BEETLES (INSECTA: COLEOPTERA) IN NESTS OF FIVE SPECIES OF PASSERIFORM BIRDS (*CARDUELIS CHLORIS, TROGLODYTES TROGLODYTES, TURDUS MERULA, TURDUS PHILOMELOS, TURDUS PILAS*) IN CENTRAL EUROPE

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Abstract. *Beetles in nests of five passeriform birds (Carduelis chloris, Troglodytes troglodytes, Turdus merula, Turdus philomelos, Turdus pilaris) were represented altogether by 65 species. In the nest of the respective birds, the number of beetle species ranged from 8 to 25. Just a minor part of them were typical nidicols, especially Haploglossa nidicola and Gnathoncus spp. They, however, they occurred in the nests in a lower number of individuals than in nests of most other birds and their occurrence tended to be concentrated in few nests. The major part of beetles was ubiquists penetrating in the nests occasionally or searching there temporal cover. Their composition strongly reflected the environment, in which the nests were placed, in this case, the floodplain forests or suburban orchards. Only the fungivorous beetles were represented in the nests of the five birds species studied at the same level as in nests of other birds studied until present more in details.*

Keywords: *beetles, bird nests, passeriform birds, Central Europe.*

Rezumat. Gândaci din cuiburile a cinci specii de passeriforme (*Carduelis chloris, Troglodytes troglodytes, Turdus merula, T. philomelos, T. pilas)* în Europa Centrală. *Gândaci din cuiburile a cinci specii de păsări passeriforme (Carduelis chloris, Troglodytes troglodytes, Turdus merula, T. philomelos, T. pilaris) au fost identificate un total de 65 de specii, iar in cuiburile păsărilor respective, numărul speciilor de gândaci a fluctuat între 8 şi 25. Numai o mică parte din ele, mai ales Haploglossa nidicola şi Gnathoncus spp. au fost specii nidicole tipice. Spre deosebire de cuiburile celorlalte păsari, aceste specii au fost înregistrate în număr mai scăzut de indivizii care, uneori, tindeau la o concentrare în puţine cuiburi. Partea cea mai mare a gândacilor a fost formată din specii ubiquiste care intrau în cuiburi ocazional sau se ascundeau acolo. Compoziţia lor a oglindit puternic mediul inconjurător în cuiburile respective, mai ales păduri de luncă sau grădini suburbane. Numai speciile fungivore au fost reprezentate în cuiburile studiate, pe nivel observat, în cuiburile celorlalte specii de păsări studiate.*

Cuvinte cheie: *gândaci, cuiburi de păsări, păsări paseriforme, Europa Centrală.*

INTRODUCTION

Beetle fauna of bird nests is in focus of attention since mid 1930-ies. Since that time a lot of data on the occurrence of individual beetles in birds' nests (HICKS 1959, 1962, 1971) or on structure and dynamics of beetle fauna in nests of some bird species (NORDBERG, 1936; JURÍK & ŠUSTEK, 1978; KRIŠTOFÍK et al., 1993, 1994, 1995, 1996, 2001, 2002, 2003, 2005, 2007; MERKL & BAGYURA, 2004; ŠUSTEK & HORNYCHOVÁ, 1983; ŠUSTEK & JURÍK, 1980, ŠUSTEK & KRIŠTOFÍK, 2002, 2003, TRYJANOWSKI et al. 2001) have been obtained. These data show, that there are considerable differences in beetle fauna structure depending on the type of bird nests, their placement in the nature and structure of the material they are build from, as well as in dependence of the predominant food of the birds. In spite of the existing data of beetle fauna in nests, most bird species are unknown or its knowledge is insufficient. The aim of this contribution is to describe the fauna in nests of five passeriform birds (*Carduelis chloris* (LINNAEUS, 1758)*, Troglodytes troglodytes* (LINNAEUS, 1758), *Turdus merula* (LINNAEUS, 1758), *T. philomelos* BREHM, 1831*, T. pilaris* (LINNAEUS, 1758)). These birds build their nests on vegetation. The nests of the four species are open, only the nest of *T. troglotydes* represents a cavity constructed from plant material on low vegetation, with a side entry. The interior of nests of *Turdus* species is lined by a mixture of loam and salivaries. All these birds are omnivorous, *Carduelis chloris* is previously phytophagous, whereas other four species are previously zoophagous, eating insects, rain worms or small molluscs. The knowledge of beetle fauna in their nests is reduced just to records of occurrence of three species in nests of *T, merula, T. philomelos* and *T. pilaris* cited by HICKS (1959).

