena* Forst., *F. pratensis* Retz., *F. exsecta* Nyl.).

Myrmecophilous beetles are a relatively large group – they are about 1.5 % of the whole beetles-order diversity in Slovakia. But at most 20 of them rank among more or less frequent species, about 40 of them rank among relatively rare species that occur only in some areas of Slovakia, and it is alarming to class up to one-half of them as very rare and sporadic species which have survived only in a few isolated places.

The high grade of myrmecophilous beetles endangerment depends on the following facts:

- the majority of them ranks among highly specialized species of a narrow symbiotic and also biotopic amplitude;
- many species live mainly in the Mediterranean area and they get up to Southern Slovakia only exceptionally [*Eocatops pelopis* (Reitt.), *Zyras ruficollis* (Grimm), etc.];
- the majority of them live in more or less low abundance;
- myrmecophilous beetles and their host-ants are threatened by many deterioration factors (see the conclusion).

The evaluation of endangerment grades of the individual species is the focal point of this paper. The following evaluative system was worked up in my dissertation (Franc, 1991). The potential endangerment index (PEI) of every species is given by a sum up of eleven numbers in the following evaluative points.

POTENTIAL ENDANGERMENT INDEX EVALUATION SCHEME

I. Distribution

1. The whole range:
 - cosmopolitic or near cosmopolitic 0
 - the species of a large range (Palearctic and wider) 1
 - the species of a lesser range (Eurosiberian, etc.) 2
 - the species of a local range (Central Europe, etc.) 3
 - the endemic or relict species 5
2. The situation of Slovakia in relation to the range:
 - inside of the range 0
 - at a border of the range 2
 - outside of the continual range of occurrence 4
3. The occurrence in the territory of Slovakia:
 - wide spread species found almost in the whole territory 0
 - the species which occurs in a lesser part of Slovakia 1
 - the species which occurs only in some regions 3
 - it occurs insularly only in a few isolated places 5

II. Abundance

1. The abundance:
 - very frequent species 0
 - frequent species 1
 - less frequent species 2
 - infrequent (relatively rare) species 3
 - rare species 4
 - very rare species 5
2. The trend in the last decades:
 - the abundance is increasing 0
 - the abundance is more or less stable 1
 - the abundance decrease is perceivable 2
 - the clearly retreating species 4
 - the rapidly disappearing species, which have been already become extinct in some areas 6

III. Ecology

1. biotopic amplitude:
 - euryoecious or near euryoecious species 0
 - the species of less biotopic claims 2
 - the species of narrow biotopic claims 4
 - the specialized species of a very narrow biotopic amplitude 6
2. The symbiotic amplitude:
 - little specialized species, which are living together with many species of host-ants 0
 - oligophilous species 2
 - symbiotically specialized, monophilous species 4
3. The ecology of host-ants (it is evaluated only in the case of monophilous and oligophilous species):
 - wide-spread species, non-endangered by man's activity 0
 - species which occur only in some regions, they are partially endangered by man's activity somewhere 2
 - vulnerable species of a narrow ecological amplitude, they are endangered mainly in the intensively exploited regions 4
4. The mobility of the species, abilities and possibilities to spread to new biotopes:
 - high 0
 - average 2
 - limited or very low 4

IV. Anthropogenic factors of protection

1. The trend of biotopic interference:

– is improving	0
– is more or less stable	1
– the biotopes are interfered without major changes	2
– the biotopes are highly interfered	4
– the biotopes are liquidated	6

2. A protection assurance from man's side:

– the species is at least more or less known among specialists, it ranks (or it has a chance to rank) among protected species; the special conservationist's attention is focused at least on some of its biotopes; the data concerning its endangerment and ways of protection are more or less available (in Red Books, etc.)	0
– the species is practically unknown and we cannot state the preceding facts in this case	1

The potential endangerment index of every species will be evaluated in the following chapter. I am dealing with the following endangerment categories in practice (with regard to a high frequency of these evaluations the following abbreviations in brackets will be used):

0-10	adaptable, little vulnerable	(ALV)
11-20	contemporarily non-endangered	(CNE)
21-30	perceivably endangered	(PE)
31-40	highly endangered	(HE)
41 and more	critically endangered	(CE)

SYSTEMATIC REVIEW OF SPECIES

This chapter contains the systematic review of evidently myrmecophilous beetles of Slovakia. Every species is supplemented by a brief characteristic of its ecology and occurrence in the Slovak territory. The evaluation of their endangerment is the focal point of this paper. A particular review of localities and findings is given only in the case of rare and faunistically significant species. The zoogeographical mapping code of every locality is given only for the first time.

The following abbreviations (except the current ones) are used in the next text:

B. B. – Banská Bystrica
 F. – always *Formica*; *F. prat.* – *F. pratensis*
 F. H. L. – Freude, Harde et Lohse: Die Käfer Mitteleuropas
 L. – always *Lasius*; *L. brun.* – *L. brunneus*, *L. fulig.* – *L. fuliginosus*
 NMP – National Museum, Praha
 pc., pcs. – piece, pieces
 PEI – potential endangerment index
 SNMB – Slovak National Museum, Bratislava.

Histeridae

Myrmecopis paykulli (Kanaar) [= *piceus* (Payk.)] a synoecious myrmecophil that occurs sporadically and rarely in colonies of *F. rufa* and *F. prat.*

PEI: 20342320221; 21: PE. Known only from several old records: Malacky (7568), Laco lgt.; Košice (72-7393) 1927, 4 pcs., Machulka lgt., coll. NMP; Handlová (7278) March 1929, Modrý Kameň (7781/82), B. B. (7280) 18 April 1926, Roubal lgt., coll. SNMB. Roubal (1930) adds Bankov (7293), Machulka lgt. The newer finding: B. B. – Hrádok (7280), in a colony of *F. rufa* at the forest border (Abieto-Fagetum) 7 March 1987.

Dendrophilus pygmaeus (L.) – a synoecious myrmecophil, frequent in colonies of *F. rufa* and *F. prat.*

PEI: 20131210221; 15: CNE.

Margarinotus (= *Hister* auct.) *ruficornis* (Grimm) – a synoecious myrmecophil that occurs sporadically and rarely in tree colonies of *L. fulig.*, occasionally with another ants.

PEI: 32442322231; 28: PE. The newer finding: Plášťovce (7879), in the colony of *L. fulig.* at the root of an oak 28 April 1991.

Satrapes sartorii (Rdtb.) – a symphillic myrmecophil, living scatteringly and very rarely in colonies of *Tetramorium caespitum* in xerothermic biotopes.

PEI: 54554422341; 39: HE. Only a few older findings from Southern and Eastern Slovakia are available: Čachtice (7272) 18 April 1935, Lučenec – Opatová (7684) 12 May 1935, B. B. 21 April 1932, Lučatín (7281) 25 March 1936, Zádíel (7390) April 1935, Roubal lgt.; Turňa nad Bodvou (7391), Hajný lgt., coll. SNMB; Turňa nad Bodvou, Machulka lgt., coll. NMP.

Hetaerius ferrugineus (Oliv.) – a synoecio-symphillic myrmecophil; it occurs sporadically, but sometimes frequently in colonies of many ant species, mainly terricolous ones.

PEI: 20121201221; 14: CNE

Cholevidae (=Catopidae)

Nemadus colonoides (Kr.) – lives sporadically and relatively rarely in tree colonies of *L. fulig.* and *L. brun.* as a synoecious myrmecophil. Occasionally it may also occur in nests, especially in hollow trees.

PEI: 20342422231; 25: PE.

Eocatops (= *Nemadus* auct.) *pelopis* (Reitt.) – occurs very sporadically in colonies of *Messor barbarus* (L.) on xerothermic slopes. It ranks among the rarest species in Central Europe.

PEI: 54552642331; 40: HE! Only two old records are available: Somotor (7596) May 1931, Pfeffer lgt. et coll.; Zádíel, May 1934, Machulka lgt. (Roubal, 1941).

Anemadus strigosus (Kr.) – occurs sporadically and very rarely in well preserved warmer forests in hollow tree colonies of *L. brun.*

PEI: 52553442341; 38: HE. Known only from several old records: Dobrá Niva (7580) June 1965, Kunerád (6978) Aug. 1971, Pfeffer lgt. et coll.; Seleska (7392), Kuthy lgt. (Roubal, 1930); Devínska Nová Ves (7767) 1940, Bratislava – Petržalka (7868) 1 June 1946, Depta

lgt.; Komárno (8274) 10 May 1931, Kováčov (8178) 3 May 1936, Hronská Breznica (7479) May 1935, Roubal lgt., coll. SNMB. Newer findings: Teplý Vrch (7586), in the hollow of an oak with *L. brun.* 4 May 1991; B. B. – The Urban Park, in the colony of *L. brun.* in a hollow lime tree 21 Sept. 1991.

