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Arthropods in the nests of lesser spotted eagle (*Aquila pomarina*)

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Abstract: In 2001–2007, altogether 57 nests of lesser spotted eagle were collected in the Orava region in northwestern Slovakia and four groups of arthropods were extracted from them. Richest in number of species and individuals were mites (23 species, 17,500 ind.), followed by beetles (12 species, 725 ind.), whereas pseudoscorpions were represented only by *Pselaphochernes scorpioides* (39 ind.) and fleas by *Ceratophyllus garei* (3 ind.). Unlike nests of other birds, free-living mites predominated in the nests fauna (83% of individuals), followed by nidicolous species with more or less free relationship to the nests, while parasitic species represented only a negligible part of the fauna. For the first time we observed phoresy of *Nenteria pandioni,* a specific and abundant mite in the eagles' nests, on the nidicolous staphylinid *Haploglossa puncticollis.* The beetle fauna in the nests was much poorer than in nests of other birds. The predatory *H. puncticollis* was dominant in the nests (83%) and occurred continuously during the whole investigation period. Other beetles, even the widely distributed nidicols such as the histerid *Gnathoncus buyssoni,* were found rarely in nests. Predators were also the only abundant trophic group of beetles in the nests, while other trophic groups of beetles abundantly co-occur in nests of majority of other birds. The occurrence of all beetles was very unevenly distributed during the investigation period, but was positively correlated with occurrence of mites. The relatively low number of species and individuals of mites and beetles in the lesser spotted eagle nests resulted from their position on tree tops, at a height of 20–30 m and their quick drying out by sun and wind. It was also indicated by an enormously low number of species and individuals of mycetophagous beetles, which represent a significant component of the fauna in nests of other birds.

Key words: lesser spotted eagle; pseudoscorpions; mites; beetles; fleas; Slovakia

Introduction

Lesser spotted eagle (*Aquila pomarina pomarina* C.L. Brem, 1831) is a migratory species breeding in Central, Eastern and South-eastern Europe, Turkey, Caucasus and Northern Iraq. It nests once a year on trees, rarely on ground or rocks. The clutch consists of almost always two eggs, rarely one egg, exceptionally three. Incubation lasts 38–43 days. In nests usually only one chick survives, only rarely two chicks fledge. The chicks live in the nests approximately seven weeks (Hudec & Šťastný 2005).

Scarce data exist about the occurrence of pseudoscorpions in bird nests. Individual records are scattered in papers of Heselhaus (1914), Lehnert (1933), Norberg (1936), Leleup (1948), Woodroffe (1953) etc. Beier (1948) summarizing the data from Europe gives five species of pseudoscorpions from bird nests. The same number is also given from England in the paper of Jones (1975). As found by Krumpál & Cyprich (1988), pseudoscorpions regularly occur first of all in bird nests in tree cavities. In nests of other bird species, pseudoscorpions occur occasionally (Krumpál & Cyprich 1988; Krištofík et al. 1993, 1994, 1996, 2002, 2003, 2005, 2007).

The mite fauna of the nests of most species of the order Accipitriformes is completely unknown, but these raptors can host a diverse mite community. According to Philips (2000), there are 21 families of mites that are associated with Accipitriformes and inhabit birds' feathers, quills, skin, subcutaneous tissues, respiratory tracts, and nests, and feed on blood, tissue fluids, skin and feather lipids and debris, keratin, fungi, algae, and other mites. Philips (2000) also presented a checklist of parasitic mites associated with birds of prey (Accipitriformes and Strigiformes). In spite of it, the data on Mesostigmata occurring in birds' nests are still fragmentary, mainly in relation to the acarocoenoses of raptor nests. Majority of them have just faunistic character. Among the systematic studies particularly focused on Mesostigmata of birds of prey nests, those of Nordberg (1936), Philips (1981), Philips & Dindal (1990), Gwiazdowicz et al. (1999, 2000, 2005a, b, 2006), Gwiazdowicz (2003), Błoszyk et al. (2006) and Fenďa & Lengyel (2007) can be named.