The aim of this study is to describe the structure of beetle fauna in the nests of all five species and to compare it with the fauna in nests of other beetles studied in more details by the authors cited above.

MATERIAL AND METHODS

The material was collected by the second author in the years 1991-1994 in 13 localities in West and central Slovakia (Komárno-National nature reserve Apáli 47°48'23"N, 18°5'33"E; Bodíky 47°55'14"N, 17°27'3"E; Bratislava-Líštiny 48°9'49"N, 17°3'59"E; Bratislava-Železná Studnička 48°10'52"N, 17°4'35"E; Devínska Nová Ves 48°11'58"N, 16°58'31"E; Dolná Riečka 48°35'48"N, 19°29'39"E; Dobrohošť 47°59'24"N, 17°20'52"E; Gabčíkovo 47°53'50"N, 17°33'45"E; Horná Riečka 48°36'17"N, 19°31'8"E; Hriňová-Pivnička 48°34'49"N, 19°31'14"E; Jahodná 48°2'22"N, 17°42'57"E; Svätý Jur-National nature reserve Šúr 48°13'46"N, 17°12'58"E; Komárno 47°45'22"N, 18°6'31"E; Krivec 48°35'11"N, 19°29'8"E; Malé Leváre 48°29'58"N, 16°57'32"E; Predná Poľana? 48°39'29"N, 19°19'14"E; Veľké Blahovo 48°2'51"N, 17°35'39"E; Vojka pri Dunaji 47°58'27"N, 17°22'28"E; Vysoká pri Morave 48°19'3"N, 16°54'32"E) and in two localities in the adjacent parts of South Moravia (Klentnica 48°51'13"N, 16°38'28"E; Pavlov

48°52'12"N, 16°39'59"E). Most localities lay in lowlands, at altitudes of 220-300 m, only the localities of *T. pilaris* are at higher altitudes (400-500 m).

The nests were collected immediately after fledging of the chicks. The arthropods were extracted by the Tulgrenn´s funnels for 48 hours and then conserved in alcohol. The material is deposited in the Institute of Zoology of Slovak Academy of Sciences in Bratislava.

The beetles were identified mostly by the keys of FREUDE et al. (1964b, 1967, 1974), SMRECZYŃSKI, (1972, 1974), RÜCKER (1983). Nomenclature of beetles is adopted according to JELÍNEK (1993).

The bionomical data on beetles were taken from the above works and from BOHÁČ & MATEJÍČEK (2003), FREUDE et al. (1964a), ROUBAL (1930, 1936, 1939), while those on birds were taken from FERIANC (1965) and HUDEC (1983). Because of a low number of beetles in most nests the material from nests of each bird species was pooled. Occurrence of beetles in the nests is characterized by their abundance, presence and average number of individuals per nests (= index of occurrence according to JURÍK & ŠUSTEK (1978) or mean intensity according to MARGOLIS et al. (1982). Structure of the fauna is characterized by Shannon-Weaver diversity index and equitability (PIELOU, 1975). The average linkage clustering using the Whiteker´s similarity index served for comparison of fauna from the studied nests.