Catopomorphus orientalis Aubé – this pontomediterranean species occurs very rarely in Central Europe. Heyrovský (1949) lists one finding from Kováčov: June 1948. Szymczakowski (in F. H. L., 1971) doubt this record and its occurrence in Slovakia. I had no opportunity to check this specimen, so that this question remains open.

Attaephilus arenarius (Hampe) – occur locally and very rarely on xerothermic slopes in colonies of *Messor structor* (Latr.). A symphillic myrmecophil.

PEI: 53553642331; 40: HE! Only a few older records are available: Čachtice, 30 May 1936, Depta lgt.; Šášovské Podhradie (7479) 27 March 1930, Hronský Beňadik (7677) 1 June 1930, Roubal lgt., coll. SNMB. Roubal (1930) adds Slovenské Nové Mesto (7596), Biró lgt., and Piešťany (7472), Fleischer et Roubal lgt. The newest finding: Medovarce (7779/80), in a colony of *Messor structor* on a xerothermic rocky slope 28 April 1991, 3 pcs. (1 pc. in coll. Dolanský).

Dreposcia umbrina (Er.) – this rare and relict species tends perceivably to be a synoecious myrmecophil (Roubal, 1930; Koch, 1989). It lives near the colonies of *L. brun.* in old, hollow trees, especially oaks.

PEI: 54552642351; 42: CE. Only a few old records are available.

Scydmaenidae

Euthiconus conicicollis (Fairm. et Lab.) – occurs scatteringly and very rarely in warmer regions near the colonies of *L. fulig.*, *L. brun.* and *F. rufa*. Probably a synoecious myrmecophil.

PEI: 54552421331; 35: HE. In the 'Red Book' of Germany (Blab et al., 1984) it is listed among CE species. Older records: B. B. 28. Dec. 1936, Roubal lgt.; Revúca (7386) and Jelšava (7387), Hajný lgt., coll. SNMB. Roubal (1930) adds Slanec (7394) April 1924, Staré Hory (7180) 16 May 1922, Ružín (7192) May 1926, together with *L. brun.* ssp. *parallelocollis* Saulcy (Machulka lgt.). Recent findings: B. B. – Urpín, in a rotten lime tree near a colony of *L. brun.* 24 April 1981; Podbrezová (7183), under the bark of an oak near a colony of *L. fulig.* 14 May 1989.

Neuraphes carinatus (Muls.) – this sporadic and rare species tends perceivably to be a (synoecious?) myrmecophil (Machulka, 1931; Koch, 1989). Its ecology and distribution in Slovakia is little known.

PEI: 32552322331; 31: HE. Newer finding: B. B. – Pod Urpínom, in a colony of *Myrmica laevinodis* Nyl. near the railway station 8 May 1982 (Rous det.).

Neuraphes imitator Blattny – lives sporadically and rarely near colonies of several ant species. Particular records and data concerning its distribution in Slovakia are missing. Probably a synoecious myrmecophil.

PEI: 54552422331; 36: HE.

Scydmoraphes minutus Chaud. – Roubal (1930), Machulka (1931) and Koch (1989) state that it tends to be a (synoecious?) myrmecophil. It always occurs sporadically and rarely.

PEI: 34552422331; 34: HE.

Stenichnus foveola Ray (= *compendiensis* Mequign.) – Roubal (1930, 1941), Machulka (1935) and Koch (1989) list it among myrmecophils. It always occurs sporadically and rarely, therefore its ecology and distribution in Slovakia is little known.

PEI: 54552642341; 41: CE.

Several other species [*S. godarti* (Latr.), *S. collaris* (Müll. et Kze.), etc.] occur occasionally near ant colonies, but they are only hemimyrmecophils.

Euconus (Napochus) chrysocomus Saulcy – lives as a symphillic myrmecophil in colonies of *Tetramorium caespitum*. It occurs sporadically and very rarely in xerothermic biotopes.

PEI: 54552632331; 39: HE. Only a few old records are available: Hlohovec (7572), without date, Roubal lgt., coll. SNMB. Roubal (1941) adds Čachtice, Richter lgt., and Turňa nad Bodvou, Roubal lgt. Newest finding: Čabrad' (7780), in an understone colony of *Tetramorium* on a xerothermic rocky slope 8 April 1989.

Euconus (N.) claviger (Müll. et Kze.) – occurs sporadically in colonies of several *Formica* spp. (especially *F. rufa*) and of other ants. It is a relatively frequent species.

PEI: 20132211121; 16: CNE.

Euconus (N.) pragensis Mach. – occurs locally and rarely in colonies of *L. brun.* and *F. rufa*.

PEI: 32543422231; 31: HE. Only a few old records are available: Pajštún (7768) 1942, Depta lgt.; Košice, 17 June 1926, 2 pcs.; Lučatín, 25 March 1936, Roubal lgt., coll. SNMB; Košice, 6 April 1924, together with *L. Brun.*, Machulka lgt., coll. NMP. Roubal (1930) adds B. B., Hronská Breznica, Leopoldov (7572), Roubal lgt. A recent finding: B. B. – The Urban Park, in a colony of *L. brun.* in a hollow lime tree 21 Sept. 1991, 3 pcs.

Euconus (Neonapochus) maeklini (Mannh.) – occurs scatteringly and very rarely in well preserved biotopes. It lives in colonies of *L. brun.*, *L. fulig.* and *F. rufa*.

PEI: 52552422231; 33: HE. Also in the 'Red Book' of Germany (Blab et al., 1984) it is listed among endangered species. Known only from several old records: Košice, 1924, about 20 pcs. and 1934, 2 pcs., Machulka lgt.; Trenčín (7174), Kočí lgt., coll. NMP; Gíraltove (6895) June 1930, Depta lgt.; Sered' (7772) June 1939, Löbl lgt., coll. SNMB. A recent finding: Budča (7480), in a colony of *L. brun.* in an old oak 24 March 1990.

The symbiotic relation of the last three species has a synoecio-symphillic character.

Scydmaenus (Cholerus) perrisi Reitt. – lives as a synoecious myrmecophil only in colonies of *L. brun.* It occurs locally and relatively rarely in well preserved biotopes.

PEI: 20432442231; 27: PE. Recent findings: Plášťovce, in a colony of *L. brun.* in a hollow oak 28 April 1991; Posádka (7672), in a colony of *L. brun.* in a hollow willow near the river Váh 18 April 1992.

Scydmaenus (Ch.) hellwigi Hbst. – lives as a synoecious myrmecophil in colonies of *L. brun.*, *L. fulig.* and rarely of *F. rufa*. It is a relatively frequent species.

PEI: 20322322131; 21: PE.

Ptiliidae

Ptenidium formicetorum Kr. [=myrmecophilum (Motsch.)] – is a typical detritophilous species that often lives as a synoecious myrmecophil in colonies of several ants. It is a relatively frequent species.

PEI: 20222321121; 18: CNE.

Ptilium myrmecophilum (Allib.) – occurs relatively often in colonies of *F. rufa* and *F. prat.* A synoecious myrmecophil.

PEI: 20122331121; 18: CNE.

Astatopteryx laticollis Perris – occurs locally and very rarely as a synoecious myrmecophil in colonies of *Camponotus*, especially *C. pubescens* (F.). Only a few old records are available.

PEI: 52552442341; 37: HE.

Staphylinidae

Thoracophorus corticinus (Motsch.) – a synoecious myrmecophil that occurs locally and rarely in well preserved forests and also in older parks. It lives near colonies of *L. brun.* in hollow trees.

PEI: 50442642341; 35: HE. Newest finding (always together with *L. brun.*): B. B. – Urpín, in a cavity of a lime tree 30 May 1981; Plášťovce, in a decaying oak 16 April 1989; Svätajurský Šúr (7769), in a decaying oak 21 April 1987, many pcs. (Kubinec lgt. et coll.).

Trogophloeus punctatellus Er. – occurs sporadically and very rarely near colonies of *Tetramorium caespitum*, mainly in xerothermic biotopes. Probably a synoecious myrmecophil.

PEI: 32552442341; 35: HE. Roubal (1930) mentions one old finding from Hronská Breznica, 20 May 1928. Only one recent finding is available: Dolná Mičiná (7381), in an understone colony of *Tetramorium* on the xerothermic karst slope 14 May 1983 (Boháč det.). Probably the second record for Slovakia!

Stenus aterrimus Er. – a synoecious myrmecophil, living in colonies of *F. prat.* and *F. rufa*. It occurs relatively rarely.

PEI: 20331321231; 21: PE. Newest findings: Nemecká (7182), in a colony of *F. prat.* on the xerothermic karst slope 25 May 1980; Dobrá Niva, in a colony of *F. prat.* at an oak grove 22 Febr. 1987, 4 pcs., Franc et Kubinec lgt. et coll.

