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Arthropods (Pseudoscorpionidea, Acarina, Coleoptera, Siphonaptera) in nests of the bearded tit (*Panurus biarmicus*)

Ján Krištofík, Peter Mašán & Zbyšek Šustek

Institute of Zoology, Slovak Academy of Sciences, Dúbravská cesta 9, SK-84506 Bratislava, Slovakia; e-mail: jan.kristofik@savba.sk

Abstract: In the period 1993–2006, during investigation of reproduction biology of the bearded tit, 106 deserted nests of the species were collected in Slovakia, Austria and Italy and their arthropod fauna was analyzed. Occasionally introduced individuals of the pseudoscorpion *Lamprochernes nodosus,* a frequent species in Central Europe, were recorded in the nests. Altogether 984 individuals and 33 species of mesostigmatic mites (Acari) were found in 46.2% of the nests examined. The ectoparasite *Ornithonyssus sylviarum* was most abundant and frequent; it represented almost 68.3% of all individuals. Due to it, the parasitic mites predominated (69.4% of individuals). Other ecological groups were less represented: edaphic detriticols – 11.6%, coprophils – 10.7%, species of vegetation stratum – 8.2%, and nidicols – 0.2%. Beetles (40 species, 246 individuals) were present in 57 nests. Most of the beetles were strongly hygrophilous species inhabiting soil surface in the reed stands or other types of wetlands and the shore vegetation. Predators represented 59% of all individuals. They might find food in the nests, but none of the species had a close relationship to bird nests and represented 35% of species. All beetle species penetrated the nests occasionally, when ascending on the vegetation or searching cover during periods of increased water level. Occasionally, larvae and nymphs of the *Dermacentor marginatus* tick were found. They were most probably introduced by insectivores of the genus*Neomys*. Only one species of fleas, *Ceratophyllus garei* – a parasite of birds nesting in humid environment, was recorded in the nests.

Key words: bearded tit; pseudoscorpions; mites; ticks; beetles; fleas; Slovakia; Austria; Italy

Introduction

The bearded tit (*Panurus biarmicus* L., 1758) is distributed in the Palaearctic subregion, with discontinuous distribution in its southern parts. This discontinuity results from mosaic-like distribution and disappearance of suitable habitats, as well as from severe winters which extinct whole populations. It nests primarily in reed stands, but also in high stands of cat's tail, sedges with dense lower layer and permanent presence of water. The minimum size of such stands is 3–5 ha. At high densities, the bearded tit nests in groups, 2, 3 or even 4 times during the breading season. The number of chicks is 1–7, the parental care lasts 10–13 days (Hudec 1983).

Among the bird nests, pseudoscorpions are known to prefer nests built in cavities. A new pseudoscorpion species from the great tit nests was described by Beier (1971). Krumpál & Cyprich (1988) recorded 16 pseudoscorpion species in nests of 34 bird species, among them 9 species occurred in bird nests regularly. Pseudoscorpions were also recorded in nests of some bird species by Krištofík et al. (1993, 1994, 1996, 2002, 2003), but in most cases they occurred in nests only occasionally. Mite communities in the bearded tit nests have not been studied in complexity till present. Only mites of the suborder Astigmata living on the bearded tit plumage were investigated by Černý (1978) and Mironov (1985). No special or casual study has focused on beetles in nests of the bearded tit. Data on occurrence of fleas in the bearded tit nests are scarce; some casual data were published by Hicks (1959, 1962, 1971).

The aim of this study is to describe the structure of arthropod fauna in the extensive material of fledged nests of the bearded tit obtained during 13 years in South Slovakia, Burgenland (Austria) and North Italy. The results presented in this study are the first published data on arthropod fauna in the nests of this bird species.

Material and methods

Bearded tit nests were collected in 1993, 1994 and 2002–2006 after fledging of chicks at the following sites: Slovakia – fishponds near Dolný Štál (47°58′ N, 17°45′ E, 4 nests) and Veľké Blahovo (48°02′ N, 17°36′ E, 13 nests); Austria – all sites around Neusiedler See lake near Jois (47°57′ N, 16°42′ E, 21 nests), Breitenbrunn (47°54′ N, 16°43′ E, 11 nests), Winden (47°56′ N, 16°45′ E, 8 nests) and Illmitz (47°47′ N, 16°49′ E, 35 nests) and Italy – all sites in the Po River delta near Argenta (44°41′ N, 11°50′ E, 8 nests) and Campotto (44°42′ N, 11°50′ E, 6 nests). All arthropods were extracted from the nests by means of Tulgren's funells. The pseudoscorpions, mites, ticks and fleas were mounted into permanent slides, whereas the beetles were preserved in alcohol.