RESULTS AND DISCUSSIONS

Altogether 65 beetle species were found in nests of the five passeriform species (Table 1). The number of beetle species in nests of individual birds moved from 8 (*Turdus pilaris*) to 25 (*T. merula*) and the number of individuals moved from 14 (*T. pilaris*) to 141 (*T. troglodytes*). Both values were positively correlated with increasing number of nests of birds (r = 0.71 and 0.72 respectively). Most species were represented in the whole material by a very low number of individuals (32 species by 1 individual, 13 species by 2 individuals, 9 species by 3 individuals, 3 species by 4 individuals and 1 species by 5 individuals). Most of these species occurred only in a single nest and showed a low value of presence and occurrence intensity (Table 1). In contrast, only eight species were represented by more than 10 individuals. This structure of beetle fauna is illustrated by a high value of equitability (Table 1).

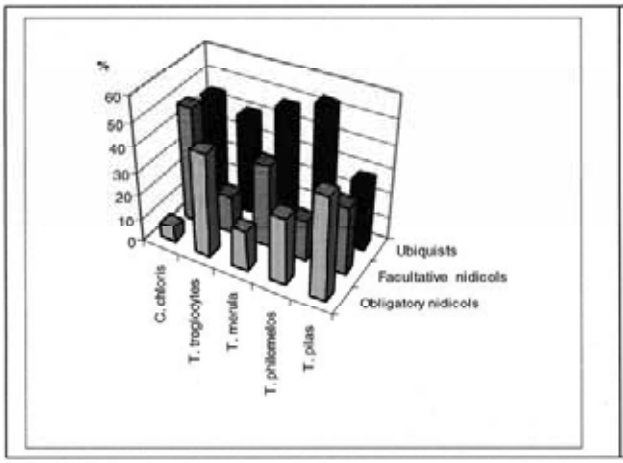

Figure 1. Relative abundance of beetles according to their relation to the nests of five species of passeriform birds.
Figura 1. Abundența relativă a gândacilor în funcție de relația lor față de cuiburile a cinci specii de păsări paseriforme.

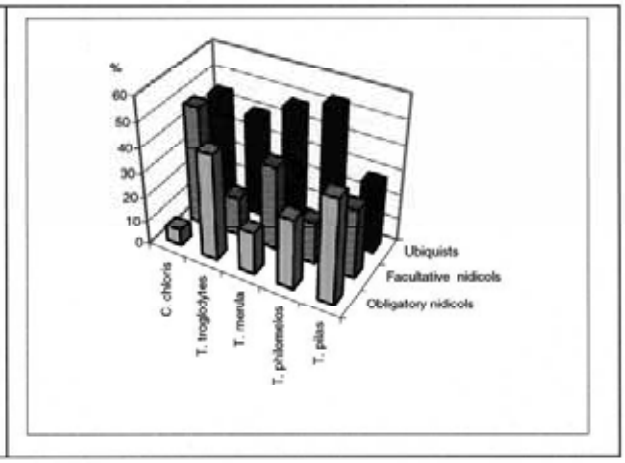

Figure 2. Number of species of beetles according to their relation to the nests of five species of passeriform birds.
Figura 2. Numărul speciilor de gândaci în funcție de relația lor față de cuiburile a cinci specii de păsări paseriforme.

Among all 65 species, three species, *G. buyssoni*, *G. communis* and *H. puncticollis* are typical nidicols occurring exclusively in the nests of many other birds, while two other species, the algivorous *A. vaga* and carnivorous *Ph. subiliformis,* show an increased affinity to the bird's nests (Table 1, Figs. 1 and 2). They are predominant, qualitatively and quantitatively, in the nests of *T. troglodytes* and *T. pilaris*. In the nests of other three birds, especially in *C. chloris*, their representation was lower. Only *H. puncticollis* was found in the nests of all five birds, but its occurrence was low (0.15-0.88 individuals per nest), except the nests of *T. troglodytes* (3.32 individuals per nests). However, in its nests 56 individuals of 58 were concentrated in a single nest. A similar concentration of *H. puncticollis* was also observed in nest of other four species.

