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Arthropods (Pseudoscorpionida, Acari, Coleoptera, Siphonaptera) in nests of the tengmalm's owl, *Aegolius funereus*

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Nidobiology of tengmalm's owl differs from other cavity nesters by nest size and the amount of food left-overs and excrements of chicks in the nests. These factors may considerably affect the composition of arthropod fauna in their nests. Three pseudoscorpions, *Dinocheirus panzeri, Chernes cimicoides, Chelifer cancroides,* were recorded in 94 nests of the tengmalm's owl. Of them, *D. panzeri* and *C. cimicoides* show a high affinity to bird nests. Among 7 mesostigmatic mite species found in the nests, the haematophagous ectoparasite *Dermanyssus gallinae* strongly predominated (76.9% of all mesostigmatic mites). The tick *Ixodes arboricola,* a significant ectoparasite of cavity nesting birds, was also found. Beetles were represented by 23 species. The carnivorous, typically nidicolous *Gnathoncus buyssoni* was eudominant (41.8%). It was accompanied by two other nidicolous species, *Gnathoncus rotundatus* and *Haploglossa puncticollis*, both representing 10.7% of individuals. Their occurrence was not correlated with the occurrence of mites that could have been their potential food source (correlation coefficient – 0.068). There was a high proportion of necrophagous and coprophagous beetles (34.8% of species and 30.5% of individuals). Fleas were represented by two species – *Ceratophyllus gallinae,* the main parasite of tengmalm's owl, and *Ceratophyllus sciurorum sciurorum*, occurring in the nests of tengmalm's owl occasionally.

Key words: pseudoscorpions, mesostigmatic mites, ticks, beetles, fleas, tengmalm's owl, nests, Bohemia, Moravia, Slovakia.

Introduction

The tengmalm's owl, *Aegolius funereus* (L., 1758), is a circumpolar species distributed in the taiga and in isolated territories southerly of the zone of taiga. The isolated populations are probably glacial relics (HUDEC, 1983). The tengmalm's owl splits into 6 subspecies, of which *A. funereus funereus* (L., 1758) lives in Europe. In Europe, the tengmalm's owl breeds in montane pine, pine-spruce and birch forests, old forest stands with beech, and coniferous forests with mature trees (DEL HOYO et al., 1999). It is a non-migratory species nesting in tree cavities, in nest boxes or,

only very exceptionally, in rock cavities or under roof of isolated buildings. It breeds once a year, exceptionally twice. The breeding season of the tengmalm's owl lasts from March to July and one clutch includes 1–6 chicks (HUDEC, 1983).

There are no published data on occurrence of pseudoscorpions and ticks in tengmalm's owl nests. Mites in the owl nests have not been systematically studied though sporadic data can be found in papers of ZEMAN & JURÍK (1981), KUTZER et al. (1982), PHILIPS & DINDAL (1990) and FAIN et al. (1993). The data on mites in nests of the tengmalm's owl are based on a very limited number of nests. In Norway, PHILIPS (1981) found representatives of Mesostigmata, Prostigmata, Astigmata and Cryptostigmata in four nests of the tengmalm's owl. NORDBERG (1936) mentioned two species of Uropodina in two nests. PHILIPS et al. (1983), in USA, analysed mites from one nest of the Northern saw-whet owl, *Aegolius acadicus* (J. S. Gmelin, 1788). The authors did not record the presence of parasitic *Ornithonyssus* and/or *Dermanyssus* mites in nests of the tengmalm's owl, though these mites have been found in nests of other owls (e.g. SHUMILO & LUNKASHU, 1971; ZEMAN & JURÍK, 1981; FAIN et al., 1993).

Beetles in nests of the tengmalm's owl were studied only by NORDBERG (1936) who analysed two nests in which he found 7 species and by STRAND (1967) who found 14, mostly nidicolous species.

Only three species of fleas [*Ctenophthalmus agyrtes impavidus* Jordan, 1928, *Megabothris rectangulatus* (Wahgren, 1903) a *Ceratophyllus gallinae* (Schrank, 1803)] have been found in nests of the tengmalm's owl (NORDBERG 1934, 1936).

The aim of this paper is to analyse the fauna of pseudoscorpions, mesostigmatic mites, ticks, beetles and fleas in formerly used nests of the tengmalm's owl and to compare it with arthropod fauna in nests of other bird species.

Material and methods

The nests of the tengmalm's owl were collected into plastic bags in four mountain ranges: Šumava, Český les (Bohemia), Ždárské vrchy hills (Bohemia and Moravia) and Chočské vrchy hills (Slovakia). A part (37) of the nests was collected 1–2 months after fledging. All areas studied are rich in extensive forests with predominance of Norway spruce (*Picea excelsa*), the less abundant tree species were beech (*Fagus sylvatica*), fir (*Abies alba*) and pine (*Pinus silvestris*). The nest material was collected after the end of the breeding season from wooden nest boxes made specially for tengmalm's owls. The boxes were filled with sawdust to a depth of about 10 cm. The nest boxes (20 × 20 × 40 cm) were situated 4–6 m above the ground, usually at margins of clearings, meadows etc. at altitudes of 600–1100 m. In 1993–1998, 94 nests were collected at the sites listed in Appendix 1.