The beetle fauna of bird nests is relatively well known, but it was studied mainly in passerine birds, whose nests are easier available (Jurík & Šustek 1978; Krištofík et al. 1993, 1994, 1996, 2002, 2003, 2005, 2007; Majzlan & Rychlík 1992; Šustek & Jurík 1980; Šustek

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& Hornychová 1983; Šustek & Krištofík 2002, 2003). The beetles in nests of birds of prey were little studied. Nordberg (1936) and Hicks (1959) present a relatively rich list of species found accidentally in nests of different accipitriform birds and owls. Beetles were studied more systematically only in nests of saker (Merkl et al. 2004) and owls (Krištofík et al. 2003; Majka et al. 2006). However, there are no published data on beetles in lesser spotted eagle nests.

The data about fleas from eagles nesting in Europe are very scarce. In the nests of golden eagle the species *Ceratophyllus vagabundus* (Boheman, 1865) and *C. gallinae* (Schrank, 1803) were recorded (Hick 1959, 1971 and Peus 1968, respectively) while four flea species in the nests of lesser spotted eagle (Cyprich et al. 2006).

The aim of this study is an analysis of arthropod fauna in an extensive material of nests of the lesser spotted eagle, collected in mountain area of west Carpathians and its comparison with fauna in nests of other bird species, especially with the birds of prey.

Material and methods

The interior lining from nests of the lesser spotted eagle was collected in 2001–2007 after fledging of chicks in Slovakia in the Orava region, in surroundings of the villages Dolný Kubín (49°13′ N, 19°20′ E, 2 nests), Dolný Kubín-Záskalie (49°14′ N, 19°17′ E, 1 nest), Dolný Kubín-Kňažia (49°14′ N, 19°19′ E, 1 nest), Horná Lehota (49°15′ N, 19°25′ E, 1 nest), Dlhá nad Oravou (49°16′ N, 19°27′ E, 3 nests), Habovka (49°17′ N, 19°37′ E, 2 nests), Podbiel (49°19′ N, 19°19′ E, 3 nests), Tvrdošín (49°20′ N, 19°34′ E, 2 nests), Vitanová (49°20′ N, 19°44′ E, 1 nest), Čimhová (49°21′ N, 19°41′ E, 1 nest), Oravská Lesná (49°22′ N, 19°13′ E, 1 nest), Ústie nad Priehradou (49°22′ N, 19°35′ E, 3 nests), Trstená (49°22′ N, 19°36′ E, 9 nests), Zákamenné (49°23′ N, 19°19′ E, 10 nests), Oravská Jasenica 49°23′ N, 19°26′ E, 2 nests), Suchá Hora (49°23′ N, 19°48′ E, 1 nests), Hladovka (49°24′ N, 19°46′ E, 8 nests), Námestovo (49°25′ N, 19°27′ E, 1 nest), Novoť (49°26′ N, 19°15′ E, 1 nest), Mútne (49°28′ N, 19°18′ E, 3 nests), Rabča (49°29′ N, 19°29′ E, 1 nets).

Pseudoscorpions, mites, beetles and fleas were extracted from lining of the nest interior by means of Tulgren's funnels. Pseudoscorpions, mites and fleas were mounted into permanent slides. Beetles are preserved in alcohol. Ecological data on beetles were taken from works of Boháč & Matějíček (2003), Freude et al. (1964, 1974), Nordberg (1936) and Roubal (1930, 1936). The whole material is deposed in the collections of the Institute of Zoology of Slovak Academy of Sciences in Bratislava (Slovakia). The quantitative characteristics of occurrence of parasites are used in the sense of Margolis et al. (1982).

Results and discussion

Pseudoscorpions

In the nests of the lesser spotted eagle we found 39 individuals of *Pselaphochernes scorpioides* (Hermann 1804) (1 ♂, 1 protonymph, 1 deutonymph, Zákamenné, 14 July 2001; 3 protonymphs, 14 deutonymphs, Námestovo, 15 July. 2001; 1 tritonymph, Dlhá nad Oravou 14 July 2003 and 1 ♂, 1 ♀, 1 protonymph, 8 deutonymphs, 7 tritonymphs, Dlhá nad Oravou, 18 July 2004). Pseudoscorpions occurred in four nests (prevalence 7%, mean intensity 9.8 ind.), abundance 1–18 individuals. *P. scorpioides* is commonly distributed the whole Europe over. It prefers various humid substrates like compost, heaps of decaying plant materials, manure dumps, decaying wood, und tree bark, it rarely occurs in caves or bird nests (Beier 1963). In cavities of deciduous trees it was recorded by Šťáhlavský (2001) and in oak-hornbeam litter by Christophoryová & Krumpál (2006). In England it was found in jackdaws nests (Jones 1975).