All other species had a free relation to the nests. They can be divided into two groups. The first group is represented by facultative nidicol and includes the necrophagous (*Trox perrisis, T. scaber, S. watsoni, G. quadriguttatus*), fungivorous (representatives of Lathridiidae, Cryptophagidae, Corylophidae) and detritophagous species (representatives of Anobiidae, Phalacriidae). They frequently occur in nests of many birds being attracted by the rests of food of animal origin or by bodies of dead chicks as well as by moulded or decaying construction material of the nests. They predominate especially in the nests of *Carduelis chloris* and reached a considerable representation in nests of *Turdus merula* and *T. pilaris* (Figs. 1 and 2). The second group represents ubiquists and includes a wide

spectrum of species frequently occurring in the nests surrounding and penetrating there occasionally or searching there a temporal cover. Composition of this group (especially the species *P. assimilis, O. obscurus, E. micans, C. rivularis, O. rugosus, S. juno, C. scutellata, C. variabilis*) reveals placement of a parts of the nests of *T. troglodytes, T. merula* and *T. philomelos* in humid places, near a brook (Bratislava-Železná studienka) or in floodplain forests, near adjacent reed stands (Bodíky, Dobrohošť, Vojka pri Dunaji, Jahodná, National nature reserves Apáli and Šúr). Most species of this group were the species living at the moment of the nests sampling on the twigs of tress or shrubs (all Curculionidae and Chrysomelidae, among the carabids *L. cyanocephala*). Also the high presence of *D. longimanus*, a weevil living on poplars, is characteristic for the nests from the above floodplain localities, while the species of the *Anthonomus* genus are characteristic for the nests collected in the orchards in Bratislava-Líštiny. All these species represented a highly dominant component of the nests fauna in all nests, except those of *T. pilaris* (Figs. 1 and 2).

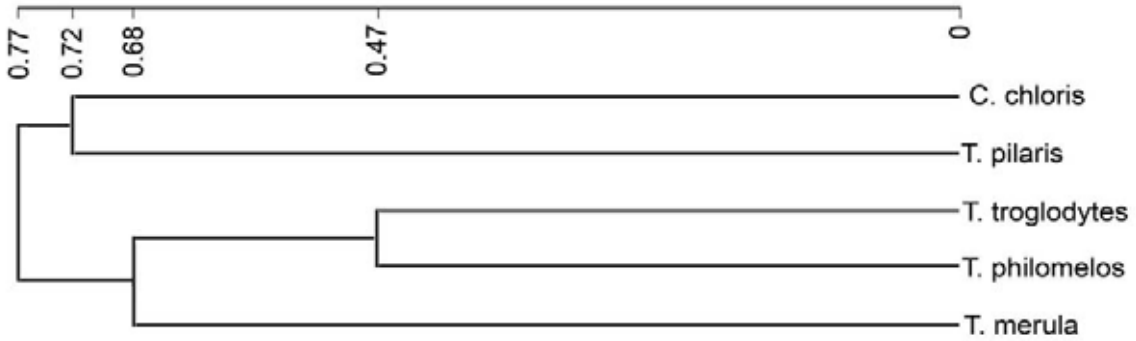

Figure 3. Classification of beetle fauna in nests of five passeroform beetles.
Figura 3. Clasificarea faunei de gândaci din cuiburile a cinci specii paseriforme.

When compared mutually, the beetle fauna in the nests of each bird species forms two clusters at the dissimilarity level 0.77 (Fig. 1). The first includes fauna of nests of *Carduelis chloris* and *T. pilaris*. Their common features is a low number of species and individuals resulting from a reduced number of nests studied and absence of the hygrophilous species penetrating into the nest from the surroundings. The second cluster includes the nests of *T. troglodytes, T. philomelos* and *T. merula*. Structure of this cluster results especially from higher number *of P. assimilis, A. vaga, H. puncticollis* and *D. longimanus* and reflects collecting on a considerable part of the nests in floodplain localities. This pattern of clustering is however strongly biased by the environment in which the nests were collected.