Pseudoscorpions, ticks, mites, beetles and fleas were extracted from the nests by means of Tulgren's funnels (NOVÁK, 1969). The pseudoscorpions, ticks, mites and fleas were mounted on microscope slides, the beetles were preserved in alcohol. All material has been deposed in the collections of the Institute of Zoology, Slovak Academy of Sciences in Bratislava (Slovakia). The quantitative characteristics of occurrence of parasites are used as described in MARGOLIS et al. (1982). Similarity of the composition of mite and beetle fauna in the nests collected immediately and 1–2 months after fledging was expressed by the proportional similarity index (POOLE, 1974).

Result and discussion

Pseudoscorpions

In nests of the tengmalm's owl three pseudoscorpion species were found: *Dinocheirus panzeri* (C. L. Koch, 1837), 2 ♀♀; *Chernes cimicoides* (F., 1793), 1 ♂, 1 ♀, Velká Skála, area of Postřekov, 27.VII.1993; *Chelifer cancroides* (L., 1758), 1 ♂, Černovrší, area of Pec, 27.VII.1993, 1 tritonymph (TN), Škamranka, area of Postřekov, 27.VII.1993.

Among these species, *Chelifer cancroides* naturally occurs throughout Europe but it was also unintentionally introduced almost to all continents. This species has been recorded in nests of several bird species, for instance the house martin *Delichon urbica* L., 1758, the barn swallow *Hirundo rustica* L., 1758, the common starling *Sturnus vulgaris* L., 1758 and the house sparrow *Passer domesticus* (L., 1758) (BEIER, 1963). KRUMPÁL & CYPRICH (1988) mentioned this species to be frequent in nest-box-nesting birds and to be very common in non-cavity-nesting birds. *Dinocheirus panzeri* is distributed in C and N Europe. It occurs in old hollow trees, in litter, in old buildings, deposits of organic materials, sheds and bird nests (BEIER, 1963). KRUMPÁL & CYPRICH (1988) found this pseudoscorpion in non-cavity-nesting birds and KRIŠTOFÍK et al. (2002) in nests of the lesser grey shrike *Lanius minor* Gmelin, 1788. Based on literature and our own material, *C. cancroides* and *D. panzeri* can be considered as nidicolous species. *Chernes cimicoides* is distributed in N, W, C and E Europe. It is a typical forest species living primarily on and under tree bark, rarely in litter (BEIER, 1963). C[illegible] sional occurrence of this species within nest[illegible] was recorded by KRUMPÁL & CYPRICH (1[illegible]

Table 1. Representation of mesostigmatic mites in tengmalm's owl nests.

Family/Species	EG	I_1	I_2	I	D (%)	MI	P (%)
Hypoaspididae							
Hypoaspis lubrica Voigts et Oudemans, 1904	NP		7	7	0.5	7	1.1
Laelapidae							
Androlaelaps casalis (Berlese, 1887)	FPB	74	179	253	19.2	23	11.7
Androlaelaps fahrenholzi (Berlese, 1911)	FPM		1	1	0.1	1	1.1
Dermanyssidae							
Dermanyssus gallinae (Redi, 1674)	OPB	969	44	1013	76.9	50.7	21.3
Macronyssidae							
Ornithonyssus sylviarum (Canestrini et Fanzago, 1877)	OPB	15	11	26	2.0	5.2	5.3
Ameroseiidae							
Proctolaelaps scolyti Evans, 1958	SP		12	12	0.9	12	1.1
Trematuridae							
Trichouropoda orbicularis (C. L. Koch, 1839)	CS		5	5	0.4	5	1.1
Total		1058	259	1317	100.0	54.9	25.5

Key: EG – ecological group; OPB – obligatory parasite birds; FPB – facultative parasite of birds; FPM – facultative parasite of mammals; NP – nidicolous predator; EP – edaphic predator; SP – subcorticolous predator; CS – coprophilous saprophag; I_1 – number of individuals in nests collected immediately after fledging of chicks; I_2 – number of individuals in nests collected 1–2 months after fledging of chicks; I – total of individuals; D – dominance; MI – mean intensity; P – prevalence.

and in nests of the lesser grey shrike by KRIŠTOFÍK et al. (2002).

Mites

In 24 nests of 94 examined nests (25.5%) of the tengmalm's owl, we found 1,317 mesostigmatic mites (Tab. 1). The mean intensity was 54.9 (SD = 191.1, n = 24).

