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BEETLES (COLEOPTERA) IN DESERTED NESTS OF *PHOENICURUS OCHRUROS, PARUS CAERULEUS, PARUS MAJOR, SITTA EUROPAEA* AND *STURNUS VULGARIS*

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Abstract: Beetles from 196 nests of four cavity nesters and one semi-cavity nester collected in 1978-1994 in South West and Central Slovakia were analysed. Number of species (7-31) recorded in nests of each bird species depended on number of examined nests of this bird (18-116). In all nests, the carnivores, necrophages and detritophages prevailed as to number of species as to number of individuals. A minor, but constantly occurring group were mycetophages. Unlike nests of birds nesting on wooden plants, the phytophages were absent or occurred only individually. The nest fauna showed two seasonal aspects. The carnivores prevailed in late spring and summer, while the scavengers (necrophages and detritophages) in late summer and autumn. The only carnivore culminating in autumn was *Gnathoncus communis* (Marseul, 1862).

Key words: Beetles, cavity nesting birds, *Phoenicurus ochruros, Parus caeruleus, Parus major, Sitta europaea, Sturnus vulgaris*

INTRODUCTION

Cavity nests of birds represent a particularly suitable environment for development and survival of not only strictly nidicolous arthropods, but also for other arthropod species, first of all scavengers, which find there food and cover. Repeated breeding in a cavity may even release some species from necessity to search for new nest after deserting the cavity by one breeding pair and fledglings. In this way, relatively stable conditions can arise for live of several generations of a species. These facts are usually reflected in a larger species richness and/or number of individuals of nidicolous beetles in cavity nests, and make the cavity nests a particularly interesting object of investigations.

The beetles in nests of cavity nesting birds were first studied by NORDBERG (1936). Some casual data published by different authors were summarised by HICKS (1959, 1962 and 1971). The beetles in an extensive number of house sparrow nests in boxes were analysed by JURÍK & ŠUSTEK (1978), in house and tree sparrow nests by ŠUSTEK & KRIŠTOFÍK (in press) and in tengmalm owls by KRIŠTOFÍK et al. (in press).

The aim of this paper is to deepen the knowledge of structure of beetle fauna in nests of four cavity breeders [*Parus caeruleus* Linnaeus, 1758, *Parus major* Linnaeus, 1758, *Sitta europaea* Linnaeus, 1758 and *Sturnus vulgaris* Linnaeus, 1758] and *Phoenicurus ochruros* (Gmelin, 1774) to compare it with nests other birds and describe the seasonal dynamics of dominant beetles.

MATERIAL AND METHODS

The nests examined (*Ph. ochruros* 22, *P. caeruleus* 20, *P. major* 116, *S. europaea* 18, *S. vulgaris* 20) were collected in 23 localities of South West and Central Slovakia (for details see Appendix) in the years 1978-1994, the whole vegetation period over. All the nests except of those of *P. ochruros* were from boxes and were taken after fledging of chicks. The nests collected were transported to the laboratory in canvas bags. The beetles were extracted by the Tulgrens's funnels, hand-sorted and conserved in 70% alcohol.

The names of beetles conform with JELÍNEK (1993). The ecological parameters (dominance, presence, Sorensen's and Renkonen's indices of similarity) are used in the sense of SCHWERDTFEGER (1975). The unweight average linkage method (ORLÓCI 1978) was used for classification of species assemblages. The indices of occurrence extensity (number of individuals per all nests examined) and intensity (number of individuals per positive nests) (JURÍK & ŠUSTEK 1978). Histograms of seasonal dynamics of some species were reconstructed from one month samples collected in different years.

RESULTS

Quantitative and qualitative structure

Number of beetle species found in nests of each bird species was positively correlated with number of nests examined (Fig. 1). Although the linear model of this dependence showed a higher coefficient of determination, the power curve model seems to be more realistic. The largest number of species was found in nests of *P. major*, the lowest in nests of *S. europaea* (Tab. 1).

In Ph. ochruros, 8 species were found. Gnathoncus buyssoni, Anthrenus pimpinelae and Alphitobius diaperinus had the cumulative dominance of 93.5%.