The relation of a large number of species is more clearly illustrated by representation of trophic groups of species (Fig. 2). In nests of all five bird species, the carnivorous species predominate (20.7 to 64.3%), being followed by phytophags (14.3 to 32.7%) and fungivors (6.4-27.6%). They were present in the nest of all five species. Algivores were absent in the nests of *T. pilaris,* but in the nests of other species were represented by 3.8-9.4%. Detritophags and necrophags were found only in nests of *T. merula, T. troglodytes* and *C. chloris.* Their representation ranged from 0.7% in nests of *T. troglodytes* to 10.3% in *Carduelis chloris.*

Already NORDBERG (1936) showed that composition of beetle fauna depends on nest type. In general, a richer fauna was found in the birds nesting in tree or soil cavities and boxes and the birds of prey or insectivorous birds. The later studies (JURÍK & ŠUSTEK, 1978; KRIŠTOFÍK et al., 1993, 1994, 1995, 1996, 2001, 2002, 2005, 2007; MERKL & BAGYURA, 2004; ŠUSTEK & HORNYCHOVÁ, 1983; ŠUSTEK & JURÍK, 1980; ŠUSTEK & KRIŠTOFÍK, 2002, 2003) confirmed this relationship. They also found that there is a relatively small number of nidicolous species forming the nest fauna, while the major part of fauna always consisted of ubiquists using nests as one of food resources or cover. Their number is almost linearly correlated with increasing number of nests examined (KRIŠTOFÍK & ŠUSTEK 2002, 2003). The poorest beetle fauna in bird nests was found in nest of *Remiz pendulinus* (KRIŠTOFÍK et al. 1993, 1995), whose firm walls consisting of dense and fine plant fibbers did allow only the existence of the minute fungivorous Lathiididae. At the same time fixing of its nest on the top of thin twigs inhibited penetration of other beetle species. A beetle fauna most influenced by the surroundings was found in nests of *Acrocephalus arundinaceus*, *A. scirpaceus* and *A. palustris* (KRIŠTOFÍK et al. 2001, 2005). In the nests of the first two species it consisted of enormous numbers of *C. scutellata*, a lady bird eating the aphids living on reed, while in the nests of *A. palustris* it included also many

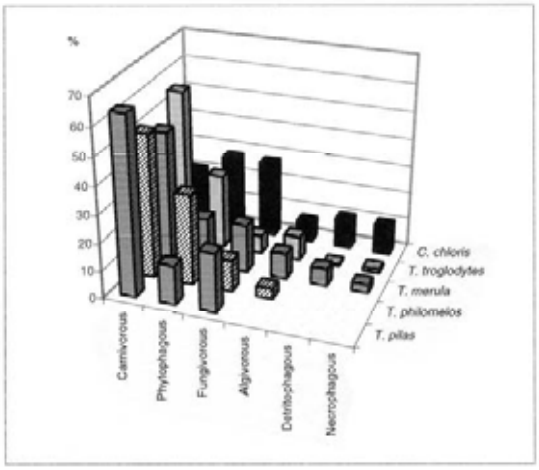

Figure 4. Relative abundance of six trophic groups of beetles in nests of five passeriform birds.
Figura 4. Abundenţa relativă a şase grupe trofice ale gândacilor din cuiburile a cinci specii paseriforme.

representatives of soil fauna escaping on the reed stalks during floods. The most specific beetle fauna occurs in the nest of *Riparia riparia* (ŠUSTEK & JURÍK, 1980; KRIŠTOFÍK et al. 1994) where a single specified obligatory nidicol, *Haploglossa nidicola* (FAIRMAIR, 1852) highly predominates. The most similar beetle fauna with the nests of the five birds *T. merula, T. philomelos, T. pilaris, T. troglodytes* and *Carduelis chloris* was found in the nests of *Lanius collurio* and *Lanius minor* (KRIŠTOFÍK et al. 2002). They were also characteristic with by a low proportion of typically nidicolous species and by a large diversity of phytophagous beetles living on trees on which the nests were situated. The similarity of beetle fauna of these birds' species reflects the nest type.