Mites

A total of 17,500 individuals belonging to 23 species of Mesostigmata were obtained from 57 examined nests of the lesser spotted eagle (Table 1). Mites were present in 39 nests (68.4%), their abundance fluctuated between 1 and 11,917 individuals in one nest. The average number of mites per one nest was 307. The most frequent species were *Androlaelaps casalis* (it occurred in 42.1% of nests), *Nenteria pandioni* (29.8%), *Eulaelaps stabularis*, *Ornithonyssus sylviarum* and *Proctolaelaps pygmaeus* (each 21.1%), *Macrocheles matrius* (15.8%), *Androlaelaps fahrenholzi* (14%) and *Hypoaspis lubrica* (10.5%). In other mite species recorded, the percentage of nests infested was lower than 10. The most abundant species were *P. pygmaeus* (247 ind. per one nest examined), *Androlaelaps casalis* (25 ind.), *N. pandioni* (11 ind.) and *H. lubrica* (5 ind.). The mites occurred more abundantly in 2001 (simultaneously all species recorded, with a strong predominance of *P. pygmaeus*), 2003 (*A. casalis, O. sylviarum*) and 2004 (*A. casalis*), while in other years the occurrence of mites was low. This pattern was correlated with the occurrence of beetles, especially carnivores (see bellow).

The mites found in the examined nests belonged to different ecological groups. On the base of the trophic relations to the host and habitat requirements to their nests, they were classified into the following groups (ordered according to the level of positive affinity to the host):

1 – Ectoparasites (21.7% of species and 1.8% of individuals) represent a negligible quantitative component of acarocoenoses studied. Atypically, they mostly consist of species, which are associated with small mammals and include species living in hair (*Hirstionyssus eusoricis*) or nests (*A. fahrenholzi*, *E. stabularis, Haemogamasus nidi*). Representation of *O. sylviarum,* a specialized birds' ectoparasite, was insignificant (2 ind. per one nest studied), while species of the genus *Dermanyssus* were not recorded.

2 – True nidicols (21.7% of species and 15.2% of individuals) include mites living in mammal nests and some types of bird nests and finding there food or favorable microclimatic conditions for their reproduction or survival. They are mostly predators feeding on abundant microfauna living in the nests, but do not have a direct trophic relation to the host. *Vulgarogamasus remberti* prefers nests of mammals, while *A. casalis* and *H. lubrica* have a special relation to nests of birds.

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Table 1. Survey of mesostigmatic mites in nests of the lesser spotted eagle.