The obligate haematophagous parasite *Dermanyssus gallinae* was the most common (76.9% of individuals). *Androlaelaps casalis*, a nidicole and a facultative ectoparasite of birds was also eudominant (19.2%). *D. gallinae* was found in 20 nests (21.3%) and *A. casalis* in 11 nests (11.7%). The obligate haematophage *Ornithonyssus sylviarum* was recorded in 5 nests (5.3%).

The species diversity of mite communities in tengmalm's owl nests was low (7 species), the communities were also slightly diversified ecologically. According to topical and trophic requirements, most recorded species belong to nidicolous or parasitic species that represent 71.4% of all species. We did not find any free-living edaphic or coprophilous predators that abundantly occur in nests of many other bird species.

A low number of species and individuals of mites was found in the nests examined in spite of the fact that in decaying wood in natural tree hollows the fauna of mesostigmatic mites is relatively rich (MRCIAK & SIXL, 1974; SHCHERBAK, 1980; HIRSCHMANN & WIŚNIEWSKI, 1982; WIŚNIEWSKI & HIRSCHMANN, 1993), similarly as in nests of cavity-nesting passerine birds (BORISOVA, 1977; ZEMAN & JURÍK, 1981). We suppose that the results were influenced, besides small quantity of nest debris material, by late sampling of a part of the nest material from boxes (1–2 months after fledging). This was reflected in the difference in number of individuals (Tab. 1) and in the representation of individual species (proportional similarity 22.84%). However, the results are also a consequence of a high number (942) of *D. gallinae* in one nest. Irrespectively of this, the results show that blood sucking mites desert nests shortly after fledging of chicks.

The occurrence of *D. gallinae* in birds nesting in natural or artificial hollows was confirmed by ZEMAN & JURÍK (1981) and PIRYANIK & AKIMOV (1964). In the zone of broad-leaved and coniferous forests of Russia, *D. gallinae* was also found to prefer nests of cavity-nesting birds (ZEMSKAYA, 1971). In addition, *D. gallinae* attacks domestic fowl and synanthropic birds (MAURER et al., 1993; MUMCUOGLU & LUTSKY, 1990). The ectoparasitic *Dermanyssus hirundinis* has a lot of bird hosts in C Europe, but among owls it has been found only in the tawny owl, *Strix aluco*, L., 1758 (ZEMAN & JURÍK 1981).

PHILIPS (1981) found 94 mesostigmatic mites in four nests of the tengmalm's owl. They be-

longed to 8 taxa: only 20 and 15 individuals were identified as *Androlaelaps casalis* and *Gamasodes bispinosus* (Halbert, 1915), respectively [*G. bispinosus* is a hydrophilous predator preferring decaying plant substrates (KARG, 1993)], and 40 individuals were identified as *Proctolaelaps* sp. nr. *epuraeae* Hirschmann, 1963. It is generally known that both *Proctolaelaps* spp. and species of *Dendrolaelaps* Halbert, 1915 are adapted to live under bark, where they inhabit bark beetle galleries (e.g. KIEŁCZEWSKI et al., 1983). Twelve individuals in the material of PHILIPS (1981) belonged to the group of *Dendrolaelaps cornutus* Hirschmann, 1960. In our material, only *Proctolaelaps scolyti* was a subcorticolous species. In contrast to a considerable number of necrophagous and coprophagous beetles, no necrophagous mites were identified in the material studied.

Ticks

Nine nymphs of *Ixodes arboricola* Schulze et Schlottke, 1929 were found in 94 nests of the tengmalm's owl (Křížová hora hill, area of Světlík 2.VII.1993). *I. arboricola* is a typical parasite of cavity nesters like the common starling, the house sparrow or the great tit *Parus major* L., 1758 (FILIPPOVA, 1977). However, the tick was also found in nests of non cavity nesters like the European goldfinch *Carduelis chloris* (L., 1758), the crested lark *Galerida cristata* (L., 1758) (FILIPPOVA, 1977), the common blackbird *Turdus merula* L., 1758 (KRUMPÁL et al., 1995) and the penduline tit *Remiz pendulinus* L., 1758 (KRIŠTOFÍK et al., 1993). Among owls, *I. arboricola* has been recorded in nests of the little owl *Anthene noctua* (Scopoli, 1769) (FILIPPOVA, 1977; HUDDE & WALTER, 1988), the eagle owl *Bubo bubo* (L., 1758) (HUDDE & WALTER, 1988) and the pygmy owl *Glaucidium passerinum* (L., 1758) (HUDEC, 1983). The tengmalm's owl may also be considered as host of *I. arboricola*.

Beetles

A total of 177 beetles belonging to 23 species and 11 families were found in 37 nests of 94 examined nests of the tengmalm's owl (Tab. 2). Staphylinidae were represented by 7 species while the other families by 1–3 species.