As to representation of trophic groups of beetles, the predominance of carnivores is characteristic of nests of most birds. However, in a clear correlation between quantity of carnivorous beetles, especially of the typical nidicols, and presence of other arthropods (mites, flea larvae) in the nests has not been found (KRIŠTOFÍK et al. 2001, 2005, 2007). In the nest of all studied birds so far in more details, they tend to be concentrated in a small number of nests. However, most carnivorous beetles in the nests of the five birds in this study used the nests just as temporal cover. The fungivorous beetles always occur in the nest in relatively low numbers, but, at the same time, they represent the most constant component of beetle fauna in bird nests, even in those with a very poor beetle fauna, like in *Remiz pendulinus* (KRIŠTOFÍK et al. 1993, 1995). The phytophags are always present in the nests as ubiquists and mostly are little abundant. A similarly high abundance and diversity of them was observed only in nests *Lanius collurio* and *L. minor* (KRIŠTOFÍK et al. 2002, TRYJANOWSKI et al. 2001). Unlike the nests of other birds, there was a low representation of phytophags, detriophags and necrophags. Especially, the necrophags occur in the nest of most birds accidentally, being attracted there by bodies of dead chicks. More regularly the necrophags occur in the nests with accumulated keratinous particles (nests of *Passer* spp.) or in nests owls, birds of prey and of *Merops apiaster* where food rests are accumulated in large quantities, especially at the end of breeding period (KRIŠTOFÍK et al. 1996, 2003, 2005; MERLK & BAGYURA 2004).

CONCLUSIONS

The beetle fauna of five passeriform birds *T. merula, T. philomelos, T. pilaris, T. troglodytes* and *Carduelis chloris* is relatively poor in comparison with nests of many other birds. It consisted of 2 or 3 obligatory nidicolous species, which predominated quantitatively in nests of *T. troglodytes* and *T. pilaris,* while in nests of the other three species their representation was lower or much lower than that of the facultative nidicolous or ubiquist species. In all studied nests, their representation was considerably lower than in nests of the cavity nesting birds. It was obviously due to lower humidity in the nests built up on trees or shrubs. Among the facultatively nidicolous species, only the fungivores reached a comparable representation within nest of other birds. The nest fauna in all nests studied was strongly influenced by the character of localities, where the nests were collected. It was and penetrated by many ubiquist species, mostly Carabids and Staphylinids from the ground surface or Curculionids living on trees or shrubs, on which the nests had been constructed. These beetle represented the predominating component of the nest fauna, except nests of *T. pilaris*, where their representation was approximately balanced with other two ecological groups of beetles. The present knowledge of the nests fauna of all five bird species, however, remains incomplete and needs further investigations.

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Table 1. Survey of beetles, their relations to bird nests (R) and trophic relation (T), number of individuals (N), average number of individuals per nest (A) and presence (P %) in nests of five passeroform beetles (Relation to nests: U – ubiquists, F – facultative nidicols, O – obligatory nidicols; trophic relations: A – algivors, C – carnivores, D – detritophags, F – fungivors, N – necrophagus, P – phytophagus).

Tabel 1. Specii de gândaci, relaţiile lor faţă de cuiburi (R) şi relaţiile lor trofice, numărul indiviziilor (N), numărul mediu al indiviziilor pe un cuib (A) şi prezenţa (P %) lor în cuiburile de cinci specii de păsări paserifome (Relaţia faţă de cuiburi: U – ubiquişti, F – nidicoli facultativi nidicoli, O – nidicoli obligatorii; relaţii trofice: A – algivori, C – carnivori, D – detritofagi, F – fungivori, N – necrofagi, P – fitofagi).