Species	EC	Σ(♀)	Σ(♂)	Σ(s)	Σ(n)	D (%)	MI	RD	P (%)
Androlaelaps casalis (Berlese, 1887)	N	878	179	418	1,475	8.43	61.46	25.88	42.11
Androlaelaps fahrenholzi (Berlese, 1911)	PM	57	6	3	66	0.38	8.25	1.16	14.04
Cornigamasus lunaris (Berlese, 1882)	FC	–	1	7	8	0.04	2.00	0.14	7.02
Dendrolaelaps sp.		54	–	16	70	0.40	17.50	1.23	7.02
Dendrolaelaps zwoelferi Hirschmann, 1960	FS	11	1	–	12	0.07	4.00	0.21	5.26
Digamasellus punctum (Berlese, 1904)	FC	–	1	–	1	0.01	1.00	0.02	1.75
Eulaelaps stabularis Vitzthum, 1925	PM	88	7	8	103	0.59	8.58	1.81	21.05
Haemogamasus nidi Michael, 1892	PM	3	1	–	4	0.02	1.33	0.07	5.26
Halolaelaps sp.		–	–	3	3	0.02	1.50	0.05	3.51
Hirstionyssus eusoricis Bregetova, 1956	PM	1	–	–	1	0.01	1.00	0.02	1.75
Hypoaspis lubrica Voigts et Oudemans, 1904	N	267	17	10	294	1.68	49.00	5.16	10.53
Iphidozercon sp.		2	–	–	2	0.01	2.00	0.04	1.75
Lasioseius inconspicuus Westerboer, 1963	FW	32	11	7	50	0.28	16.67	0.88	5.26
Macrocheles glaber (J. Müller, 1860)	FC	1	–	–	1	0.01	1.00	0.02	1.75
Macrocheles matrius (Hull, 1925)	N	166	13	46	225	1.28	25.00	3.95	15.79
Macrocheles subbadius (Berlese, 1904)	FC	5	–	–	5	0.03	1.25	0.09	7.02
Multidendrolaelaps sp.		2	1	–	3	0.02	1.50	0.05	3.51
Nenteria pandioni Wiśniewski et Hirschmann, 1985	N	32	29	609	670	3.83	39.41	11.75	29.82
Ornithonyssus sylviarum (Canestrini et Fanzago, 1877)	PB	102	2	31	135	0.77	11.25	2.37	21.05
Proctolaelaps pygmaeus (J. Müller, 1860)	FS	8587	1245	4288	14,120	80.68	1,176.67	247.72	21.05
Trichouropoda structura Hirschmann et Z.-Nicol, 1961	FW	45	33	170	248	1.42	62.00	4.35	7.02
Vulgarogamasus remberti (Oudemans, 1912)	N	–	–	2	2	0.01	1.00	0.04	3.51
Zercon curiosus Trägårdh, 1910	FW	2	–	–	2	0.01	2.00	0.04	1.75
Total		10,335	1,547	5,618	17,500	100	448.72	307.02	68.42

Explanations: s – subadults, D – dominance, MI – mean intensity, RD – relative density, P – prevalence; EC – ecologic characteristic, PB – parasites of birds, PM – parasites of mammals, N – nidicolous, FS – free living species in soil, FC – free living coprophilous species, FW – free living species in wood.

Among nidicols found in the studied nests, *Macrocheles matrius* has not any preference for he nests of birds or mammals, while *N. pandioni* exhibits a specialized affinity to the nests of Accipitriformes. Generally, mites of this group represent an intermediate component in the nests examined.

3 – Free living mites (56.6% of species and 83% of individuals) include ubiquitous predators associated with various types of habitats. They have not any trophic (parasitic, feather, body) or topic (nest) relation to their host. Occasionally they find here optimal conditions for reproduction and development. In some types of the nests they can occur very abundantly. In the nests studied, they were the richest group in species. They can be divided into ecological subgroups like humicols (*Dendrolaelaps zwoelferi*, *P. pygmaeus*), coprophils (*Cornigamasus lunaris*, *Digamasellus punctum*, *Macrocheles glaber*, *M. subbadius*) and lignicols (*Lasioseius inconspicuus*, *Trichouropoda structura, Zercon curiosus*). Among free living species *P. pygmaeus* highly predominated (with 80.7%).

The mites in nests of the lesser spotted eagle have not been studied systematically. Only Gwiazdowicz (2003) and Gwiazdowicz et al. (2005a) analyzed lining from four nests from Poland, in which they found only 7 individuals of the nidicolous *A. casalis.* Based on our results and earlier studies, certain factors common for nests of birds of prey and influencing the communities of mesostigmatic mites in these nests can be defined. The most important are nest strategy and trophic demands of birds of prey. The large nests, systematically constructed and repeatedly inhabited for several years, are placed high above the ground. They are isolated from the soil and the lining consists of heterogenous material. Mite taxocoenoses in the nests of birds of prey are characterized, first of all, by absence or negligible representation of the specific hematophagous ectoparasites of the genus *Dermanyssus* and the somatic ectoparasites of the genus *Ornithonyssus.* In the studied nests of lesser spotted eagle we recorded only *O. sylviarum.* Its quantitative representation was almost negligible, with a dominance under 1% (*O. sylviarum* was found in the nests of eagles of the genus *Aquila* for the first time). It is remarkable that even the cosmopolitan representatives of these genera, which in the whole Palaearctic region infest a wide scale of hosts have not been recorded in nests of other birds of prey (Philips 1981; Philips & Dindal 1990; Gwiazdowicz et al. 1999, 2000, 2005b; Gwiazdowicz 2003; Fenďa & Lengyel 2007). Exceptions are data of Gwiazdowicz et al. (2006) about finding of one female *D. gallinae* in 34 nests of *Heliaeetus albicilla* from Poland , and of Philips (2000), who named several parasites (*D. americanus*, *D. gallinae*, *O. bursa*, *O. iheringi*, *O. sylviarum*) having a relationship to the predators *Accipiter gentilis*, *A. nisus*, *A. striatus*, *A. virgatus*, *Cathartes aura*, *Elanoides forficatus*, *Elanus notatus*, *Falco cenchroides*, *F. cherrug*, *Pseudogyps africanus* and *Rostrhamus sociabilis.* A characteristic feature of mite taxocoenoses in nests of birds of prey is a significant representation of a large number of "true" nidicol species. However, we did not record them in our material, except for *N. pandioni.* These species, most frequently represented by *Macrocheles ancyleus*, *M. penicilliger* a *Uroseius infirmus* (Gwiaz-