Eudominant species were *Gnathoncus buyssoni* (41.8%) and *Onthophagus ovatus* (12.9%), dominant were *Haploglossa puncticollis* (9.1%), *Trox scaber* (5.1%), *Thanatophilus sinuatus* (5.1%) and *Atheta crassicornis* (5.1%) and subdominant were *Aleochara bilineata* (3.9%) and *Dermestes lardarius* (3.4%). Other species were represented by 0.5–1.7%. The most frequently occurring species were *G. buyssoni* (presence 20.2%), *A. bilineata* (presence 9.6%) and *T. scaber* (presence 5.1%). Presence of other species ranged from 1.1 to 3.2%. Among the eudominant species, *Onthophagus ovatus* was concentrated only in two nests. Other dominant species were distributed more homogeneously (Tab. 2).

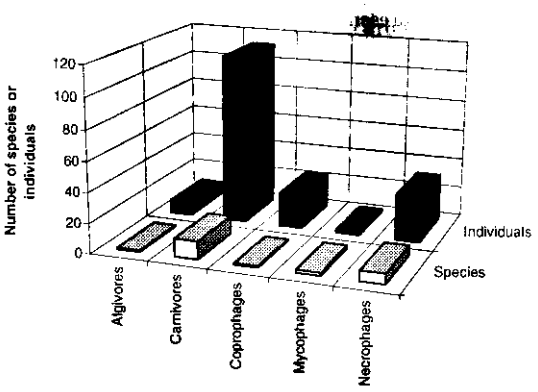

Fig. 1. Representation of trophic groups of beetles in nests of tengmalm's owl.

Carnivorous beetles were the most abundant trophic group (Fig. 1). They were represented by 12 species (52.2%) and 111 individuals (62.7%). Most of them were typical nidicoles (*Gnathoncus* spp. and *H. puncticollis*) regularly occurring in nests of many other bird species (HICKS, 1959, 1962, 1971). They had a rich food base in abundant mites found in the nests (see above). The presence of 9 individuals of 7 species (*Bembidion dentellum, Xantholinus longiventris, Philonthus cephalotes, Philonthus varians, Gabrius exiguus, Adalia bipunctata* and *Coccidula scutellata*) was occasional. These species form a regular component of edaphon (Staphylinidae) or are abundant aphidophages living on plants (Coccinelidae). The carnivorous beetles co-occurred with mites that represent for them a rich potential food source only in 10 nests out of 94 (correlation coefficient – 0.068). The co-occurrence of carnivorous beetles and mites was even lower, if non nidicolous carnivorous beetles were excluded from the calculations (co-occurrence in 5 nests, correlation coefficient – 0.089). This was probably a consequence of: (i) the relatively low presence of both mites and nidicolous carnivorous beetles (Tabs 1, 2), and (ii) the parasitic mites, unlike beetles, desert the nests shortly after fledging of chicks.

The composition of the beetle fauna was strongly influenced by the presence of decaying

Table 2. Survey of beetle species in the nests of the tengmalm's owl, their trophic relations, absolute and average number of individuals, dominance and presence.

Family/Species	T.R.	I_1	I_2	I	D (%)	P (%)	A
Carabidae							
Bembidion dentellum (Thunberg, 1787)	C	1		1	0.6	1.1	1.0
Histeridae							
Gnathoncus buyssoni Auzat, 1927	C	19	55	74	41.8	20.2	4.1
Gnathoncus rotundatus (Kugelan, 1792)	C		3	3	1.7	1.1	3.0
Hister brunneus (F., 1775)	C	3		3	1.7	1.1	3.0
Silphidae							
Thanatophilus sinuatus (F., 1775)	A		9	9	5.1	2.1	4.5
Leiodidae							
Nargus badius (Sturm, 1839)	A		9	4	2.3	1.1	4.0
Sciodrepoides watsoni (Spence, 1815)	N		1	1	0.6	1.1	1.0
Staphylinidae							
Xantholinus longiventris Heer, 1839	C		1	1	0.6	1.1	1.0
Philonthus varians (Paykull, 1789)	C		1	1	0.6	1.1	1.0
Philonthus cephalotes (Gravenhorst, 1802)	C		1	1	0.6	1.1	1.0
Gabrius exiguus (Nordmann, 1837)	C		1	1	0.6	1.1	1.0
Atheta crassicornis (F., 1792)	A?	1	8	9	5.1	3.2	3.0
Haploglossa puncticollis (Kirby, 1832)	C	1	15	16	9.0	1.1	1.8
Aleochara bilineata Gyllenhal, 1810	C		7	7	3.9	9.6	2.3
Trogidae							
Trox scaber (L., 1767)	N	4	5	9	5.1	5.3	1.8
Scarabaeidae							
Onthophagus ovatus (L., 1767)	Co-N		23	23	13.0	2.1	11.5
Dermestidae							
Dermestes lardarius L., 1758	N	1	5	6	3.4	3.2	2.0
Attagenus pellio (L., 1758)	N		1	1	0.6	1.1	1.0
Nitidulidae							
Nitidula carnaria (Schaller, 1783)	N		1	1	0.6	1.1	1.0
Coccinelidae							
Adalia bipunctata (L., 1758)	C		3	3	1.7	1.1	3.0
Coccidula scutellata (Herbst, 1783)	C	1		1	0.6	1.1	1.0
Latridiidae							
Cartodere constricta (Gyllenhal, 1827)	F		1	1	0.6	1.1	1.0
Latridius minutus (L., 1767)	F		1	1	0.6	1.1	1.0
Total		31	146	177	100.4	63.3	55.0