Leptacinus formicetorum Märk. – a synecthrical myrmecophil, living in colonies of *F. rufa*, *F. prat.* and *F. exsecta*. It occurs relatively often.

PEI: 20121321121; 16: CNE.

Gyrophypnus atratus (Heer) – lives as a synecthrical myrmecophil in colonies of *F. prat.* and *L. fulig.* It occurs sporadically and rarely.

PEI: 30334322221; 25: PE. Only a few records are available: Kováčovce (7882) May 1928; Leopoldov, April 1927; Košice, June 1926, Roubal lgt., coll. SNMB; Roubal (1930): Horná Lehota (7183), Čejka lgt.; Korbel (1937): Trenčianska Skalka (7074) 2 Nov. 1936, near a colony of *Formica* sp. Zúber (1988) adds Trenčianska Teplá (7074), near a colony of *L. fulig.* 23 April 1986, 10 pcs. and 16 May 1987, 7 pcs. The newest finding: Teplý Vrch, in a colony of *L. fulig.* at a root part of an oak 4 May 1991.

Quedius brevis Er. – a synecthrical myrmecophil, living near the colonies of *F. rufa* and *L. fulig.* It occurs relatively rarely, but sometimes often.

PEI: 30344322121; 25: PE.

Lamprinodes saginatus (Grav.) – probably a synecthrical myrmecophil, living in colonies of *Myrmica* spp., *F. rufa* and *L. fulig.*

PEI: 54554422331; 38: HE. Only a few old records are available: Trenčianske Teplice (7075), Kočí lgt.; Pajštún, 1942, Depta lgt., coll. SNMB; Košická Belá – Šivec (7192) 25 March 1928, Machulka lgt., coll. NMP. Roubal (1930) adds Trenčín, Čepelák lgt.

Lamprinodes haematopterus (Kr.) – probably a synecthrical myrmecophil that lives in colonies of *Tapinoma erraticum* and potentially of *Tetramorium caespitum*.

PEI: 54554643341; 44: CE! Only a few records are available: Košická Belá, 10 March 1926, 3 pcs. and 18 May 1930, 1 pc., Machulka lgt.; Inovec (7274) 15 May 1927, Rambousek lgt., coll. NMP; Bratislava – Petržalka, 8 June 1946, Depta lgt., coll. SNMB. Roubal (1930) adds Dolné Držkovice pri Bánovciach nad Bebravou (7275) May 1925, Čepelák lgt.

Lamprinus erythropterus (Panz.) – probably a synecthrical myrmecophil, living in colonies of *Tetramorium caespitum* and potentially of *L. fulig.* and *L. brun.*

PEI: 52554632341; 40: HE! A relatively large number of old records are available: Šášovské Podhradie, 17 Sept. 1930; Jalná (7479), in a colony of *Tetramorium* 8 March 1930; B. B., in a colony of *L. fulig.* near the river Hron, Aug. 1931; B. B., accidentally on a vegetation 16 Sept. 1920; Veľký Blh (7586), in a colony of *L. fulig.* 3 July 1930, Roubal lgt.; Bratislava, 1941; Devínska Nová Ves, 1940, Depta lgt., coll. SNMB; Inovec, in a colony of *Tetramorium* 5 May 1929, Rambousek lgt.; Košická Belá – Šivec, 1925, Machulka lgt., coll. NMP. Roubal (1930) adds Košice – Čermel' (7293), Machulka lgt. Despite it, newer findings are missing.

The last three species rank among the utmost rare-and-sporadic beetles of Central Europe. Their perceivable retreat is evident, but it is not simple to explain it. They are relict, very vulnerable species and their retreat is a consequence of many factors, global changes of the landscape, disappearing of suitable biotopes, etc.

Euryusa optabilis Heer – this synoecious myrmecophil lives together with several species of the genus *Lasius*. It occurs sporadically and relatively rarely.

PEI: 30443322231; 27: PE. A newer finding: B. B. – Šášovská dolina, in a colony of *L. niger* 8 June 1980 (Kubinec lgt. et coll., Pfeffer det.).

Euryusa sinuata Er. – a synoecious myrmecophil, typical for *L. brun.*, exceptionally it occurs near *L. fulig.* It is a relatively frequent species, but only in well-preserved environments.

PEI: 30331442231; 26: PE.

Euryusa coarctata Märk. – a synoecious myrmecophil, living only in colonies of *L. brun.* It occurs very sporadically and utmost rarely in well preserved biotopes.

PEI: 54554642241; 42: CE. Only a few old records are available: Košice, 20 April 1924, several pcs.; Košice – Hradová (7293) 1930, Machulka lgt., coll. NMP; Bratislava (77-7868-69) 8 June 1952; Svätôjurský Šúr, 20 April 1952, Depta lgt., coll. SNMB.

Euryusa brachelytra Kiesw. – a synoecious myrmecophil, living in colonies of *L. brun.* and *L. fulig.*, but it has been found also together with *Myrmica* spp. in mountain altitudes (Likovský, 1967; Dvořák, 1979). It occurs locally and rarely.

PEI: 30441322231; 25: PE.

Amidobia (= *Atheta* auct.) *talpa* (Heer) – lives as a synoecious myrmecophil in colonies of *F. rufa*, *F. prat.* and potentially of other ants. It occurs scatteringly, but sometimes often.

PEI: 20231211231; 18: CNE. New findings: Hronec (7283), in a mixed colony of *F. rufa* and *F. fusca* 13 Febr. 1983, Likovský det.; Dobrá Niva, in a colony of *F. prat.* at an oak grove 22 Febr. 1987, 4 pcs., Franc et Kubinec lgt. et coll.

Notothecta flavipes (Grav.) – a synoecious myrmecophil, living in colonies of *Formica rufa*, *F. prat.* and rarely of *F. sanguinea* Latr. It is one of the wide spread and frequent species.

PEI: 10111221121; 13: CNE.

Notothecta confusa Märk. – a synoecious myrmecophil, living in colonies of *L. fulig.*, potentially also of *Formica* spp. (Koch, 1989). It occurs sporadically and very rarely in older deciduous forests.

PEI: 34554432241; 37: HE. Only a few old records are available: Selec pri Trenčíne (7274), Kočí lgt.; B. B., May 1933; Levice (7777) 23 March 1930, Roubal lgt., coll. SNMB. A recent finding: Plášťovce, in a colony of *L. fulig.* at a root part of an oak, 28 April 1991 (Boháč rev.).

Lyprocorrhe anceps (Er.) – a synoecious myrmecophil of a wide symbiotic amplitude, but it occurs especially in colonies of *F. rufa* and *F. prat.* It is one of the wide spread and frequent species.

PEI: 20111221121; 14: CNE.

Zyras (*Zyras*) *fulgidus* Grav. – a prosynecthical myrmecophil of a wide symbiotic amplitude; here we can deal with a beginning myrmecophily. It occurs sporadically and rarely in warmer, well-preserved biotopes.

PEI: 31341301131; 21: PE. A relatively large number of older and recent records are available. Newest findings: Jablonov nad Turňou (7490), accidentally on xerothermic vegetation 8 June 1986 (Kubinec lgt. et coll., Franc det.); Plášťovce, in a colony of *L. fulig.* at a root part of an oak 3 June 1985.

Zyras (*Z.*) *haworthi* (Steph.) – lives similarly as the preceding species and it also occurs sporadically and rarely.

PEI: 30341302131; 21: PE. Newest findings: Babiná (7580), in a colony of *Myrmica* sp. under an old log 15 June 1986; Detvianska Huta (7483), accidentally in the pheromon trap for *Ips typographus* 5 July 1987 (Brutovský lgt. et coll.).

Zyras (*Pella*) *erraticus* (Hag.) – probably a hyposynecthical myrmecophil, living only in colonies of *Tapinoma erraticum* in well preserved xerothermic biotopes. It is one of the rarest beetles of Europe.

PEI: 54554643441; 45: CE! Only one old record is available: Košice, 1925, without further details, Machulka lgt., coll. NMP. It is not out of the question that it approaches total extinction.

Zyras (*P.*) *limbatus* (Payk.) – a synecthical myrmecophil of a wide symbiotic amplitude. It occurs relatively often, especially near the colonies of *Lasius* spp.

PEI: 20332321131; 21: PE. A remarkable finding has been made: Jablonov nad Turňou, in a colony of *Tapinoma erraticum* on a xerothermic rocky slope 5 May 1991. The symbiosis with *Tapinoma* has not been reported till now.

Zyras (*P.*) *funestus* (Grav.) – lives as a synecthical myrmecophil near the colonies of *L. fulig.* It is a wide-spread and frequent species.

PEI: 20111241121; 16: CNE.