Springer

Table 1. Survey of mesostigmatic mites in nests of the bearded tit.

Species	C	Σ(n)	D (%)	I	R_A	P (%)
Amblyseius bicaudus Wainstein, 1962	V	32	3.25	2.67	0.30	11.32
Amblyseius neobernhardi Athias-Henriot, 1966	V	8	0.81	2.67	0.08	2.83
Amblyseius sp.	V	36	3.66	7.20	0.34	4.72
Androlaelaps casalis (Berlese, 1887)	N	1	0.10	1.00	0.01	0.94
Anthoseius sp.	V	1	0.10	1.00	0.01	0.94
Arctoseius semiscissus (Berlese, 1892)	SC	1	0.10	1.00	0.01	0.94
Cheiroseius curtipes (Halbert, 1923)	ED, H	20	2.03	5.00	0.19	3.77
Cheiroseius laelaptoides (Berlese, 1887)	ED, H	1	0.10	1.00	0.01	0.94
Dermanyssus hirundinis (Hermann, 1804)	E	8	0.81	4.00	0.08	1.89
Discourella modesta (Leonardi, 1899)	ED	1	0.10	1.00	0.01	0.94
Eulaelaps stabularis (C.L. Koch, 1836)	E	2	0.20	1.00	0.02	1.89
Gamasodes spiniger (Trägardh, 1910)	SC	1	0.10	1.00	0.01	0.94
Glyptholaspis saprophila Mašán, 2003	SC	1	0.10	1.00	0.01	0.94
Haemogamasus hirsutus Berlese, 1889	E	1	0.10	1.00	0.01	0.94
Hypoaspis austriaca Sellnick, 1935	ED	2	0.20	2.00	0.02	0.94
Hypoaspis lubrica Voigts et Oudemans, 1904	N	1	0.10	1.00	0.01	0.94
Hypoaspis praesternalis Willmann, 1949	ED	2	0.20	1.00	0.02	1.89
Lasioseius confusus Evans, 1958	ED, H	18	1.83	3.00	0.17	5.66
Leioseius minusculus Berlese, 1905	ED, H	40	4.07	2.86	0.38	13.21
Leptogamasus oxygynelloides (Karg, 1968)	ED	1	0.10	1.00	0.01	0.94
Leptogamasus sp.	ED	1	0.10	1.00	0.01	0.94
Ololaelaps placentula (Berlese, 1887)	ED, H	16	1.63	3.20	0.15	4.72
Ornithonyssus sylviarum (Canestrini et Fanzago, 1877)	E	672	68.29	44.80	6.34	14.15
Parasitus fimetorum (Berlese, 1903)	SC	32	3.25	32.00	0.30	0.94
Pergamasus crassipes (L., 1758)	ED	1	0.10	1.00	0.01	0.94
Platyseius italicus (Berlese, 1905)	ED, H	4	0.41	1.33	0.04	2.83
Poecilochirus carabi G. et R. Canestrini, 1882	SC	69	7.01	69.00	0.65	0.94
Proprioseiopsis okanagensis (Chant, 1957)	V	4	0.41	1.33	0.04	2.83
Prozercon carpathofimbriatus Mašán et Fenďa, 2004	ED	4	0.41	1.00	0.04	3.77
Punctodendrolaelaps fallax (Leitner, 1949)	SC	1	0.10	1.00	0.01	0.94
Trachytes aegrota (C.L. Koch, 1841)	ED	1	0.10	1.00	0.01	0.94
Trachytes baloghi Hirschmann et Zirngiebl-Nicol, 1969	ED	1	0.10	1.00	0.01	0.94
Veigaia nemorensis (C.L. Koch, 1839)	ED	1	0.10	1.00	0.01	0.94
Total		984	100	20.08	9.28	46.23

Explanations: C – ecological characteristics (E – ectoparasite, N – nidicol, ED – edaphic detriticol, SC – saprophilous or coprophilous detriticol, V – species of vegetation stratum, H – hygrophilous); D – dominance; I – mean intensity; R – relative density; P – prevalence.