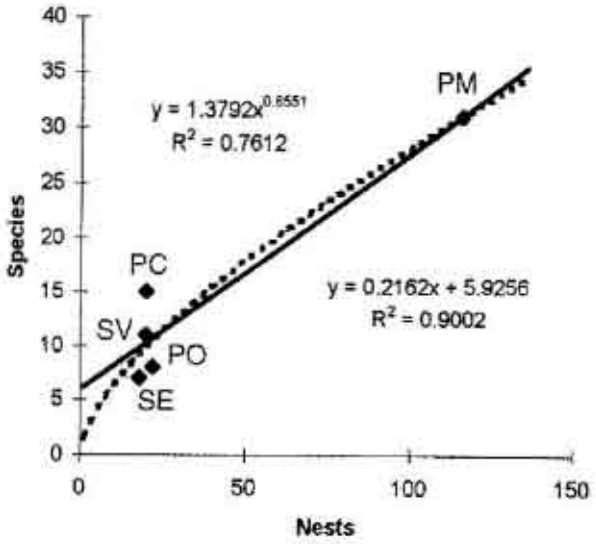

Fig. 1. Dependence of number of species on number of nests of *Ph. ochruros* (PO), *P. caeruleus* (PC), *P. major* (PM), *S. europaea* (SE), and *S. vulgaris* (SV)

Their presence moved from 9.1 to 18.2% and extensity from 0.82 to 4.58 (Tab. 1).

In *P. caeruleus*, 11 species were recorded, but only three of them, *Gnathoncus buyssoni, Alphitobius diaperinus* and *Lathridius minutus*, had the cumulative dominance of 77.2%. Their presence ranged from 10.0 to 30.0% and extensity from 0.25 to 0.95

In *P. major*, 31 species were found, but four species *Anthrenus pimpinelae, Haploglossa puncticollis, Gnathoncus buyssoni, Atheta harwoodi* had cumulative dominance of 77.8%. Their presence ranged from 7.8 to 20.7% and extensity 0.37 to 3.18.

In *S. europaea*, 7 species were found. *Gnathoncus buyssoni, Haploglossa puncticollis* and *Trox. scaber* represented 75% of individuals. Their presence was 5.6 and extensity ranged from 0.11 to 0.44.

In *S. vulgaris* 15 species were recorded. *Gnathoncus communis, Gnathoncus buyssoni, Atheta harwoodi, Haploglossa puncticollis, Anthrenus pimpinelae* and *Alphitobius diaperinus* had cumulative dominance of 84.2%. Their presence moved from 10.0 to 15.0% and extensity from 1.00 to 2.90.

In all nests, but particularly in *Ph. ochruros* and *P. major*, number of *Anthrenus pimpinelae* varied considerably. In many nests it was absent and most individuals were concentrated in a small number of nests. The maximum numbers of individuals in one nest were 89 and 90, respectively, what represented 86% and 23%, respectively, of all *Anthrenus pimpinelae* found in *Ph. ochruros* and *P. major*.

Similarity of species assemblages

According to presence/absence data, the assemblages formed two major clusters (Fig. 2). The first included assemblages in *Ph. ochruros* and *P. caeruleus*. They were relatively poor in number of species (Tab. 1) and were characterised by common presence of *Gnathoncus buyssoni, Anthrenus pimpinelae* and *Alphitobius diaperinus*. The second cluster included assemblages in *P. major, S. europaea* and *S. vulgaris*. These assemblages showed very different numbers of species (Tab. 1). It resulted from very different of number of nests examined, but they were characterised by a large number of common species. All the species found in the poor-in-species nests of *S. europaea* also occurred in *P. major* and *S. vulgaris*, while nests of *P. major* and *S. vulgaris* showed 11 common species. The co-occurrence of *Gnathoncus buyssoni. Gnathoncus communis, Atheta harwoodi, Haploglossa puncticollis, Anthrenus pimpinelae, Lathridius minutus, Trox scaber* characterised the nests of *P. major, S. europaea* and *S. vulgaris*.