Zyras (*P.*) *humeralis* (Grav.) – lives as a synecthical myrmecophil near the colonies of *L. fulig.* and several *Formica* spp. It is a wide-spread and relatively frequent species.

PEI: 20111221121; 14: CNE.

Zyras (*P.*) *similis* (Märk.) – lives as a synecthical myrmecophil near the colonies of *L. fulig.*, *Liometopum microcephalum* and potentially of several other *Lasius* spp. It occurs sporadically and relatively rarely.

PEI: 10331321121; 18: CNE. Newest findings (always together with *L. fulig.*): Muráň (7286), in a hollow beech 21 July 1982; Plášťovce, in a hollow oak 6 April 1986; Budča, in a hollow oak 18 April 1987.

Zyras (*P.*) *cognatus* (Märk.) – occurs sporadically but sometimes often near the colonies of *L. fulig.* and exceptionally of another *Lasius* spp. A synecthical myrmecophil.

PEI: 20231321131; 19: CNE.

Zyras (*Lepla*) *lugens* (Grav.) – a hyposynecthical myrmecophil, it lives near the colonies of *L. fulig.* and rarely of *L. brun.* and *Liometopum microcephalum* together with larger species of the subgenus *Pella*. It occurs sporadically, but sometimes often.

PEI: 20322321131; 20: CNE.

Zyras (*L.*) *hampei* (Kr.) – probably a hyposynecthical myrmecophil, living near the colonies of *Liometopum microcephalum*. It occurs very locally and rarely in old, well-preserved forests of lower altitude. Older and recent records include only two isolated localities – the surroundings of Bratislava and of Rimavská Sobota. It is one of the most endangered species of Slovak insects.

PEI: 5454464451; 46: CE! Newest findings: Svätajurský Šúr, in the colony of *Liometopum* in a hollow oak 8 May 1990; Teplý Vrch, in the same circumstances 4 May 1992, 3 pcs.

Zyras (L.) laticollis (Märk.) – a hyposynecthrical myrmecophil, living only near colonies of *L. fulig.* together with larger species of the subgenus *Pella*. It is a relatively frequent species.

PEI: 30111341131; 19: CNE.

Zyras (Pellochromonia) ruficollis (Grimm) – synecthrical myrmecophil, living only near colonies of *Liometopum microcephalum*. It occurs only insularly, locally and rarely, often together with *Z. hampei*.

PEI: 54554644351; 46: CE! Known from several old records: Rimavská Sobota (7686) 19 June 1924, Roubal lgt.; Svätajurský Šúr, 4 June 1944, Depta lgt., coll. SNMB. Roubal (1930) adds Ozorovce (7572), Chyzer lgt.; Seleška, Kuthy lgt. and Silická planina (7489), Rambousek lgt. Recent findings include only one locality – Svätajurský Šúr, but its abundance is decreasing there also. Since active attention of genofund specialists and conservationists is not devoted to this problem, the isolated Slovak population of *Z. ruficollis* will probably become extinct in the near future!

Myrmoecia plicata (Er.) – synecthrical myrmecophil, living only in colonies of *Tapinoma erraticum*. It occurs sporadically and very rarely in well preserved xerothermic biotopes.

PEI: 52552643331; 39: HE. Only a few older records are available: Levice 11 April 1926, Trenčianska Teplá 15 May 1929, B. B. – Laskomer, 20 May 1932, Roubal lgt., coll. SNMB; Košická Belá (7192) 29 May 1932, Košice 1925, 4 pcs., Ružín, Machulka lgt., coll. NMP; Dvořák (1965): Nitra (7774) 18 May 1963, a pair; Tisovec (7385) 7 May 1962 (an interesting finding from a submountain region); Dvořák (1979): Kováčovské kopce (8178) 12 May 1973, Horák lgt., Boháč coll. A recent finding: Pravica (7682). in an understone colony of *Tapinoma* on a xerothermic slope 9 May 1992, 2 pcs.

Myrmoecia confragrosa (Hochh.) – a synecthrical myrmecophil, living in the colonies of *Tapinoma erraticum*, and exceptionally of *L. fulig.* and *L. niger* (L.) (Koch, 1989). It occurs sporadically and very rarely in well preserved xerothermic biotopes.

PEI: 54554643341; 44: CE! Only a few old records are available: B. B. – Laskomer, 11 May 1924, Roubal lgt., coll. SNMB; Košice 1925, 2 pcs., Košická Belá, 4 pcs. without details, Machulka lgt., coll. NMP. Roubal (1930): Košice – Hradová, 1925, Machulka lgt.; Dvořák (1965): Trenčianske Teplice 12 May 1963, 2 pcs.

Myrmoecia perezi (Uhagon) – a synecthrical myrmecophil, living only in colonies of *Tapinoma erraticum*. This Mediterranean species occurs in Central Europe only sporadically and very rarely in well preserved xerothermic biotopes.

PEI: 54554643341; 44: CE! Known only from two findings: Bánovce nad Bebravou (7275) 11 April 1926, 3 pcs., Roubal lgt., coll. SNMB; Dvořák (1965): Nitra 18 May 1963. A recent finding: Jablonov nad Turňou, in a colony of *Tapinoma* under an oak wood on a xerothermic karst slope 5 May 1991, 6 pcs. (2 pcs. coll. Kubinec, 1 pc. coll. Boháč).

Lomechusoides strumosus (F.) – it is a typical symphyllic myrmecophil which lives in colonies of *F. sanguinea* and exceptionally of another *Formica* spp. It occurs sporadically and relatively rarely in warmer biotopes.

PEI: 30331332130; 22: PE. Recent findings: Detvianska Huta – Vrchdobroč (7483), accidentally in the pheromon trap for *Ips typographus* 25 June 1987 (Brutovský lgt. et coll.); Nemecká, in a colony of *F. sanguinea* on a rocky karst slope 16 April 1980; Příbelce (7781), in an understone colony of *F. sanguinea* in a xerothermic oak forest (*Corneto-Quercetum*) 31 May 1990.

Lomechusa emarginata (Payk.) – a symphyllic myrmecophil which lives in colonies of several *Myrmica* spp. and of *F. fusca*. It occurs sporadically and relatively rarely.

PEI: 30232221131; 20: CNE – PE. Recent findings: B. B. – Pod Rybou, in a colony of *Myrmica* sp. near an old swimming pool 18 March 1979 (Kubinec lgt. et coll.); B. B. – Sásová, in an understone colony of *Myrmica* 13 April 1980; B. B. – Rúdlovská cesta, in a flight during a very warm afternoon 26 April 1987.

Lomechusa paradoxa (Grav.) – a symphyllic myrmecophil which lives in colonies of several *Myrmica* spp. and of *F. rufibarbis*. It is a sporadic and very rare species of warm biotopes.

PEI: 32553321331; 31: HE. Several older records are available: Trenčianske Teplice, Kočí lgt.; Motešice (7175) 30 March 1934, Babiná, 14 April 1935, Roubal lgt., coll. SNMB; Roubal (1930): Trenčín, Čepelák lgt.; B. B. 9 April 1924, Roubal lgt.; Roubal (1941): Levice, 14 May 1931; Pfeffer (in litt.): Malacky, May 1933; Dvořák (1979): Štúrovo (8178) July 1961, Rous lgt. Recent findings: B. B. – Šalková (7281), in an understone colony of *Myrmica* near the river Hron 12 April 1980, Dubová (7182), in a colony of *Myrmica* at a xerothermic karst slope 16 April 1980 (Kubinec lgt. et coll., Franc det.); B. B. – Sásovská dolina, on a meadow near a creek in a colony of *Myrmica* 20 April 1983; B. B. – Sásová, in a colony of *F. rufibarbis* on a xerothermic karst slope 19 May 1991.

Lomechusa pubicollis Bris. – a symphyllic myrmecophil which lives in colonies of *Myrmica* and *F. rufa*. It occurs sporadically and rarely.

PEI: 30343321131; 24: PE. Only a few records are available: B. B., 21 May 1920, Roubal lgt., coll. SNMB; Košická Belá, 28 April 1929, Machulka lgt., coll. NMP; Roubal (1930): Trenčín Čepelák lgt.; Omšenie (7075), Brančík lgt.; Bardejov (6793), Csiki lgt.; B. B. – Kopa, 21 April 1924, Roubal lgt.; Korbel (1937): Breznica pri Trenčíne (7173); Boháč (1982): Štúrovo, 14 July 1961, Strejček lgt.

The last three species have an interesting bionomy: they live in colonies of *Formica* during summer (a metamorphosis is passed here) and they hibernate in colonies of *Myrmica*. The dependence on two host-ants is the supposition of their high vulnerability. Actually, a perceivable decrease in them is evident.