Key: T.R. – trophic relations: A – algivores; C – carnivores; Co – coprophages; F – fungivores; N – necrophages; I_1 – number of individuals in nests collected immediately after fledging of chicks; I_2 – number of individuals in nests collected 1–2 months after fledging of chicks; I – total of individuals; D – dominance, A – average number of individuals in positive nests; P – presence.

food rests, vomits and excrements of owls in the nests, resulting in the occurrence of a considerable number of necrophagous and/or coprophagous beetles of five families (Tab. 2, Fig. 1) representing 34.8% of species and 30.5% of all individuals. Besides the species *Dermestes lardarius, Attagenus pellio* and *Trox scaber* that also frequently occur in nests of other bird species, the carrion beetles *Nargus badius, Sciodrepoides watsoni* (both characteristic representatives of the edaphic fauna) and particularly *Thanatophilus sinuatus,* occurring exclusively on corpses of vertebrates (ŠUSTEK, 1981) were also found. The presence of decaying substances of animal origin and excrements in two nests also attracted a large number of *O. ovatus* which is primarily coprophagous, but its wide ecological valence allows, similarly as some other congeners, to visit also carrion. Both *T. sinuatus* and *O. ovatus* usually do not occur in nests of other birds. In addition, the presence of the carnivorous staphylinid *A. bilineata* in several nests and of the histerid *Hister brunneus* in one nest was also caused by the presence of decaying substances.

Fungivores were represented only by two species and two individuals of Latridiidae (Tab. 2, Fig. 1). When compared with nests of other bird

species, their representation was strikingly low (JURÍK & ŠUSTEK, 1978; KRIŠTOFÍK et al., 1993, 1995, 2002). It is possible that the odour of decaying left-overs of food of owls or of their vomits may repel them. But, the low representation of latridiids is surprising, because these beetles are typical inhabitants of various mouldy loose materials, like the sawdust, which covered bottom of the nest boxes of the tengmalm's owl.

One species, *Atheta crassicornis*, is probably algivorous (Tab. 2, Fig. 1), but it can not be excluded that it is at least partly carnivorous (FREUDE et al., 1974).

Phytophagous species were absent in our samples, though they occur occasionally or in large numbers in nests of a lot of other bird species (NORDBERG, 1936; HICKS, 1959).

There was no essential difference between the beetle fauna in the nests collected immediately after fledging of chicks (7 nests) and those collected later (30 nests). In both groups of nests all dominant species were present (Tab. 2). Proportional similarity of the beetle fauna was 50.6%. The average number of individuals per nest was 4.4 and 4.8 in nests collected immediately after fledging and those collected later, respectively. This shows that nidicolous beetles, in contrast to blood-sucking mites and fleas, do not desert the nests shortly after fledging of chicks.

Among the beetles found in nests of the tengmalm's owl by NORDBERG (1936), three species – *Haploglossa puncticollis, Hister cadaverinus* and *Gnathoncus rotundatus* were also recorded in our material. However, several species found in our material (e.g. *Trox scaber, Dermestes lardarius, Attagenus pellio, Latridius minutus*) were recorded in nests of other birds (where excrements and other debris were accumulated) NORDBERG (1936). Further 14 beetle species were recorded by STRAND (1967), among which *Gnathoncus buyssoni* and *T. scaber* were also found in our material. Four species were typical nidicoles occurring in nests of other birds. Some beetles found in tengmalm's owl nests, particularly *G. byussoni, G. rotundatus, H. puncticollis, T. scaber, D. lardarius, Cartodere constricta* and *L. minutus*, also frequently occur in nests of other birds, both cavity and non-cavity nesters. Below, we compare the beetle fauna in tengmalm's owl nests with nests of nine bird species, for which an extensive published material has been available.