According to proportional similarity (Renkonen's index), the assemblages form two major clusters (Fig. 2). One cluster includes nests of *Ph. caeruleus* and *S. europaea* characterised by a high predominance of *Gnathoncus buyssoni* (50-54 % of individuals). Second cluster includes nests of *Ph.ochruros, P. major* and *S. vulgaris* which were characterised by simultaneous predominance of *Anthrenus pimpinelae* (44-60%), *Haploglossa puncticollis* (17-19%) and *Gnathoncus buyssoni* (6.7-11.5%). The very variable representation of *Alphitobius diaperinus* 0-22.5% did not influenced results of classification.

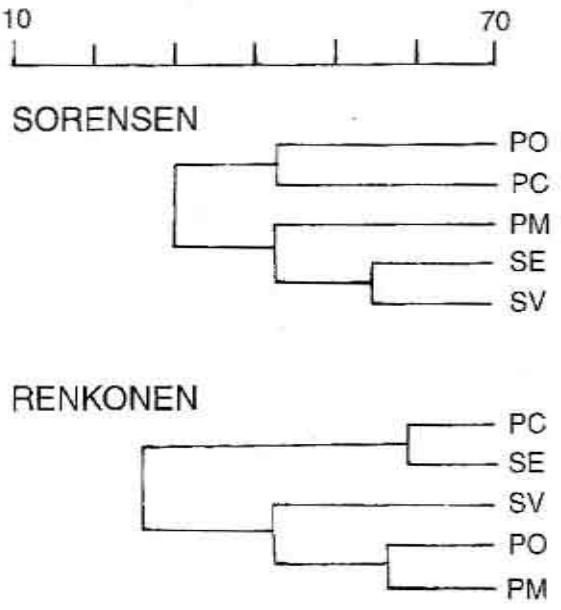

Fig. 2. Unweight average linkage classification of beetle fauna in nests of five cavity nesters (abbreviations as in Fig. 1).

Trophic structure

The largest portion (40-50%) of beetle species in all nests, except those of *P. caeruleus*, were carnivores (Fig. 3) followed by detritophages (in *Ph. ochruros* and *P. major*) or necrophages (in *S. europaea* and *S. vulgaris*). Detritophages were the richest in species group in *P. caeruleus*. The mycetophages represented about 10% of species in all nest. Algivores represented 5-10% of species, except the nests of *Ph. ochruros*, where they absented.

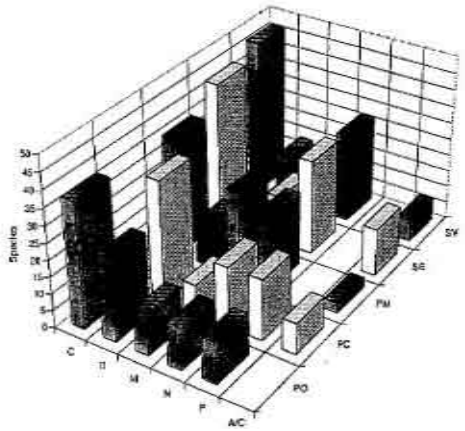

Fig. 3. Percentage of species of individual trophic groups of beetles in nests of five cavity nesters (C - carnivores, D - detritophages, M - mycetophages, N - necrophages, P - phytophages, A/C - algivores/carnivores, other abbreviations as in Fig. 1).

Dominance of individual trophic groups of beetles was very variable (Fig. 4). Carnivores strongly predominated (43.4-68.8% in *P. caeruleus, S. europaea* and *S. vulgaris*), while in *P. major* they formed the second dominant group (33.8%). The necrophages highly predominated in *Ph. ochruros* and *P. major* (60.3 and 52.7%). In other nests their representation did nod exceed 20%. Detritophages were the second dominant group in

Ph. ochruros and *P. major* (22.7 and 22.9%) and the third dominant group in *S. vulgaris* (14.8%). Representation of other trophic groups was low in all nests. It did not exceed 10%. The phytophages were present only in *Ph. ochruros* and *P. caeruleus*. The algivores were absent in *Ph. ochruros*.