Dinarda dentata (Grav.) – a typical myrmecophil for colonies of *F. sanguinea*, rarely together with another *Formica* spp. It is wide spread and in some places a frequent species.

PEI: 20221332131; 20: CNE.

Dinarda märkeli Kiesw. – lives in colonies of *F. rufa*, *F. polyctena* and accidentally of another *Formica* spp. It occurs sporadically, but in some places frequently.

PEI: 20231221121; 17: CNE.

Dinarda hagensi Wasm. – lives in colonies of *F. exsecta* and exceptionally of *F. prat.* It occurs sporadically and very rarely on warmer meadows and xerothermic biotopes.

PEI: 52552342331; 35: HE. Only one old record is available: Trenčín, Čepelák lgt. (Roubal, 1930).

Dinarda pygmaea Wasm. – lives in colonies of *F. cunicularia* Latr. and *F. rufibarbis* and potentially of *F. fusca*. It occurs sporadically and very rarely on xerothermic biotopes.

PEI: 52552422331; 34: HE. Only a few old records are available: Piešťany, March 1925; B. B. – Kremnička (7380) 9 March 1938, Roubal lgt., coll. SNMB; Roubal (1930): Motešice, 28 April 1929, Roubal lgt.; Košice, Machulka lgt.; Korbek (in litt.): Opatová pri Trenčíne (7074) 13 April 1937, 4 pcs. A recent finding: Pravica, in the colony of *F. cunicularia* on a xerothermic slope 26 May 1991.

The symbiotic relation of the last four species is not entirely explained. They are synoecious species, but they tend to be partially symphillic.

Amarochara (Lasiochara) bonnairei Fauv. – a synoecious myrmecophil, living in colonies of several *Lasius* spp., mainly of *L. fulig.* and *L. brun.* It occurs very locally and rarely in well preserved forests and groves.

PEI: 52552421331; 33: HE. Only a few old records are available: Košice 1927, 3 pcs., Machulka lgt., coll. NMP; Nízke Tatry – Šponga (7181) Aug. 1933, Roubal lgt. (a remarkable finding in a relatively cold submountain valley); Pajštún 1942, Depta lgt., coll. SNMB; Roubal (1930) adds Kostolany pri Košiciach (7293), Machulka lgt.

Oxypoda vittata Märk. – lives as a synoecious myrmecophil near and in colonies of *L. fulig.* and rarely of *F. rufa*. It occurs sporadically and relatively rarely.

PEI: 30331321231; 22: PE. Recent findings (always together with *L. fulig.*): Budča, in a hollow oak 8 June 1985; B. B. – The Urban Park, in a root cavity of an old nut-tree (*Juglans nigra*) 21 Oct. 1988 and 27 March 1990; Badín (7380), in a root cavity of a beech 5 Oct. 1991, 2 pcs.

Oxypoda rugicollis Kr. – lives as a synoecious myrmecophil only in colonies of *F. prat.* It occurs sporadically and very rarely in warmer biotopes.

PEI: 54552341331; 36: HE. Only two old records are available: Omšenie, Brančík lgt. and Žihlavič (7175), Kočí lgt. (Roubal, 1930). Recent finding: B. B. – Sásovská dolina, in the colony of *F. prat.* on a karst shrubby slope 7 March 1987, Boháč det.

Oxypoda formiceticola Märk., – a synoecious myrmecophil, that lives in colonies of *F. rufa*, *F. polyctena* and less of *F. fusca*. It is a relatively frequent species.

PEI: 30121221221; 17: CNE.

Oxypoda pratensis Lohse – a synoecious myrmecophil, living in colonies of *F. prat.* and rarely of *F. exsecta*. This species was distinguished not long ago, therefore its distribution in Slovakia is little known. Probably it is a relatively rare species of a local occurrence.

PEI: 32542432331; 32: HE. Lohse et Lucht (1989) mention its occurrence in Germany, Czechoslovakia and other Central European countries, but without whatever detailed data. Recent finding: B. B. – pod Suchým vrchom, in a colony of *F. prat.* on a xerothermic karst slope 1 April 1991, about 10 pcs., Boháč rev. It is the first clearly defined record for Slovakia.

Oxypoda haemorrhoea Mannh. – lives as a synoecious myrmecophil in colonies of *F. rufa* and *F. prat.* It is a relatively frequent species.

PEI: 20111221121; 14: CNE.

Homoeusa acuminata (Märk.) – lives as a synoecious myrmecophil in colonies of *L. fulig.*, *L. brun.* and *L. niger*. It occurs scatteringly and relatively rarely, but in older, well-preserved forests it tends to be frequent.

PEI: 20332322231; 23: PE. Newest findings: Štúrovo, in the colony of *L. fulig.* in a xerothermic oak forest (*Corneto-Quercetum*) 10 May 1985; Budča, in the colony of *L. fulig.* in a hollow oak 8 June 1985; Čabrad', in the colony of *L. brun.* under an old willow log 30 April 1990.

Homoeusa paradoxa Scriba – probably a synoecious myrmecophil that lives in colonies of *Liometopum microcephalum*. It is known from Southern Europe: Italy, Balcan Peninsula, Greece. Therefore its finding out in Slovakia is surprising. It always occurs spradically and rarely, in Central Europe utmost rarely. It is one of the most endangered species of Slovak insects.

PEI: 54552644441; 44: CE! Only one finding is known: Plášťovce, in a colony of *Liometopum* at the roots of an oak on a xerothermic rocky slope 3 May 1986, Pfeffer det., in coll. SNMB et NMP rev. A new species for Slovakia and Central Europe!

Thiasophila angulata (Er.) – lives as a synoecious myrmecophil in colonies of *F. rufa*, *F. polyctena* and occasionally of *F. prat.* It is a wide spread and frequent species.

PEI: 10111221121; 13: CNE.

Thiasophila lohsei Zerche – a synoecious myrmecophil, living in colonies of *F. prat.* Its distribution in Slovakia is little known. Lohse et Lucht (1989) stated, that a part of older and also newer data about "*T. angulata* var. *pexa* Motsch." concerned *T. lohsei*. But Zerche (1987) recalls that *T. pexa* itself is a separate species that lives in Mongolia and Siberia. It seems that *T. lohsei* occurs relatively continuously on the warmer extraforestral biotopes in Slovakia, but it is not frequent.

PEI: 32332342231; 28: PE. Newest findings: Dubová, in a colony of *F. prat.* in a warm karst slope 17 March 1991, several pcs.; B. B., in a colony of *F. prat.* on the 'Jesenský vršok' hill 28 March 1991, several pcs. (Boháč rev.)

Thiasophila canaliculata Muls. et Rey – a synoecious myrmecophil that lives only in colonies of *F. exsecta*. It occurs locally and very rarely. Particularly defined data from Slovakia are missing. Only some old and general records are available; for example, Roubal (1905) states only "Bohemia". It is probably a very vulnerable species of a clearly discontinuous range. It is necessary to direct the attention of conservationists to this species and its host-ant.

PEI: 54552442331; 38: HE.

Thiasophila wockei (Schn.) (= *nitescens* Fauv.) – a synoecious myrmecophil that lives in colonies of *Camponotus* spp.; Koch (1989) reported mainly of *C. vagus* (Scop.) in decaying stumps of larch. Particular data concerning its occurrence in Slovakia are missing. Koch (1989) states only "Bohemia"; Roubal (1949) mentions one old finding also from Bohemia. It is probably a very rare relict species of a very sporadic, insular distribution. It deserves the attention of conservationists.

PEI: 54552442331; 38: HE.

Thiasophila inquilina (Märk.) – synoecious myrmecophil that lives in colonies of *L. fulig.* and exceptionally of *F. prat.* It occurs very sporadically and rarely.

PEI: 30442342231; 28: PE. Only a few data are available: Muráň, Gíraltovec, Košice 1926-1927, Machulka lgt., coll. NMP; Sliach (7380) June 1927, Roubal lgt.; Selec pri Trenčíne, Kočí lgt., Gíraltovec 1928, Svätajurský Šúr, 23 May 1949, Depta lgt., coll. SNMB. The recent finding: Kozárovce (7677), in a colony of *F. prat.* on the xerothermic slope 24 Febr. 1990, Boháč det.

Haploglossa gentilis (Märk.) – it lives as a synoecious myrmecophil in colonies of *L. fulig.* and *L. brun.*, and occasionally in nests in hollow trees. It occurs scatteringly and mostly rarely in well preserved warmer forests.

PEI: 304 324 32 231; 27: PE. Several older records are available: Gíraltovec 1930-1933, several pcs.; Bratislava and the surroundings, Sered' 1939, Pajštún 1941, Depta lgt.; Selec pri Trenčíne, several pcs., Kočí lgt.; B. B., April 1926; Komárno 5 June 1932, Roubal lgt., coll. SNMB; Roubal (1930) adds Košice, Machulka lgt. Newest findings: Malacky, in a colony of *L. brun.* in an old oak 8 July 1990; Teplý Vrch, in a colony of *L. fulig.* at roots of an oak 4 May 1991, Boháč rev.