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Table 2. Survey of beetles found in nests of the lesser spotted eagle.

Family and species	TR	Number of individuals							All years					
		2001	2002	2003	2004	2005	2006	2007	Ind.	D (%)	IO	SDp	MO	SDa
Histeridae														
Carcinops pumilio (Erichson, 1834)	C	1							1	0.1	1.0	0.0	0.0	0.2
Gnathoncus buyssoni Auzat, 1917	C			9	5		1	1	16	2.2	1.8	4.9	0.3	1.2
Ptiliidae														
Acrotrichis intermedia (Gillmeister,. 1845)	De	20					6		26	3.6	6.5	10.5	0.5	2.8
Leiodidae														
Ptomaphagus sericatus (Chaudoir, 1845)	N				1				1	0.1	1.0	0.0	0.0	0.2
Staphylinidae														
Philonthus subuliformis (Gravenhorst, 1822)	C	1							1	0.1	1.0	0.0	0.0	0.2
Atheta vaga (Heer. 1839)	A	37		9	11				57	7.9	5.7	8.4	1.0	4.9
Haploglossa puncticollis (Kirby, 1832)	C	158	106	151	100	26	51	10	602	83.0	22.3	27.9	10.6	25.5
Haploglossa picipenis (Gyllenhal, 1827)	C	1		5	6		5		17	2.3	2.8	5.6	0.3	1.2
Euplectus signatus (Reichenbach, 1816)	C				1				1	0.1	1.0	0.0	0.0	0.2
Monotomidae														
Monotoma picipes Herbst, 1793	M			1					1	0.1	1.0	0.0	0.0	0.2
Latridiidae													0.0	0.0
Dienerella elongata (Curtis, 1830)	M			1					1	0.1	1.0	0.0	0.0	0.2
Corticaria vincenti Johnson, 2007	M					1			1	0.1	1.0	0.0	0.0	0.2
Number of individuals		218	106	176	124	27	63	11	725					
Number of species		6	1	6	6	1	4	2	12					
Number of nests		10	11	9	14	4	6	3	57					
Number of positive nests		9	6	8	6	3	4	3	35					

Explanations: TR – trophical relation, Ind. – number of individuals, D – dominance, IO – occurrence intensity (= number of individuals per positive nests), MO – mean occurrence (= number of individuals per all nests), SD – standard deviation, p – positive nests, a – all nests, A – algivores, C – carnivores, De – detritophags, M – mycetophags.

dowicz et al. 1999, 2006; Mašán 2001, 2003; Gwiazdowicz 2003; Fenďa & Lengyel 2007), prefer nests of birds of prey (Accipitriformes, Strigiformes). They occupy them by means of phoresy on nidicolous beetles (Sixl 1971; Mašán 1993). At the same time they can be considered as necrophiles or cadavericols living on food rest of birds. In addition, *N. pandioni* is a specific and abundant mite in the eagles' nests. In our material we observed, for the first time, its phoresy on the nidicolous staphylinid *Haploglossa puncticollis* (together 7 deutonymphs attached on two adult beetles).