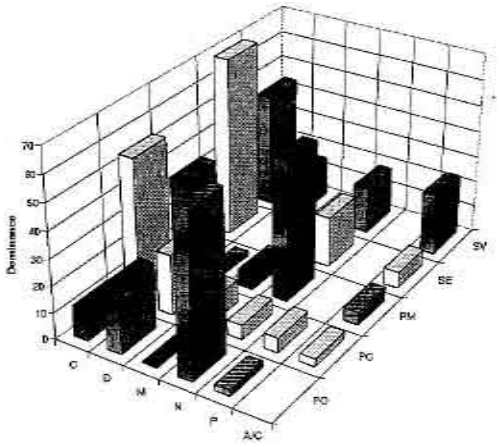

Fig. 4. Dominance of individual trophic groups in nests of five cavity nesters (abbreviations as in Fig. 1 and 3).

Occurrence intensity (Fig. 5) of most trophic groups did not exceed 2.0 and in few cases reached 5.0. A higher intensity was shown by carnivores in *S. vulgaris* (16.3), necrophages in *Ph. ochruros* (9.4), *P. major* (7.4) and *S. vulgaris* (6.5) and algivores in *S. vulgaris* (8.5).

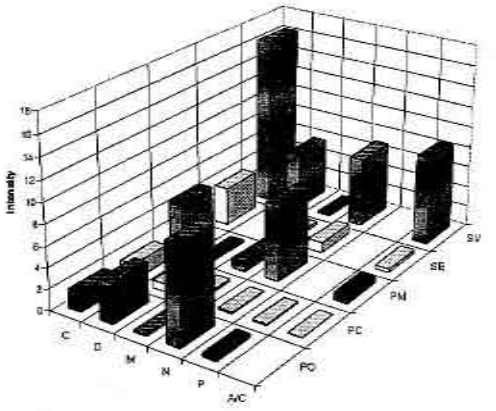

Fig. 5. Occurrence intensity of individual trophic groups in nests of five cavity nesters (abbreviations as in Fig. 1 and 3).

Seasonal dynamics of dominant species

In spite of different representation in the nests of individual bird species, the selected dominant species of beetles showed the following occurrence patterns. The scavengers (Fig. 6-7) appeared in the nests in September and October (necrophagous *Anthrenus pimpinelae*) or in October (detritophagous *Alphitobius diaperinus*). In other months their occurrence was much lower or they were absent at all.

The carnivorous *Haploglossa puncticollis* (Fig. 8) occurred in the nests from May to August. Its occurrence culminated in June.

Different patterns were shown by two *Gnathoncus* species (Fig. 9-10). The common *Gnathoncus buyssoni* occurred in the nests the whole growing season over, but it showed a tendency to culmination in June and July, a decline in occurrence in August and September and a slight increase in October and November. In contrast, the rare *Gnathoncus communis* occurred in a small number in May and June. From July to September it did not occur. A culmination in the nests of *S. vulgaris* started in October.

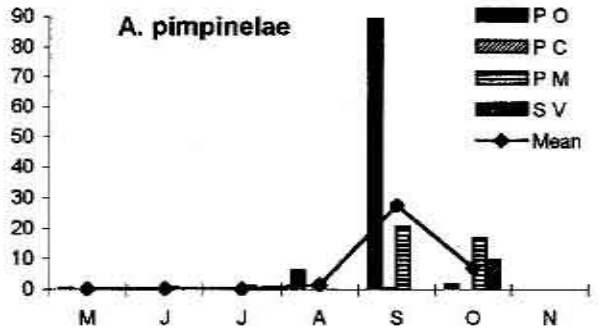

Fig. 6. Seasonal dynamics of *A. pimpinelae* in nests of *Ph. ochruros, P. caeruleus, P. major* and *S. vulgaris* (ordinate – occurrence intensity, abbreviations as in Fig. 1).

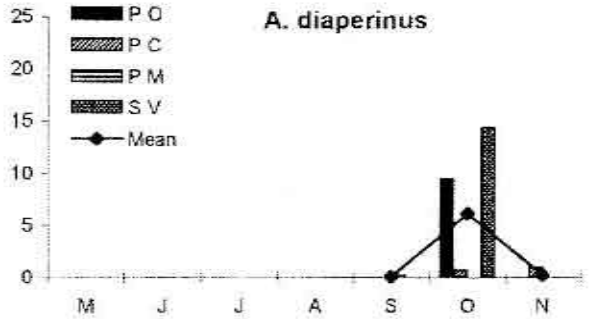

Fig. 7. Seasonal dynamics of *A. diaperinus* in nests of *Ph. ochruros, P. caeruleus, P. major* and *S. vulgaris* (ordinate – occurrence intensity, abbreviations as in Fig. 1).