Haploglossa villosula (Steph.) [=pulla (Gyll.)] – lives as a synoecious myrmecophil in colonies of several ants, especially in hollow trees. It often occurs as a nidicolous species. It is a sporadic, but sometimes frequent species.

PEI: 20122311131; 17: CNE. A recent finding: B. B. – Urpín, in a colony of *L. brun.* in a hollow willow near the river Hron 29 March 1992, 4 pcs.

Haploglossa marginalis (Grav.) – a synoecious myrmecophil that lives in colonies of *L. brun.* and *L. fulig.* in well-preserved warmer forests. It occurs sporadically and rarely.

PEI: 30442422241; 28: PE. Several older records are available: Štúrovo 24 May 1926, Kamenica nad Hronom (8178) 24 May 1937, Roubal lgt.; Gíraltovec 1927, 1933; Devínska Nová Ves 1940, 1943, several pcs.; Čachtice 1938; Pajštún, July 1940, Depta lgt.; Vrbové (7372), Kočí lgt., coll. SNMB; Košice, Machulka lgt., coll. NMP. Roubal (1930) adds Veľký Blh, Roubal lgt. Newest findings: Budča, under the bark of an oak together with *L. brun.* 11 April 1981 and 18 April 1987, Likovský det.; Malacky, in a colony of *L. brun.* in a hollow oak 8 July 1990, Boháč rev.

Pselaphidae

Saulcyella schmidtii (Märk.) – a synoecious myrmecophil that lives in colonies of *L. brun.*, *L. fulig.* and *F. rufa*. It occurs very locally and rarely in well-preserved warmer biotopes.

PEI: 54553321331; 35: HE. In the 'Red Book' of Germany (Blab et al., 1984) it is listed among CE species. Only a few old records are available: Petrovce (7094) 1932, Hermanovce (6992) 1934, Löbl lgt.; Gíraltovec 1930-1932, several pcs., Depta et Löbl lgt.; Košice 1 July 1929, several pcs., Machulka lgt.; Šášovské Podhradie 15 April 1934, Roubal lgt., coll. SNMB; Trenčín, Košice, Kostolany, Ružín, Machulka lgt., coll. NMP. An unequal, insular distribution of *S. schmidtii* is the reason of its high vulnerability.

Trichonyx sulcicollis (Reichb.) – lives in hollow and damaged trees as a synoecious myrmecophil, but it is not unconditionally dependent on ants. It occurs locally and mostly rarely mainly together with *L. brun.* and *Ponera coarctata* (Latr.).

PEI: 32332421241; 27: PE. Later findings: Dobrá Niva, under the bark of an oak near a colony of *L. brun.* 2 July 1981; Turá (7877), in the same circumstances 5 June 1989; B. B., in a flight near the cinema 'Hviezda' during a late evening 27 June 1990.

Amauronyx märkeli (Aubé) – a synoecious myrmecophil that lives in colonies of *Tetramorium caespitum*, *Ponera coarctata* and exceptionally of *Myrmica* spp. It occurs very locally and rarely mainly in xerothermic biotopes.

PEI: 52542432331; 34: HE. Only a few old data are available: Trenčín, Bratislava – Petržalka, Košice, Machulka lgt., coll. NMP; Košice 1928, Machulka lgt.; Selec pri Trenčíne, Kočí lgt.; Pajštún, July 1940 and 10 June 1946, Depta lgt.; Kováčov 10 April 1932, Trenčianska Teplá 6 Aug. 1925, 3 pcs., Roubal lgt., coll. SNMB. Korbel (1937) adds Trenčín, near *Myrmica* sp. 15 Nov. 1934. Recent findings are missing.

Batrissus formicarius Aubé – a synoecious myrmecophil; it lives only in colonies of *L. brun.* It feeds on parasitic acarids and various organic detritus (Roubal, 1905); the same concerns *Batrissodes* spp. It occurs relatively frequently, but only in well-preserved forest ecosystems.

PEI: 30231442331; 26: PE.

Batrissodes delaporteii (Aubé) – a synoecious myrmecophil that lives in colonies of *L. brun.* and exceptionally of *L. fulig.* It occurs sporadically and mostly rarely in warmer biotopes.

PEI: 30331332331; 25: PE. A relatively large number of older and recent records are available. A remarkable finding from mountain altitudes: Dobročský prales (7384), in the decaying wood of a fir in an old fir-and-beech forest (*Abieto-Fagetum*) together with *L. brun.* 26 June 1991.

Batrissodes venustus (Reichb.) – synoecious myrmecophil that lives in colonies of *L. brun.* and *L. fulig.* It is a wide-spread and frequent species.

PEI: 30211222321; 19: CNE

Batrissodes hubenthalii Reitt. – lives as a synoecious myrmecophil in colonies of *L. brun.* It has a relatively large range – Besuchet (in F. H. L., 1974) listed Southern, Northern and Central Europe (Moravia, Poland, Ukraine), but it occurs always sporadically and rarely. Data from Slovakia are not accessible.

PEI: 54552332331; 36: HE. A recent finding: B. B. – Urpín, in a colony of *L. brun.* in a hollow lime tree 7 Aug. 1981, Rous rev. A new species for Slovakia.

Batrissodes adnexus (Hampe) – a synoecious myrmecophil that lives in colonies of *L. brun.* It occurs scatteringly and rarely in well-preserved forests and old parks.

PEI: 30342332331; 27: PE. A relatively big number of older and recent records are available. A remarkable finding from mountain altitudes: Poľana – Havranie skaly, about 1000 m (7382), under the bark of a fir together with *L. brun.* 25 June 1987 (Kubinec lgt. et coll., Franc det.). An interesting finding has been made: B. B. – Radvaň, in a colony of *L. flavus* (F.) in a rotten stump of a nut tree 4 Oct. 1992. Even if a little colony of *L. fulig.* has been in the stump, *B. adnexus* has been found directly in the colony of *L. flavus*!

Batrisodes buqueti (Aubé) (= *slovenicus* Mach.) – a synoecious myrmecophil that lives in colonies of *L. brun.* It occurs sporadically and very rarely in well-preserved warmer forests and groves.

PEI: 52552332331; 34: HE – the same is stated in the 'Red Book' of Germany (Blab et al., 1984). Only several older records are available: Veľký Blh 2 May 1903, Košice 17 June 1926, 2 pcs., Roubal lgt.; Gíraltovec 27 May 1927, Depta lgt., coll. SNMB; Kostolany, Ružín, Slanec 6 April 1924, 3 pcs., Machulka lgt., coll. NMP; Roubal (1930): Rimavská Sobota, Levice. Recent findings (always with *L. brun.*): Kiarov (7882), in an old willow near the river Ipeľ 30 June 1989; Plášťovce, in the decaying wood of an oak 28 April 1991; B. B. – The Urban Park, under the bark of an old lime tree 21 Sept. 1991, 3 pcs. and 23 Nov. 1991, 5 pcs. Its occurrence in the urban area of B. B. is remarkable.

Chennium bituberculatum Latr. – a specialized symbiont of *Tetramorium caespitum*. Its symbiotic relation has a synoecio-symphillic character (Roubal, 1905). It lives very locally-and-rarely in well-preserved xerothermic biotopes.

PEI: 54554542331; 41: CE – the same is stated in the 'Red Book' of Germany (Blab et al., 1984). Only a few older records are available: Žilina (67-6878), Reitter lgt., coll. Laco in SNMB; Viničky (7596) 18 May 1964, Dvořák et Rous lgt., coll. SNMB; Roubal (1930): Bolešov (7074), Brančík lgt.; Harmanec (7280), Kuthy lgt. The recent finding: Plášťovce, in an understone colony of *Tetramorium* on a xerothermic slope 3 May 1986.

Centrotoma lucifuga Heyd. – it lives also in colonies of *Tetramorium* and it has a similar symbiotic relation. It occurs very locally-and-rarely in well-preserved xerothermic biotopes.

PEI: 54554442331; 40: HE! – the same is stated in the 'Red Book' of Germany. Several old records are available: B. B. – Laskomer, 3 April 1931 and 15 April 1932; B. B., 1 April 1936; B. B. – Kremnička, 31 March 1937; Lučatín, 25 March 1936; Hronská Breznica, 24 May 1922; Jalná, 17 April 1932; Zádiel, 22 March 1936, Roubal lgt.; Jelšavská Teplica (7387), Hajný lgt., coll. SNMB; Turňa nad Bodvou, April 1924, Machulka lgt., coll. NMP. Contemporarily it is found very rarely. The recent findings: B. B. – Sásovská dolina, in an understone colony of *Tetramorium* on a shrubby karst slope 3 May 1980 and 5 May 1981, 2 pcs., Franc et Kubinec lgt. et coll.