The beetle fauna in the nests of tengmalm's owl strongly differed from the fauna in nests of the house martin (ŠUSTEK & HORNYCHOVÁ, 1983). There were only two species (*D. lardarius* and *L. minutus*) among the total of 61 species, which were common for the nests of both bird species. A striking difference was between the nests of tengmalm's owl and the penduline tit (KRIŠTOFÍK et al., 1993, 1995). The nests of the penduline tit showed a high proportion of occasionally occurring species, an overall low number of individuals, negligible representation of nidicolous species and a tendency to an increased representation of several very small fungivorous species. There were only four commonly occurring species (*Philonthus cephalotes, Coccidula scutellata, Dermestes lardarius* and *Gnathoncus buyssoni*) among the total of 54 species. In addition, two of the common species occurred in the nests of tengmalm's owl and penduline tit occasionally. Similarly, big differences were observed between the beetle fauna in the nests of the tengmalm's owl and the lesser grey shrike *Lanius minor* Gmelin, 1788 and the red-backed shrike *Lanius collurio* L., 1758 (KRIŠTOFÍK et al., 2002). There were only three common species (*Atheta crassicornis, Aleochara bilineata* and *Coccidula scutellata*) among the total of 64. The nests of both *Lanius* species were inhabited by a very small number of typical nidicolous species and a small number of necrophagous species but by a larger number of phytophagous or carnivorous species living on the trees and shrubs the nests were built on. There was also a remarkable diversity of fungivorous species (mostly Latridiidae) in the nests of both *Lanius* species. A large difference was also found between the nest of tengmalm's owl and nests of the great reed warbler *Acrocephalus arundinaceus* (L., 1758) and the reed warbler *Acrocephalus scirpaceus* (Hermann, 1804) (KRIŠTOFÍK et al., 2001). Unlike of tengmalm's owl nests, beetle fauna in reed warbler nests was strongly influenced (i) by beetles living on reeds, first of all the aphidophagous *C. scutellata*, less *Sospita vigintipunctata* (L., 1758), and penetrating the nests and (ii) by almost 30 species, each represented by 1–35 individuals, living in litter and ascending on reed stalks during floods. Among the total of 82 beetle species, there were only two species (*A. bilineata, C. scutellata*) common for nests of the tengmalm's owl and reed warblers. Significant difference was also found between the beetle fauna in nests of the tengmalm's owl and the sand martin *Riparia riparia* L., 1758 (ŠUSTEK & JURÍK, 1980; KRIŠTOFÍK et al., 1994). This difference was a result of the occurrence of *Haploglossa nidicola* Fairmair, 1862, a typical and usually very abundant inhabitant of the nests of the sand martin. Among the total of 36 species, only three species (*G. buyssoni, D. lardarius* and

L. minutus) were common for the nests of the tengmalm's owl and the sand martin; in nests of the sand martin they occurred only individually. The abundant occurrence of *H. nidicola* in nest holes of the European bee-eater *Merops apiaster* L., 1758 (KRIŠTOFÍK et al., 1996) was a reason of considerable differences between the beetle fauna in nests of this species and the tengmalm's owl. However, there was a significant common feature for these nests – the frequent occurrence of the typically nidicolous *G. buyssoni*. There was also a higher number of common species – 6 among the total of 42 (*G. buyssoni, G. rotundatus, H. puncticollis, S. watsoni, Ph. cephalotes, L. minutus*). In addition, three of them were typical nidicoles. In comparison to the bird nests mentioned above, higher similarity of the beetle fauna was due to a strong accumulation of animal food rests and excrements in both nests of the tengmalm's owl and the European bee-eater. The highest similarity in the beetle fauna was found between nests of the tengmalm's owl and nests of the house sparrows in nest boxes (JURÍK & ŠUSTEK, 1978). The abundant occurrence of *G. buyssoni* and *H. puncticollis* and the occurrence of another 4 common species (*D. lardarius, L. minutus, T. scaber* and *C. scutellata*) among the total of 52 species was a significant common feature. In addition, there was a functional similarity – a predominance of carnivorous and necrophagous species, irrespectively of the concrete species composition of these ecological groups. However, there was a higher proportion of fungivores in nests of the house sparrow. The considerable similarity of the beetle nest fauna in tengmalm's owls and house sparrows resulted from the accumulation of decaying organic material in all nests and the situation of nest boxes for house sparrows in relatively humid shadowed places in an oak forest (JURÍK & ŠUSTEK, 1978).

The occurrence of large carrion beetles, like *Thanatophilus* sp., *Oiceoptoma* sp., *Nicrophorus* sp. is rare in bird nests (NORDBERG, 1936; HICKS, 1959, 1962, 1971), but it was also observed in the North American saw-whet owl (PHILIPS et al., 1983) and American kestrel *Falco sparverius* L., 1758 (PHILIPS & DINDAL, 1990), in whose nests a lot of remains of animal origin can be found. This was also a reason of the occurrence of *T. scaber* in the nests of these two bird species.

Fleas

In the nests of tengmalm's owl, we found 49 ♂♂, 335 ♀♀ of *Ceratophyllus gallinae* and 1 ♂, 2 ♀♀ of *Ceratophyllus sciurorum sciurorum* (Schrank, 1803). Most of individuals (287) were found in the nests collected shortly after fledging. However, this number is due to a concentration of fleas (71 ind.) in one nest, indicating that fleas desert the nests after fledging of chicks.