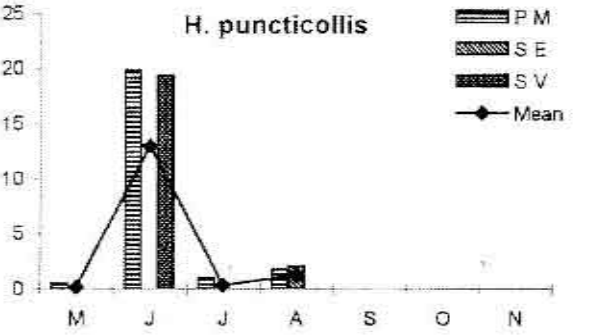

Fig. 8. Seasonal dynamics of *H. puncticollis* in nests of *P. major, S. europaea* and *S. vulgaris* (ordinate – occurrence intensity, abbreviations as in Fig. 1).

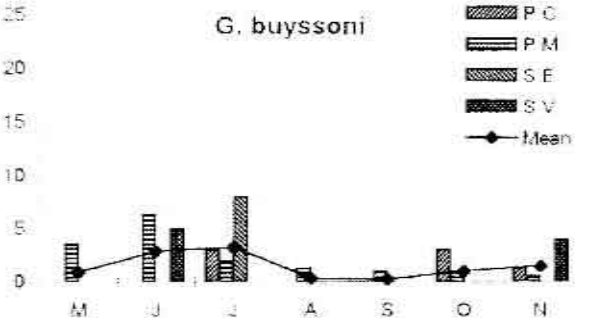

Fig. 9. Seasonal dynamics of *G. buyssoni* in nests of *P. caeruleus, P. major, S. europaea* and *S. vulgaris* (ordinate – occurrence intensity, abbreviations as in Fig. 1).

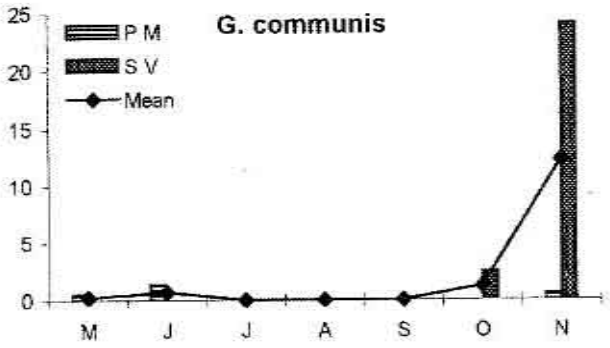

Fig. 10. Seasonal dynamics of *C. communis* in nests of *P. major* and *S. vulgaris* (ordinate - number of individuals, abbreviations as in Fig. 1).

DISCUSSION AND CONCLUSIONS

The beetle fauna in the nests of *Ph. ochruros* has been studied only by MAJZLAN & RYCHLÍK (1992) who found 11 species in its nests. Among them only one species, *Ptinus fur*, was also found in our material. Thus the further seven species (Tab. 1) are first records of beetles in its nest. However, NORDBERG (1936) found two of these species (*Haploglossa puncticollis* and *Gnathoncus buyssoni* identified likely as *Gnathoncus rotundatus* Kugelann, 1792) in *Phoenicurus phienicurus* (Linnaeus, 1758).