Family and species of beetles	**R.**	**T**	**Species of birds**														
			C. chloris			***T. troglodytes***			***T. merula***			***T. philomelos***			***T. pilas***		
			N	A	P %	N	A	P	N	A	P %	N	A	P	N	A	P %
Carabidae																	
Dromius longiceps (DEJEAN, 1826)	U	C	3	0.23	15.38												
Europhilus micans (NICOLAI, 1826)	U	C										2	0.13	6.25			
Lebia cyanocephala (LINNAEUS, 1758)	U	C													2	0.40	40.00
Oxypselaphus obscurus (HERBST, 1784)	U	C							1	0.08	8.33						
Platynus assimilis (PAYKULL, 1790)	U	C				11	0.61	27.78				5	0.31	6.25			
Trechus quadristriatus (SCHRANK, 1781)	U	C				1	0.06	5.56									
Hydrophilidae																	
Coelostoma orbicularis (FABRICIUS, 1775)	U	D				1	0.06	5.56									
Histeridae																	
Gnathoncus buyssoni AUZAT, 1917	O	C				3	0.17	11.11	4	0.33	8.33	1	0.06	6.25	3	0.60	20.00
Gnathoncus communis (MARSEUL, 1862)	O	C													1	0.20	20.00
Paralister carbonarius (HOFFMANN, 1903)	O	C				1	0.06	5.56									
Ptiliidae																	
Acrotrichis intermedia (GILLMEISTER, 1845)	F	D	1	0.08	7.69												
Leiodidae																	
Sciodrepoides watsoni (SPENCE, 1815)	F	N				2	0.11	5.56									
Staphylinidae																	
Aleochara brevipennis (GRAVENHORST, 1806)	F	C										1	0.06	6.25			
Atheta divisa (MÄRKEL, 1845)	F	A							2	0.17	8.33						
Atheta vaga (HEER, 1839)	F	A	1	0.08	7.69	12	0.67	5.56	4	0.33	16.67	2	0.13	6.25			
Haploglossa puncticolis (KIRBY,1832)	N	C	2	0.15	15.38	58	3.22	11.11	7	0.58	16.67	14	0.88	18.75	2	0.40	20.00
Omalium caesum GRAVENHORST, 1806	U	C							3	0.25	8.33						
Omalium rivulare (PAYKULL, 1789)	U	C							1	0.08	8.33						
Othius punctulatus (GOEZE, 1777)	U	C				1	0.06	5.56	1	0.08	8.33						
Oxytelus rugosus (FABRICIUS, 1775)	U	C							1	0.08	8.33						
Oxytelus tetracarinatus (BLOCK, 1799)	U	C							3	0.25	8.33	1	0.06	6.25			
Philonthus fimetarius (GRAVENHORST, 1802)	U	C				2	0.11	5.56									