Ectoparasitic mites of terrestrial mammals (e.g., species of the genera *Eulaelaps*, *Haemogamasus*, *Hirstionyssus*, *Hyperlaelaps*, *Laelaps*) occur sporadically in bird nests. In Slovakia, they were recorded in cavity nesting birds (Mašán & Krištofík 1993; Krištofík et al. 1996), especially in the birds of prey for which small mammals represent the main food basis (Philips & Dindal 1990; Philips 2000; Gwiazdowicz 2003; Gwiazdovicz et al. 2006). Their presence was also recorded in the nests of red-backed shrikes, which occasionally hunt and eat small mammals. The lining of nest of birds of prey consists predominantly of detritus of plant or animal origin. Such composition is reflected by a relatively rich qualitative representation of lignicols and coprophils and a poor representation of edaphic species. When compared with results of Gwiazdowicz (2003) and Gwiazdowicz et al. (2000, 2005b, 2006), quantitative representation of coprophilous and saprophilous species in the nests of lesser spotted eagle was negligible. It probably results from a lower content of organic detritus and lower humidity in the nests studied.

Beetles

A total of 725 individuals of 12 species were found in 35 nests among 57 nests of lesser spotted eagle (Table 2). Majority of individuals (85.3%) belonged to the only species *Haploglossa puncticollis*, a widely distributed nidicole in bird nests, and to its congener *H. picipenis*, a species occurring in nests of ants and birds, with certain affinity to nests of the birds of prey (Freude et al. 1974). The second dominant species was *Philonthus subuliformis*, an euryecious edaphic staphylinid, frequently, but not abundantly occurring in nests of many birds species. Among obligatory nidicolous species only *Gnathoncus buyssoni* was recorded as a subdominant species. In a limited number of nests, a relatively large number of detritophagous *Acrotrichis intermedia* occurred in an increased number. Other species occurred only individually in the nests studied. From faunistic point of view, finding of the rare histerid *Carcinops pumilio* is remarkable. This species, in spite of its subcosmopolitan distribution, general preference for urban habitats and many records in bird nests in the world, is a sporadic component of bird nest fauna in Slovakia.

In individual years, there were large differences in richness of nest fauna. The only constantly occurring species was *H. puncticollis.* In 2002 and 2005, it was the only species found in the nests. These differences are closely correlated with occurrence of mites, which was generally low in comparison with nests of other bird species, but it was strongly increased in 2001, 2003 and

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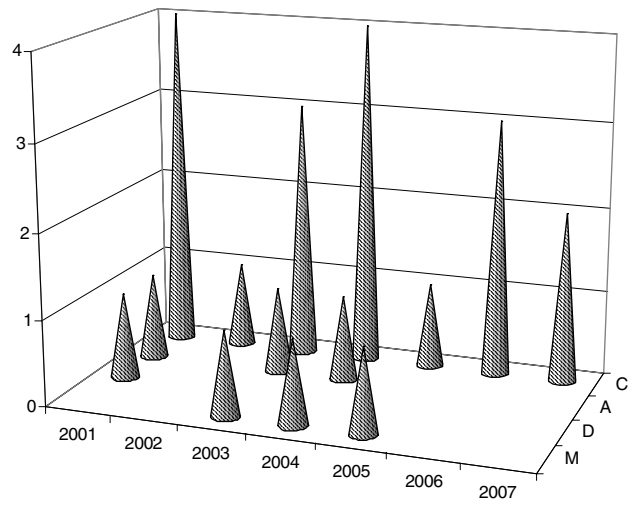

Fig. 1. Number of species in individual trophic groups of beetles in nests of the lesser spotted eagle. A – algivores, C – carnivores, D – detritophags, M – mycetophags.

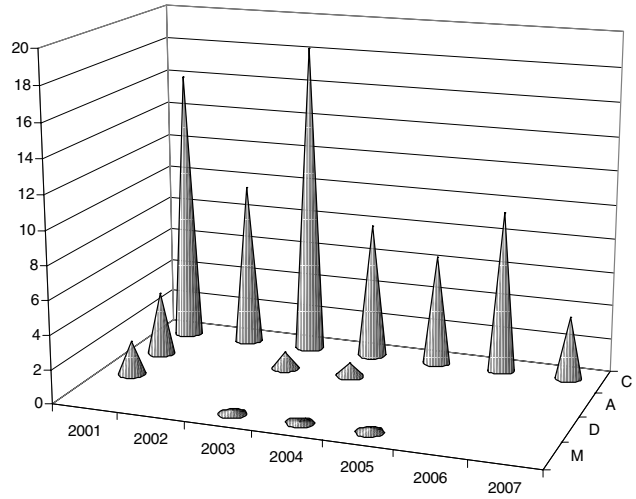

Fig. 2. Number of individuals in individual trophic groups of beetles in nests of the lesser spotted eagle (abbreviations as in Fig. 1).