The material is deposited in the collections of the Institute of Zoology of Slovak Academy of Sciences in Bratislava. The quantitative characteristics of occurrence of parasites are used in the sense of Margolis et al. (1982). Dominance of species is characterized as follows: eudominant > 10%, dominant 5–10%, subdominant 1–5%, recedent 0.5–1%, subrecedent < 0.5%. The ecological data on beetle species were taken from Boháč & Matejíček (2003), Bucciareli (1980), Freude et al. (1967), Hodek (1973), Hůrka (1996), Roubal (1930, 1936, 1939) and Rücker (1963). The nomenclature of beetles is adopted according to Jelínek (1993).

Results and discussion

Pseudoscorpions

Lamprochernes nodosus (Schrank, 1803) (1 male and 1 female, Argenta, 15 May 2004; 1 female, Campotto, 17 May 2004), a relatively common species in Central Europe, was recorded in three nests of the bearded tit. It lives hidden in soil, mostly in vicinity of manure or compost dumps, in glass houses etc. It often spreads by phoresy on flies. In Slovakia, this species was frequently recorded in open nests of several bird species (Krumpál & Cyprich 1988), but also in nest lair of the bee-eater (Krištofík et al. 1996).

Mites

A total of 984 individuals belonging to 33 mesostigmatic mite species were obtained from 106 nests of the bearded tit (Table 1). The mites were present in 46.2% of nests. Their abundance fluctuated from 1 to 261 individuals, averaging 9.3 individuals per nest.

The values of qualitative and quantitative indices of mesostigmatic mites together with some ecological characteristic are shown in Table 1. The highest prevalence recorded was of the following species *Ornithonyssus sylviarum* (14.2%), *Leioseius minusculus* (13.2%), *Amblyseius bicaudus* (11.3%) and *Lasioseius confusus* (5.7%). Prevalence of other mite species was less than 5%. The highest mean intensity and relative density were recorded in *O. sylviarum* (44.8 and 6.3), *Poecilochirus carabi* (69.0 and 0.7) and *Parasitus fimetorum* (32.0 and 0.3). In other species these values were much lower (Table 1).

The mite species found in the nests belonged to the following five ecological groups distinguished according to their host and habitat relations (ordered descendently according to their affinity to the host nests).

Ectoparasites (4 species, dominance 69.4%, prevalence 17.9%) included obligatory haematophagous ectoparasites of various wild and domestic birds (*O.*

sylviarum and *Dermanyssus hirundinis*) representing quantitatively the most significant component of the acarocoenoses studied. Facultative ectoparasites (*Eulaelaps stabularis* and *Haemogamasus hirsutus*) living in hair and nests of small mammals were also recorded in the nests.

Nidicols (2 species, dominance 0.2%, prevalence 1.9%) included free living mites having a topic relation to bird's nests, where they find food and favorable microclimatic conditions for reproduction and development. They are mostly predators eating microfauna living in the nests. They do not have a direct trophic relation to the nesting bird and were sparsely represented in the nests. Both recorded species, *Androlaelaps casalis* and *Hypoaspis lubrica,* exhibit a special affinity to nests built in tree or subterraneous hollows.

Edaphic detriticols (15 species, dominance 11.6%, prevalence 20.8%) included free living and ubiquitous soil species (see Table 1), without any trophic (parasitic) or microhabitat (host hair, body or nest) relation. They mostly eat nest microfauna. In bird nests they rarely find optimal conditions for their reproduction and development, but in some nest types they can occur abundantly. In the nests studied they represented the highest portion of species (Table 1), but showed a relatively low abundance. Most of them were strictly hygrophilous, typical of wetland habitats. Among them *Cheiroseius curtipes*, *Cheiroseius laelaptoides*, *Lasioseius confusus*, *Leioseius minusculus*, *Ololaelaps placentula* and *Platyseius italicus* represented 86.8% of individuals of detriticolous mites.