Philonthus subuliformis (GRAVENHORST, 1802)	F	C													1	0.20	20.00
Philonthus quisquiliarius (GYLLENHAL, 1810)	U	C							4	0.33	8.33						
Quedius fuliginosus (GRAVENHORST, 1802)	U	C							3	0.25	16.67						
Quedius ochripennis (MÉNÉTRIÉS, 1832)	U	C							1	0.08	8.33						
Brachygluta haematica (REICHENBACH, 1816)	U	C							1	0.08	8.33						
Stenus juno FABRICIUS, 1801	U	C										1	0.06	6.25			
Tachyporus chrysomelinus (LINNAEUS, 1758)	U	C				1	0.06	5.56				1	0.06	6.25			
Carpelinus rivularis (MOTSCHULSKI, 1860)	U	C										1	0.06	6.25			
Helodidae																	
Cyphon variabilis (THUNBERG, 1787)	U	P	1	0.08	769												
Trogidae																	
Trox perrisi FAIRMAIRE, 1868	F	N							2	0.17	8.33						
Trox scaber (LINNAEUS, 1767)	F	N	2	0.15	769												
Scarabaeidae																	
Oxyomus silvestris (SCOPOLI, 1763)	F	D							1	0.08	8.33						
Anobiidae																	
Stegobium paniceum (LINNAEUS, 1758)	F	D							2	0.17	8.33						
Nitidulidae																	
Glyschrochilus quadriguttatus (FABRICIUS, 1776)	U	N	1	0.08	7.69												
Phalacridae																	
Olibrus affinis (STURM, 1807)	F	D	1	0.08	7.69												
Olibrus fracticornis (STURM, 1807)	F	D	1	0.08	7.69												
Cryptophagidae																	
Atomaria gravidula ERICHSON, 1846	F	F							2	0.17	8.33						
Crypthophagus dentatus (HERBST, 1793)	F	F				1	0.06	5.56									
Coccinelidae																	
Coccidula scutellata (HERBST, 1783)	F	C	1	0.08	7.69												
Propylea quatuordecimpunctata (LINNAEUS, 1758)	U	C				1	0.06	5.56									
Corylophidae																	
Sericoderus lateralis (GYLLENHAL, 1827)	F	F				1	0.06	5.56				4	0.25	12.50			
Lathridiidae																	
Corticaria rubripes MANNERHEIM, 1844	F	F	4	0.31	23.08	4	0.22	16.67	5	0.42	25.00	2	0.13	12.50			
Cortinicara gibbosa (HERBST, 1793)	F	F	3	0.23	15.38												
Enicmus transversus (OLIVIER, 1790)	F	F				3	0.17	16.67									
Thes bergrothi (REITTER, 1890)	F	F							4	0.33	8.33						
Cartodere constricta (GYLLENHAL, 1827)	F	F	1	0.08	7.69												

Lagriidae																	
Lagrius hirtus (LINNAEUS, 1758)	U	P										1	0.06	6.25			
Tenebrionidae																	
Scaphidema metalicum (LINNAEUS, 1758)	U	D							1	0.08	8.33						
Chrysomelidae																	
Dibolia femoralis REDTENBACHER, 1849)	U	P				2	0.11	5.56									
Dibolia occultans (KOCH, 1803)	U	P				1	0.06	5.56									
Phylotreta nemorum (LINNAEUS, 1758)	U	P	1	0.08	7.69												
Phylotreta vittula REDTENBACHER, 1849	U	P										2	0.13	6.25			
Lema melanopus (LINNAEUS, 1758)	U	P	1	0,08	7,69	1	0,06	5,56				1	0.06	6.25			
Curculionidae																	
Anthonomus pomorum (LINNAEUS, 1758)	U	P	2	0.15	7.69										1	0.20	20.00
Anthonomus pinivorax SILFVERBERGER, 1977	U	P							1	0.08	8.33						
Anthonomus spilotus REDTENBACHER, 1849	U	P													1	0.20	20.00
Anthonomus phyllocola (HERBST, 1795)	U	P										1	0.06	6.25			
Neoglocianus maculalba (HERBST, 1795)	U	P				24	1.33	33.33									
Dorytomus longimanus (FORSTER, 1777)	U	P	3	0.23	23.08	8	0.44	27.78	8	0.67	16.67	8	0.50	25.00			
Hypera arator (LINNAEUS, 1758)	U	P							1	0.08	8.33	2	0.13	6.25			
Phytonomus dauci (OLIVIER, 1807)	U	P							1	0.08	8.33						
Sitona hispidulus (FABRICIUS, 1776)	U	P				2	0.11	11.11				1	0.06	6.25			
Trachyphloeus spinimanus GERMAR, 1824)	U	P										1	0.06	6.25			
Number of nests			13			18			12			16			5		
Number of individuals			29			141			64			52			14		
Number of species			17			22			25			20			8		
H´			3.62			3.02			4.29			3.64			2.84		
Equitability			0.88			0.68			0.92			0.84			0.95		