2004, while in 2002 and 2005–2007 the mites occurred in low number. There are two synergic reasons of this correlation – the trophical binding of carnivorous beetles to mites and their nymphs and an increased humidity in the nests in the more rainy years 2001, 2003 and 2004. Different ecological position of the mites *A. casalis, O. sylviarum* and *P. pygmaeus* (see above) indicates that only a high cumulative abundance of mites in the nests is important for the beetles. Unlike the mites, no relation of beetles to pseudoscorpions and fleas recorded in the nests of other birds has been observed. The coincidence of beetles with mites was specific even to individual nets.

As to the trophic structure, the carnivorous beetles, both strictly nidicolous or with a free relation to the bird nest, strongly predominated in the nests (Fig. 2). This pattern was maintained, qualitatively and quantitatively in all years. In some years (2002, 2006 and 2007), carnivores were the only trophic group of beetles present in the nests studied and their occurrence closely correlated with the occurrence o mites. Other trophic groups (algophags, detritophags, necrophags and mycetophags) occurred negligibly.

When compared with nests of other birds, the beetle fauna in nests of the lesser spotted eagle is extremely poor. The low number of species is comparable only with the Penduline tit nests (Krištofík et al. 1993, 1995), whose dense walls make the survival difficult even for little nidicolous beetles. Isolation of Penduline tit nests from the surrounding inhibits their active colonization, while their free suspending on twig ends improves their ventilation and reduces humidity preferred by most nidicolous beetles. The significance of these factors for forming of nest fauna becomes evident in comparison with a rich fauna in birds nesting in cavities of boxes (Šustek & Krištofík 2002, 2003). On the other hand, there were no records of a number of species that occur in bird nests occasionally and whose presence is especially characteristic of nests of the red-backed shrike and the lesser grey strike (Krištofík et al. 2002) and reed and marsh warblers (Krištofík et al. 2001, 2002). These species are representatives of fauna living in the immediate surrounding of the nests. When compared with owl nests, there were almost no necrophages or coprophages, which predominated especially in nests of the Tengmalm's owl (Krištofík et al. 2003), but also in nests of bee eaters (Krištofík et al. 1996), where they are attracted by remains of food brought to the nests by parents. Their absence in the nests of the lesser spotted eagle is also caused by the chicks' habit to defecate on the nest margins. Furthermore, the poor beetle fauna is evidently connected with low humidity in the nests of the lesser spotted eagle, which are placed on tree tops and are easily dried out by sun or wind. This is indicated by an extremely low representation of mycetophags (especially different species of Latridiidae) feeding on moulds growing on nest materials and representing an obligatory component of beetle fauna in the nests of other birds. This statement is also in accordance with a generally low representation of mites (see above).

Fleas

In two nests of the lesser spotted eagle, only three individuals of *Ceratophyllus garei* Rothschild, 1902 (1 ♂, Námestovo, 15 July 2001; 1 ♂, 1 ♀, Dolný Kubín-Záskalie, 10 July 2004) (prevalence 3.5%, mean intensity 1.5 ind.) were found. This species prefers nests of birds associated with aquatic ecosystems. Our results indicate that lining (twigs of conifers) of lesser spotted eagle nests is probably not suitable for development of fleas. Therefore they occur in them occasionally and mostly get into the nests with the brought prey. A similar statement is presented by Cyprich et al. (2006), who also found in the nests of this predator some individuals of *C. gallinae*, *C. borealis* Rothschild, 1907 and *C. sciurorum* (Schrank, 1803). These flea species occur first of all in the nests of birds nesting in cavities, on rocks or

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on solid substrate, as well as in nests of some mammal species.

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