Clavigeridae

Claviger testaceus Preysl. – a typical symphillic myrmecophil that lives in colonies of several terricolous *Lasius* spp. It is a relatively frequent species, but only in suitable biotopes. A perceivable decrease of its population is actual during last decades.

PEI: 30222321431; 23: PE. A remarkable finding has been made: Podbrezová, in a colony of *L. emarginatus* (Oliv.) under the bark of a damaged oak 31 May 1991. The symbiosis with *L. emarginatus* has not been reported till now.

Claviger longicornis Müll. – a typical symphillic myrmecophil that lives in colonies of *L. umbratus*, *L. brun.* and exceptionally of another *Lasius* spp. It occurs locally and rarely in warm biotopes.

PEI: 31342422431; 29: PE. A relatively large number of older records are available, but recently it was collected only rarely: Dubová, in an understone colony of *L. umbratus* on a xerothermic karst slope 16 April 1980, 2 pcs., Franc et Kubinec lgt. et coll.; Jablonov nad Turňou, in the colony of *L. brun.* in a high branch in an oak crown 8 June 1986 (Kubinec lgt. et coll.); Čabrad', in a colony of *L. brun.* in a willow stump 30 May 1989.

Thorictidae

Thorictus laticollis (Motsch.) – a myrmecophil that lives in colonies of *Messor* spp., especially of *M. barbarus*. It was found by Reitter more than 100 years ago in Subcarpathian Ukraine near the Slovak boundary (Roubal, 1936). Vogt (in F. H. L., 1967) states that it occurs in Southern Europe and its range goes up to Hungary and Southern Slovakia. Well-defined data from Slovakia are missing (a consequence of its very rare occurrence and of hidden bionomy), but new findings in the warmest xerothermic biotopes can be expected.

PEI: 54552632431; 40: HE.

Nitidulidae

Amphotis marginata (F.) – is a typical myrmecophil for *L. fulig.* Its symbiotic relation has a synoecio-symphillic character. It is a wide-spread and frequent species.

PEI: 30111341231; 20: CNE.

Hypocopridae

Hypocopus lathridioides Motsch. – according to the opinion of Vogt (in F. H. L., 1967) it is a hemimyrmecophil of an advanced grade; it lives in colonies of *Formica* spp., but also as a detritophil, under dry dung, etc. The occurrence and ecology of this sporadic and rare species is little known. Balthasar (in Kratochvíl, 1957) states an old Reitter's finding from Moravia. New findings in Slovakia can be expected, but its belonging among myrmecophiles remains an open question.

Cucujidae (Monotomidae)

Monotoma conicollis Guér. – a synoecious myrmecophil that lives in colonies of *F. rufa* and *F. prat.* It occurs sporadically and relatively rarely, but sometimes frequently.

PEI: 20233221131; 20: CNE – PE. A recent finding: B. B. – Urpín, in a colony of *F. rufa* at a pine forest border 25 Jan. 1992, 7 pcs.

Monotoma angusticollis Gyll. – its ecology and occurrence is similar, but it is a bit more frequent species than *M. conicollis*.

PEI: 20232221131; 19: CNE.

Cryptophagidae

Emphyllus glaber (Gyll.) – a synoecious myrmecophil that lives in colonies of *F. rufa*. It occurs sporadically and mostly rarely especially in well-preserved forest ecosystems.

PEI: 20342341331; 26: PE. A perceivable decrease of its population is evident. Recent finding: Brusno (7282), in a colony of *F. rufa* at a forest border 5 Jan. 1980, 2 pcs., Franc et Kubinec lgt. et coll.

Endomychidae

Pleganoporus bispinosus Hampe – lives as a symphillic myrmecophil only in colonies of *L. brun.* It occurs very locally-and-rarely in old well-preserved forests of lower altitudes. It is a typical primeval relict of a small range, one of the most endangered insects in Central Europe.

PEI: 54554642451; 45: CE! Only five old records are available: Hronská Breznica, 19 April 1931 and 12 May 1937; Rimavská Sobota, April 1926, 2 pcs.; "Veľká Fatra" mountains (150), without detailed data, Roubal lgt., coll. SNMB; Zvolen (7480) 18 April 1931, Roubal lgt., coll. Pfeffer!; "surroundings of Lučenec" (7684) April 1928, a pair (Roubal, 1936). Recent finding: Veľký Blh, in the colony of *L. brun.* under the bark of an old oak 4 May 1992.

Lathridiidae

Corticaria longicollis Zett. – a synoecious myrmecophil that lives in colonies of *F. rufa* and potentially of *F. polycтена*, *F. prat.* and another ants. It is a relatively frequent and wide-spread species.

PEI: 30222211221; 18: CNE.

Several other species occur also in ant colonies (*Cartodere* Thoms., *Enicmus* Thoms. spp., etc.), but they are only hemimyrmecophils.

Colydiidae

Myrmecoxenus subterraneus Chevr. – a synoecious myrmecophil, living in colonies of *F. prat.*, *F. exsecta* and rarely of *F. fusca* and terricolous *Lasius* spp. It is a relatively wide-spread and frequent species in warmer biotopes.

PEI: 20231321231; 20: CNE.

Rhopalocerus rondanii (Villa) – lives as a synoecious myrmecophil in and next to the colonies of *L. brun.* in old, hollow and decaying trees. It occurs locally and rarely.

PEI: 52442642451; 39: HE. In the 'Red Book' of Germany (Blab et al., 1984) it is listed among CE species. Only a few older records are available: Košice 1926, Machulka lgt.; Bratislava – Petržalka, 20 May 1935, 2 pcs.; Borša (7596) 5 July 1934, Roubal lgt., coll. SNMB; Košice 1924-1926, 6 pcs., Machulka lgt., coll. NMP; Korbél (1937): Trenčín, several pcs. under a bark of a poplar, Kardaš lgt.; Korbél (1951): Svätôjurský Šúr, in decaying wood of elms 1940-1946; Jelšava, May 1967, about 30 pcs., Hajný lgt., coll. SNMB. Recent findings (always together with *L. brun.*): B. B. – Urpín, in a hollow lime tree 24 April 1981; Zvolen – Sekier (7481), in a rotten beech 17 June 1985; Plášťovce, in a rotten stump of an oak 16 April 1989, 3 pcs.; Čabrad, in the cavity of a beech 23 June 1987; B. B. – The Urban Park, under the bark of a damaged lime tree 21 Sept. 1991, 3 pcs. and 23 Nov. 1991, 6 pcs. (everything Franc lgt. et coll.); Svätôjurský Šúr, in a rotten oak 21 April 1987, several pcs. (Kubinec lgt. et coll., 1 pc. in coll. mea).

Chrysomelidae

Clytra quadripunctata (L.) – a metamorphosal myrmecophil, its pupae and partially larvae live in colonies of *F. rufa*, *F. prat.*, *F. exsecta* and rarely of *F. fusca* and *F. sanguinea*. The adult feeds mainly on leaves of willows and oaks. It is a relatively wide-spread and frequent species.

PEI: 20222311031; 17: CNE.

Clytra laeviuscula (F.) – has a similar ecology, but it is typical for colonies of *F. sanguinea*. It is a relatively frequent species.

PEI: 20222342031; 21: CNE – PE.

A perceivable decrease in populations of the last two species is evident. Probably several other species of this family (*Lachnaea sexpunctata* (Scop.), *Antipa macropus* (Ill.), some *Labidostomis* Rdtb. and *Cryptocephalus* Geoffr. spp.) pass a part of their metamorphosis in ant colonies.

CONCLUSION

Data concerning 104 species of myrmecophilous beetles in Slovakia are available in this paper. Eighty-one of them I have verified by recent findings, the rest appeared only in older data. Some of them we can list among the critically endangered, because newer confirmations of their occurrence in Slovakia are missing for more than 50 years. It is not out of the question that several species are approaching total extinction; for example, *Lamprinodes saginatus* (Grav.), *L. haematopterus* (Kr.), *Zyras erraticus* (Hag.), etc.

Three species deserve special mention; they were discovered as new species for Slovakia: *Homoeusa paradoxa* Scr., *Oxypoda pratensisicola* Lohse and *Batrisodes hubenthalii* Reitt.; the first one is a new species for Central Europe as well.

Myrmecophilous beetles are a perceivably endangered group on the whole, their average PEI is 28.41. Following is the essential survey of their endangerment:

adaptable, little vulnerable	0 spp.	0.00 %
contemporarily non-endangered	29 spp.	27.88 %
perceivably endangered	30 spp.	28.85 %
highly endangered	33 spp.	31.73 %
critically endangered	12 spp.	11.54 %

The most relevant aim of this paper is the evaluation of average relative endangerment grades of myrmecophil's symbiotic synusias, which are given in table 1.