C. gallinae is naturally distributed in the Palaearctic region, but it was also unintentionally introduced to North America, New Zealand and Australia (BEAUCORNU & LAUNAY, 1990). This flea occurs in many bird species, mainly passerines, and in their nests (HICKS, 1959, 1962, 1971), but also in some mammals (BEAUCORNU & LAUNAY, 1990). In our material it was found in 22 nests – prevalence 23.4%, mean intensity 17.5, 1–81 individuals. According to NORDBERG (1936), HUDEC (1983) and our own results, the tengmalm's owl is one of the main hosts of *C. gallinae*.

C. sciurorum sciurorum is distributed from Europe to eastern Siberia and it was unintentionally introduced to Azores. This flea parasitizes mainly on the red squirrel *Sciurus vulgaris* L., 1758, the edible dormouse *Glis glis* (L., 1766), the common dormouse *Muscardinus avellanarius* (L., 1758), the garden dormouse *Eliomys quercinus* (L., 1766), the forest dormouse *Dryomys nitedula* (Pallas, 1778) and some species of Mustelinae. It was also found in nests of some bird species (BEAUCORNU & LAUNAY, 1990). In our material, we found it singly in three nests. It was probably introduced into the nests of the tengmalm's owl after fledging by another host. We consider the occurrence of *C. sciurorum sciurorum* in nests of the tengmalm's owl as accidental.

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Appendix 1. Sites of collection of tengmalm's owl nests.

Český les Mts. Skláře, area of Vranov (49°29′ N, 12° 45′ E) – 1 nest; Oslí Mlýneček, area of Postřekov (49°28′ N, 12°45′ E) – 1 nest; Velká Skála, area of Postřekov (49°28′ N, 12°45′ E) – 1 nest; Haltrava, area of Nemanice-Stará Huť (49° 26′ N, 12°45′ E) – 2 nests; Škarmanka, area of Postřekov (49° 28′ N, 12°46′ E) – 2 nests; Díly, area of Postřekov (49°27′ N, 12°47′ E) – 1 nest; Bučín, area of Capartice (49°25′ N, 12°47′ E) – 1 nest; U rybníků, area of Vranov (49°29′ N, 12° 48′ E) – 1 nest; Sádkova skála, area of Nemanice-Stará Huť (49°29′ N, 12°48′ E) – 1 nest; Černovrší, area of Pec (49°24′ N, 12°48′ E) – 1 nest.

Šumava Mts. Hill Ratiště, area of Chudenín (49°17′ N, 13°02′ E) – 1 nest; hill Koráb, area of Branišov (49°24′ N, 13°05′ E) – 2 nests; Na Porovnání, area of Petrovice nad Úhlavou (49°19′ N, 13°11′ E) – 2 nests; Na Porovnání, area of Starý Láz (49°18′ N, 13°11′ E) – 1 nest; Jižní Stráň, area of Hojsova Stráž (49°13′ N, 13°13′ E) – 1 nest; Pod Můstkem, area of Hojsova Stráž (49°13′ N, 13°14′ E) – 1 nest; Jedlová, area of Javorná (49°13′ N, 13°16′ E) – 1 nest; Uliště, area of Neznašovy (49°20′ N, 13°17′ E). – 2 nests; U Černé Krávy, area of Neznašovy (49°20′ N, 13°17′ E) – 1 nest; Lukavice, area of Strážov (49°18′ N, 13°17′ E) – 1 nest; Hůrecký vrch hill, area of Hůrka (49°08′ N, 13°21′ E) – 1 nest; U pustiny, area of Hartmanice (49°09′ N, 13°26′ E) – 1 nest; Střídka, area of Kolinec (49°18′ N, 13°27′ E) – 2 nests; Velký Babylon, area of Hartmanice (49°08′ N, 13°27′ E) – 1 nest; Stráž, area of Kolinec (49°19′ N, 13°29′ E) – 1 nest; Vidlošť, area of Kolinec (49°18′ N, 13°29′ E) – 1 nest; Korýtko, area of Horská Kvilda (49°02′ N, 13°31′ E) 1 nest; Lovčí Skála, area of Horská Kvilda (49°02′ N, 13°31′ E) – 1 nest; Horní Otýgl, area of Horská Kvilda (49°03′ N, 13° 33′ E) – 1 nest; Zlatá Studna, area of Horská Kvilda (49°03′ N, 13°35′ E) – 1 nest; Šindlov, area of Borová Lada (49°02′ N, 13°40′ E) – 1 nest; Polecký potok brook, area of Strážný (48°56′ N, 13°42′ E) – 1 nest; Michlova Huť, area of Borová Lada (49°01′ N, 13°43′ E) – 1 nest; Osičina, area of Hoslovice (49°11′ N, 13°46′ E) – 1 nest; hill Kupa, area of Vimperk, (49°01′ N, 13°49′ E) – 1 nest; Smolná hora hill, area of Volary (48°55′ N, 13°50′ E) – 1 nest; U Obory, area of Vimperk (49°02′ N, 13°50′ E) – 2 nests; Černý Kříž, area of Stožec (48°52′ N, 13°52′ E) – 1 nest; Volarský potok brook, area of Volary (48°53′ N, 13°53′ E) – 1 nest; Smrčinový potok brook, area of Nová Pec (48°46′ N, 13°58′ E) – 2 nests; Huťský Dvůr, area of Horní Planá (48°45′ N, 13° 58′ E) – 1 nest; Helfenburg, area of Bavorov (49°09′ N, 14°00′ E) – 7 nests; Libín, area of Prachatice (48°59′ N, 14°01′ E) – 1 nest; Rohanovský vrch hill, area of Zbytiny (48°57′ N, 14°01′ E) – 1 nest; Zlatý potok brook, area of Chroboly (48°57′ N, 14°02′ E) – 1 nest; Rohanovský vrch hill, area of Chroboly (48°57′ N, 14°02′ E) – 3 nests; Přední Zvonková, area of Horní Planá (48°44′ N, 14°02′ E) – 1 nest; Žernovický potok brook, area of Vitějovice (49°02′ N, 14°03′ E) – 1 nest; Houbový vrch hill, area of Horní Planá (48°47′ N, 14°03′ E) – 1 nest; Růžový vrch hill, area of Svatý Tomáš (48°39′ N, 14°04′ E) – 2 nests; U Korandy, area of Svatý Tomáš (48°39′ N, 14°04′ E) – 1 nest; Kralovice, area of Nebahovy (49° 01′ N, 14°05′ E) – 1 nest; Spálenec, area of Svatý Tomáš, (48°40′ N, 14°05′ E) – 1 nest; Zelený vrch hill, area of Frantoly (49°00′ N, 14°06′ E) – 3 nests; hill Klenovec, area of Mičovice (48°58′ N, 14°06′ E) – 3 nests; Borovka, area of Mičovice (48°58′ N, 14°08′ E) – 1 nest; Křížová hora hill, area of Světlík