Among 31 species recorded by us in *Parus major*, 17 species have not been recorded in its nests. 12 species (*Haploglossa puncticollis, Philonthus subuliformis, Atheta hardwoodi, Gnathoncus sp., Dendrophilus punctatus, Hargarinotus merdarius, Lathridius minutus, Athrenus pimpinelae, Tenebrio molitor, Quedius brevicornis*) were already recorded by authors cited by HICKS (1959, 1962). Also 12 species (*Dendrophilus punctatus, Gnathoncus buyssoni, Gnathoncus communis, Aleochara sparsa, Philonthus subuliformis, Atheta haworthi, Haploglossa puncticollis, Trox scaber, Anthrenus pimpinelae, Ptinus fur, Dienerella separanda and Lathridius minutus*) were not found in the rich material of MAJZLAN & RYCHLÍK (1992), who found in 251 nests of P. major even 63 species. However, most species occurred in their material only individually (their material totals only 99 individuals). Neither the species being represented in our material in mass showed a tendency to a stronger predominance. This fact probably resulted from collecting of most of their a long time after deserting of the nest, mainly in winter Some species found by other authors are typical inhabitants of litter and were probably found in the nests fallen on ground. Generally, most authors founded more species of the genera *Anthrenus* Schaeffer, 1766 and *Ptinus* Linnaeus, 1766. In contrast, our material was richer in mycetophagous species of Lathridiidae, Mycetophagidae, Endomychidae and Cryptophagidae (Tab. 1). This tendency, in a limited scale, was also exhibited by the material of MAJZLAN & RYCHLÍK (1992).

HICKS (1959) cited records of 19 beetle species in nests of *P. caeruleus*, among which six species (*Gnathoncus* sp., *Philonthus subuliformis, Atheta hardwoodi, Haploglossa puncticollis, Anthrenus pimpinelae, Ptinus fur* and *Cyphon variabilis*) also occurred in our material. Out of the species recorded by other authors, we found *Trox perrisi, Ptinus sexpunctatus, Lathridius minutus, Alphotobius diaperinus, Hypera rumicis* and *Hypera postica*. Two former species, however, occurred in the nests occasionally, other three species also occur in many other birds. Two of the species found by us (*Gnathoncus buyssoni, Philonthus subuliformis*) were also found by MAJZLAN & RYCHLÍK 1992, who recorder 9 species in the nests of *P. caeruleus*.

The large number of authors cited by HICKS (1959, 1961, 1972) recorded 48 beetle species in *S. vulgaris*. Some of them were recorded probably due to examination of nests fallen on ground and penetrated by soil surface beetles (*Oxytelus* spp., *Platystethus arenarius* (Fourcroy, 1785)) or due to presence of dead chicks in those nests (*Nicrophorus sepultor* Charpentier, 1825 and *Nicrophorus vespiloides* Herbst, 1784). Many species (*Gnathoncus* spp. *Dendrophilus punctatus, Atheta hardwoodi, Haploglossa puncticollis, Philonthus subuliformis, Trox scaber, Lathridius minutus*) recorded by most of these authors also occurred in our material. Unlike these authors, we also recorded *Diaclina testudinacea* and *Trox hispidus* and a large number of *Anthrenus pimpinelae* and *Alphitobius diaperinus*. MAJZLAN & RYCHLÍK (1992) recorded only 7 species in the nests of *S. vulgaris*. Three of them (*Gnathoncus buyssoni, Atheta haworthi* and *Anthrenus pimpinelae*) were also found in our material.

Structure of the dominant species of beetles (Tab. 1) in nests of *Ph. ochruros, P. caeruleus, S. europaea* and *S. vulgaris* and of majority of species found in *P. major* was most similar to structure of beetle fauna in nests of *Passer domesticus* and *Passer montanus* (JURÍK & ŠUSTEK 1978, ŠUSTEK & KRIŠTOFÍK, in press). The most characteristic feature of beetle fauna in all nests examined in this study was a high number of *Alphitobius diaperinus*, a store pest. Earlier this species was found only once in a bird nest in free nature (HICKS 1959,1962, 1972). However, it often occurs in poultry farms (LEGNER et al. 1975, STROTHER & STEELMAN 2001). Its occurrence in our material could result from collecting the nests in surroundings of villages.

Predominance of carnivorous and necrophagous beetles was also observed in different owls (NORDBERG 1936), *Merops apiaster* Linnaeus 1758 and *Aegolius funereus* (Linnaeus, 1758) (KRIŠTOFÍK et al. 1996, in press).