Table 1. The Particular Outline of Endangerment of Myrmecophilous Beetle's Symbiotic Synusias						
	the grade of endangerment symbiotic synusia	adaptable, little vulnerable	contemporarily non-endangered	perceivably endangered	highly endangered	critically endangered
terrícolas and understone species	<i>Messor</i> spp.	39.98				
	<i>Myrmica</i> spp.	26.28				
	<i>Tetramorium caespitum</i>	37.49				
	<i>Tapinoma erraticum</i>	41.90				
	<i>flavus</i>	Lasius	22.00			
	<i>umbratus</i>		29.00			
	<i>niger</i>		22.72			
	<i>alienus</i>		22.75			
	<i>emarginatus</i>		27.00			
	<i>sanguinea</i>	Formica	20.41			
	<i>fusca</i>		18.39			
	<i>cunicularia</i>		34.00			
	<i>rufibarbis</i>		32.50			
arborícolas species	<i>Liometopum microcephalum</i>	41.97				
	<i>Lasius fuliginosus</i>	24.40				
	<i>Lasius brunneus</i>	31.50				
	<i>Camponotus</i> spp.	35.35				
detritophilous spp.	<i>rufa + polycтена</i>	Formica	21.58			
	<i>pratensis</i>		22.94			
	<i>truncorum</i>		14.00			
	<i>exsecta</i>		29.32			

more than 31 species
21-30 spp.
11-20 spp.
6-10 spp.
1-5 spp.

We can see that some ecological groups of myrmecophils are especially endangered. They include:

- the species of xerothermic biotopes, well-preserved meadows, pastures and shrubby slopes. They are mainly terricolous species living in colonies of *Tapinoma erraticum*, *Tetramorium caespitum*, *Messor* spp. and also *Formica rufibarbis* and *F. cunicularia*;
- the species of older deciduous forests and groves. They are chiefly symbionts of *Liometopum microcephalum*, *Lasius* and *Camponotus* spp.

The situation is more perilous if we realize that many of them rank among unique, relict and zoogeographically valuable species with large possibilities of bioindicative utility. The gradual retreat of myrmecophils and of all insects is caused directly by permanent pressure on their biotopes (1), and indirectly by globally acting ones (2). These include:

- (1) – a large majority of so-called recultivations;
 - pasturing intensification and field enclosure;
 - afforestation of so-called 'sterile' steppes, shrubby and rocky slopes;
 - clean-cutting wood exploitation and fight against old trees and so-called 'over-matured' forests;
 - cutting down of old and hollow trees in cities, filling the hollows of old trees with wooden, concrete or other material (it causes a rapid decrease of valuable, but very vulnerable habitats);
 - burning out steppes, meadows and tree cavities;
 - expansion of so-called cottage-and-garden colonies.
- (2) – all kinds of pollution (air, water, and soil);
 - application of chemicals (especially biocides) in agriculture and forestry;
 - the slow, but gradual changes of the climate-and-landscape system.

Unfortunately, everything which has been said so far has been primarily concerned with negative aspects. Therefore it is necessary to close this paper with an outline of the ways in which future improvement could be achieved. This part concerns not only myrmecophilous beetles, but it tends to improve the protection of the whole class of insects.

1. In the sphere of preventive protection (which should be the main theme of real nature protection) there are the following points:
 - improvement of research concerning problems of vulnerability, actual endangerment, and bioindicative-utility perspectives of single taxa and mainly of the ecologic groups of insects;
 - mapping of the dispersion of localities, which are valuable because of the occurrence of rare and endangered species;
 - wider popularization of a large scale of entomological and entomo-conservational problems in the mass-media;
 - improvement of the position of entomological topics in general education. We must stop simplifying and underestimating the problems of biology and of nature protection in general.

2. In the sphere of practical protection there are the following points:

- granting of strict territorial protection for the valuable and endangered localities;
- stable control of the protection conditions in all the protected territories;
- it is also necessary to work up a checklist of the endangered insects of Slovakia as a serious document, where the appropriate attention ought to be given also to myrmecophilous beetles.

The real conditions for improvement of the unsatisfactory situation concerning insect genofund protection will be created after the introduction of the preceding proposals. It is now high time if we do not want to continue the sad tradition of mourning for disappearing species.

REFERENCES

- Blab J. et al., 1984: Rote Liste der gefährdeten Tiere und Pflanzen in der Bundesrepublik Deutschland. Kilda Verl., Graven, 270 pp.
- Dvořák M., 1965: Zajímavé nálezy drabčků na Slovensku (Col., Staphylinidae). *Acta rer. natur. Mus. nat. slov.* (Bratislava) 11: 88-94.
- Dvořák M., 1967: Zajímavé nálezy drabčků na Slovensku II. (Col., Staphylinidae). *Acta rer. natur. Mus. nat. slov.* (Bratislava) 13: 81-88.
- Dvořák M., 1980: Československé druhy rodu *Zyras* Steph. (Col., Staphylinidae). *Entomol. probl.* 16 (Bratislava): 93-99.
- Franc V., 1991: Myrmekofilné chrobáky Slovenska so zvláštnym zreteľom k ich ohrozeniu a perspektívam ochrany. (Kandidátska dizertačná práca.) [Myrmecophilous Beetles of Slovakia with Special Reference to Their Endangerment and Perspectives for Protection.] Ph. D Thesis. Ms. in Libr. of Prírodovedecká fakulta Univerzity Komenského, Bratislava, 194 pp. (in Slovak).
- Freude H., K. W. Harde et G. A. Lohse, 1964, 1967, 1971, 1974: Die Käfer Mitteleuropas, 4, 7, 3, 5. Goecke & Evers Verl., Krefeld, 264, 310, 365, 381 pp.
- Heyrovský L., 1949: Nové a zajímavé nálezy brouků z Československa. *Čas. Čsl. spol. entom.* 46: 54-56.
- Koch K., 1989: Die Käfer Mitteleuropas. Ökologie, I. Goecke & Evers Verl., Krefeld, 440 pp.
- Korbel L., 1937: Príspevok k poznaniu myrmekofilov Slovenska. Pamätnica Mest. múz. K. Brančika, Trenčín, p. 29-35.
- Korbel L., 1951: Coleoptera Svätajurského Šúru (Prírodná rezervácia). Slov. akadémia vied a umení, Bratislava, 155 pp.
- Kratochvíl J. et al., 1957: Klíč zvířeny ČSR II. Nakl. ČSAV, Praha, 746 pp.
- Likovský Z., 1967: Příspěvek k Faunistice československých Aleocharinů (Col., Staphylinidae). *Acta rer. natur. Mus. nat. slov.* (Bratislava) 13: 89-96.
- Lohse G. A. et W. H. Lucht, 1989: Die Käfer Mitteleuropas, 1. Supplementband mit Katalogteil. Goecke & Evers Verl., Krefeld, 346 pp.
- Lokay E., 1905: Coleoptera myrmecophila bohémica. *Čas. Čes. spol. entom.* 2: 33-50.
- Machulka V., 1931: Určovací klíč československých druhů podčeledi Neuraphini (Col., Scydmaenidae). *Čas. Čsl. spol. entom.* 28: 72-89.

Machulka V., 1935: Příspěvek k poznání fauny východního Slovenska a Podkarpatské Rusi. *Čas. Čsl. spol. entom.* 32: 126-134.

Roubal J., 1905: Prodrómus myrmecophilů českých. *Věst. Král. čes. spol. nauk, tř. 2* (Praha) 44 pp.

Roubal J., 1930, 1936: Katalog Coleopter (brouků) Slovenska a Východných Karpát I, II. Praha, 527, 434 pp.

Roubal J., 1941: Katalog Coleopter (brouků) Slovenska a Východných Karpát III. Orbis, Bratislava, 363 pp.

Roubal J., 1949: Rozšíření broučích myrmekofilů v SV Čechách a bibliografie literatury o českých myrmekofilních broucích. *Čas. Čsl. spol. entom.* 46: 157-165.

Smetana A., 1958: Fauna ČSR XII. Drabčíkovití – Staphylinidae I. (Staphylininae). Nakl. ČSAV, Praha, 435 pp.

Zerche L., 1987: Beitrag zur Kenntnis der Gattung *Thiasophila* Kraatz, 1856 (Col., Staphylinidae, Aleocharinae). *Entom. Blät.* (Krefeld) 83: 91-114.

Zúber M., 1988: Příspěvek k poznání výskytu některých drabčíkovitých brouků (Col., Staphylinidae). *Zpr. Čsl. spol. entom. při ČSAV* 24: 99-100.