(48°43′ N, 14°14′ E) – 2 nests; Jezvinec, area of Větřní (48°47′ N, 14°16′ E) – 2 nests; Třešňovický vrch hill, area of Rožmitál na Šumavě (48° 42′ N, 14°22′ E) – 1 nest; Rožmberk nad Vtavou (48°39′ N, 14°23′ E) – 1 nest; Černý les forest, area of Horní Dvořište (48°37′ N, 14°23′ E) – 1 nest; Chuchelský les forest, area of Kaplice (48°46′ N, 14°25′ E) – 2 nest; Poluška, area of Rožmitál na Šumavě (48°45′ N, 14°25′ E) – 1 nest. **Žďárske vrchy hills.** Křivý Javor, area of Fryšava (49°39′ N, 16°01′ E) – 1 nest; Holcova studně, area of Křižánky (49°41′ N, 16°02′ E) – 1 nest; ; U osla, area of Česká Cikánka (49°42′ N, 16°03′ E) – 1 nest. **Chočské vrchy hills.** Turícka dolina valley, area of Turík (49°07′ N, 19°21′ E) – 1 nest; Lučanská dolina valley, area of Lúčky (49°09′ N, 19°22′ E) – 1 nest; Kalamenianska dolina valley, area of Kalameny (49°10′ N, 19°23′ E) – 1 nest; Stará fara, area of Lúčky (49°08′ N, 19°23′ E) – 1 nest.

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First record of *Reesa vespulae* (Coleoptera, Dermestidae) in Slovakia

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Reesa vespulae was introduced to Europe from North America (ADAMS, 1978), where this species is considered a museum pest (the first record was from a wasp nest in a museum), but it also occurs in households; it has become more abundant and caused many problems in Europe during the last two decades. It is a parthenogenetic species, and thus only one egg may start an infestation. Larvae could survive a mild winter in non-heated stores. *R. vespulae* is mostly feeding on dead insects, museum materials, but there is evidence from the Czech Republic, Germany and the United Kingdom that it could cause serious damage on seeds of wheat, rye, and of various other species, and on dried plant materials (STEJSKAL & KUČEROVÁ, 1996).

Reesa vespulae (Milliron, 1939)

Material examined: C Slovakia, Zvolen env., (railway station) (48°35′ N, 19°09′ E), 10–25.VI.2002, 6 adults and numerous larvae, leg. J. Vámoš, det. et coll. J. Háva; 11.VI.2002, 15 adults, leg. et coll. P. Zahradník, det. J. Háva; V.2002, 15 adults, leg., det. et coll. D. Brutovský

Distribution: A species known from Europe, N Africa, N America, Chile, Afghanistan, Japan, Russia, New Zealand, Australia (HÁVA, 2002); from C Europe known from the Czech Republic (HÁVA, 2001), Poland, Germany. First record of the species in Slovakia.

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