The beetle fauna in nests of other birds strongly differed from fauna in nests of *Ph. ochruros, P. caeruleus, P. major, S. europaea* and *S. vulgaris*. The nests of *Lanius minor* Gmelin, 1788 and *Lanius collurio* Linnaeus, 1758, which are constructed on trees and shrubs, differed by a high proportion of occasionally occurring phytophagous beetles (KRIŠTOFÍK et al. 2002). The nests of *Remiz pendulinus* Linnaeus, 1758 differed by a very low number of species and predominance of the minute mycetophagous species of Lathridiidae, which were the only beetles able to live in the dense construction material of penduline tit nests (KRIŠTOFÍK et all., 1993, 1995). The nests of *Acrocephalus arundinaceus* (Linnaeus, 1758) and *Acrocephalus scirpaceus* (Hermann, 1804) (KRIŠTOFÍK et al. 2001) differed by a high number of Coccinelidae living on reed

leaves and by a high number of species living in litter and emerging during floods. Beetle fauna in nests of these birds was influenced by position of the nests or by consistence of their construction material.

Irrespectively of different species richness, which resulted mainly from different number of nests examined, there can be distinguished two seasonal aspects of beetle fauna in nests of cavity nesters. The summer aspect characteristic by predominance of carnivorous and mycetophagous species and the autumnal aspect characterised by a strong predominance of necrophages and detritophages. Predominance of carnivores and mycetophages in summer aspect reflects predation of nests parasites on one hand and starting decomposition of the nests material. Predominance scavengers in autumnal aspect reflects advancing decomposition of the nests material, feathers, food rests and faeces in the nests.

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APPENDIX

Localities with nest collection and numbers of nests collected

Bratislava - Petržalka (48° 07′ N, 17° 06′ E) - *P. major* 1, *S. europea* 1; Bratislava - Líštiny (48° 10′ N, 17° 04′ E), *P. caeruleus* 10, *P. major* 18, *Ph. ochruros*, *S. europaea* 10, *S. vulgaris* 12; Bratislava - Vrakuňa (48° 09′ N, 17° 13′ E), *P. caeruleus* 1, *P. major* 1, Debrad' (48° 39′ N, 20° 58′ E) *P. major* 5; Drieňovec (48° 37′ N, 20° 58′ E) *P. major* 2; Stankovany - Fedorov (49° 09′ N, 19° 12′ E), *P. major* 3; Jahodná (48° 37′ N, 17° 42′ E), *P. major* 7; Kamenica nad Hronom (47° 50′ N, 18° 45′ E), *P. major* 2, *S. europaea* 2; Bratislava - Kopáč (48° 05′ N, 17° 10′ E), *P. caeruleus* 6, *P. major* 7, *S. vulgaris* 2; Kováčová (48° 37′ N, 19° 05′ E), *P. major* 2, *S. europea* 4; Marianka (48° 15′ N, 17° 03′ E), *P. major* 2; Nemšová (48° 58′ N, 18° 06′ E) *P. major* 2; Oščadnica (49° 28′ N, 18° 53′ E), *P. major* 3; Plavecké Podhradie (48° 29′ N, 17° 15′ E), *P. major* 2; Podunajské Biskupice (48° 08′ N, 17° 14′ E), *P. major* 2; Rajecké Teplice (49° 08′ N, 18° 41′ E), *P. major* 3; Rohožník (48° 27′ N, 17° 10′ E), *P. major* 6; *Ph. ochruros* 2; Sološnica (48° 27′ N, 17° 14′ E), *P. major* 4; Stankovany - settlement Podšíp (49° 10′ N, 19° 10′ E), *P. caeruleus* 6, *P. major* 2; *S. vulgaris* 2; Svätý Jur - biological station Šúr (48° 14′ N, 17° 13′ E), *P. major* 4; *Ph. ochruros* 2; Rohožník - Vývrat, water reservoir (48° 26′ N, 17° 10′ E), *P. caeruleus* 3, *P. major* 3; *Ph. ochruros* 6; Veľký Meder (47° 52′ N, 17° 45′ E), *Ph. ochruros* 1; Záhorská Bystrica (48° 14′ N, 17° 02′ E), *P. major* 6.

Table 1. Survey of beetles in nets of five cavity nesters and their trophic relations (I - number of individuals, P - presence in %, TR - trophic relations, A - algivores, C - carnivores, D - detritophages, M - mycetophages, N - necrophages, P - phytophages).

Family / species	TR	*Ph. ochruros*		*P. caeruleus*		*P. maior*		*S. europaea*		*S. vulgaris*	
		I	P	I	P	I	P	I	P	I	P
Carabidae											
Syntomus pallipes Dejean, 1825	C	1	4.55								
Histeridae											
Dendrophilus punctatus (Herbst, 1792)	C					9	2.59			3	5.00
Gnathoncus buyssoni Auzat, 1917	C	18	13.64	19	30.00	96	20.69	8	5.56	20	20.00
Gnathoncus communis (Marseul, 1862)	C					10	2.59			32	15.00
Gnathoncus nidorum Strockmann, 1957	C									1	5.00
Margarinotus merdarius (Marseul, 1862)	C					1	0.86			8	10.00
Leiodidae											
Catops sp.	N							1	5.56		
Staphylinidae											
Aleochara curtula (Goeze, 1777)	C					6	0.86				
Aleochara sparsa Heer, 1839	C					3	1.72				
Atheta harwoodi D. S. Wiliams, 1930	A(C)			1	5.00	43	7.76	1	5.56	68	10.00
Haploglossa puncticollis (Kirby, 1832)	C					143	14.66	2	5.56	58	10.00
Omalium rivulare (Paykull, 1789)	C					1	0.86				
Philonthus succicola C.G.Thomson, 1860	C					1	0.86				
Philonthus subuliformis (Gravnhorst, 1802)	C					12	3.45	1	5.56	8	15.00
Quedius brevicornis (C. G. Thomson, 1860)	C					1	0.86				
Sepedophilus pedicularia (Gravenhors, 1802)	C	1	4.55								
Helodidae											
Cyphon variabilis (Thunbrg, 1787)	P	4	9.09								
Trogidae											
Trox hispidus (Pontopidan, 1783)	N					6	1.72			9	10.00
Trox perisi (Fairmair, 1868)	N			1	5.00					6	10.00
Trox scaber (Linnaeus, 1767)	N					7	1.72	2	5.56	10	10.00
Dermestidae											
Anthrenus pimpinlae (Fabricius, 1775)	N	103	18.18	1	5.00	369	12.07			29	10.00
Dermestes lardarius Linnaeus, 1758	N					3	2.59				
Dermestes murinus Linnaeus, 1758	N					8	1.72				
Dermestes sp. larvae	N					43	1.72				
Ptinidae											
Ptinus fur (Linnaeus, 1758)	D	4	13.64	1	5.00	10	3.45				
Ptinus sexpunctatus Panzer, 1795	D			1	5.00	1	0.86				
Nitidulidae											
Omosita discoidea (Fabricius, 1775)	N					5	0.86				
Cryptophagidae											
Atomaria pusilla (Paykull, 1798)	M	1	4.55								
Antherophagus pallens (Linnaeus, 1829)	M					2	0.86				
Endomychidae											
Mycetea subterranea (Fabricius, 1801)	M					3	0.86				
Lathridiidae											
Cartodere constricta (Gyllenhal, 1827)	M					26	0.86				
Corticaria ferruginea Marsham, 1802	M					6	0.86				
Cortinicera gibbosa (Herbst, 1793)	M					1	0.86				
Dienerella separanda (Reitter, 1887)	M					11	0.86				
Lathridius minutus (Linnaeus, 1767)	M			3	10.00	5	2.59	1	5.56	1	5.00
Mycetophagidae											
Typhaea stercorea (Linnaeus, 1758)	M					1	0.86				
Anthicidae											
Anthicus sp.	D			1	5.00						
Tenebrionidae											
Alphitobius diaperinus (Panzer, 1797)	D	38	9.09	5	10.00	2	1.72			43	15.00
Diaclina testudinea (Piller et Mitteerpacher, 1783)	D									1	5.00
Tenbrio molitor Linnaeus, 1758	D					2	0.86				
Curculionidae											
Hypera rumicis (Linnaeus, 1758)	P			1	5.00						
Hypera postica Gyllenhal, 1813	P			1	5.00						
Total of individuals		170	45.45	35	60.00	837	51.72	16	16.67	297	40.00
Number of species		8		11		31		7		15	
Number of nests with beetles		11		12		60		3		8	
Number of nests examined		22		20		116		18		20	

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