Saprophilous detriticols (6 species, dominance 10.7%, prevalence 5.7%) included species with a strong affinity to excrement of large herbivores, dunghills and manure, carcasses and similar substrates, i.e. temporal microhabitats. They also occur facultatively in other substrates containing excrements or decaying organic matter (manured arable soils, heterogeneous organic refuses, nests etc.). They show a high phoretic activity, allowing them entry to bird nests. *Gamasodes spiniger* and *Parasitus fimetorum* are coprophiles, *Arctoseius semiscissus*, *Glyptholaspis saprophila* and *Punctodendrolaelaps fallax* prefer decomposing vegetation rests and raw humus, while *Poecilochirus carabi* is necrophilous.

Species of vegetation stratum (5 species, dominance 15.2%, prevalence 19.8%) included aerophilous predators freely living on herbs, shrubs and trees, with few representatives in the nests studied.

The mite community in the nests of the bearded tit, similarly to nests of the great reed warbler and the reed warbler (Krištofík et al. 2001) is characterized by eudominant representation of the parasitic species *O. sylviarum* (68.3% of individuals) and a large number of recedent to subrecedent ubiquitous species occurring in the nests occasionally. The mutual similarity of mite communities of bird nests is caused by selection of nesting habitat in reed stands around water bodies and attachment of the nests on reed stems above water (rarely above ground, especially after water subsides). In the non-parasitic mites (except for herbicolous species being able to spread passively with air currents and having indifferent relation to the nests, similarly as other species with a negligible abundance in the nests) it strongly limits penetrating of mites into the nests as a potential microhabitat and food resource.

Mite communities in nests of the birds nesting in reed and cat's tail stands have very similar qualitative and quantitative structure of individual ecological groups of species, but they differ by representation and infestation of nests by the parasitic species. For example, in 273 nests of the great reed warbler and the reed warbler (Krištofík et al. 2001), dominance of haematophages was almost equal to 99.1%, with a mean intensity was 339 and 629 individuals, respectively, while in the bearded tit only 45 individuals were present. The considerably lower infestation of bearded tit nests cannot be explained by the size of bearded tit and its nest, nor by the placement of the nests above water or the shore. However, bearded tits, unlike other species, do not construct new nests from material taken from old nests; this behavior may reduce the occurrence of parasitic mites in its nests. This can be shown by the presence of *D. hirundinis* in different nest types. *D. hirundinis*, a typical nest parasite of birds, occurred only sporadically in the bearded tit nests (prevalence 1.9%, mean intensity 4), whereas it predominated nest of the penduline tit(*Remiz pendulinus* L., 1758) (prevalence 92.4%, mean intensity 401) (Krištofík et al. 1993). Although penduline tits nest around or above water bodies, they do not form colonies, build relatively well-isolated nests suspended in tree crowns and often use material from old nests for construction of new nests. This behavior supports the passive spreading of parasites into their own nests.

O. sylviarum, unlike species of the genus *Dermanyssus*, is considered to be a somatic ectoparasite, therefore its dependence on nest biology of the hosts is lower. It behaves as a typical nest parasite only at a mass outbreaks, spreading to nests in the vicinity and infesting the adjacent reed stands. This was confirmed by Schniererová (2000), who extracted a rich material of *O. sylviarum* from reed by means of Tulgren's funels. It provides evidence that *O. sylviarum* is able to actively get into nests. *O. sylviarum* can outbreak in nests of reed warblers (*Acrocephalus scirpaceus* Hermann, 1804) and its population size can reach several hundred thousands individuals.

The successful strategy of the bearded tit against parasitization by *O. sylviarum* is illustrated by the absence of nests with out-broken populations of this mite and a high percentage (85.5%) of non-infested nests. For example, in marsh warblers (*Acrocephalus palustris* Bechstein, 1798) the percentage of non-infested nests was only 26.3%, in great reed warblers (*Acrocephalus arundinaceus* L., 1758) 62.7% and only in reed warblers it reached a similar value (84.5%) as in bearded tits (Krištofík et al. 2001, 2005).

Table 2. Survey of beetles in nests of the bearded tit.

Family / Species	T	H	R	I	M	D%	P%
Carabidae							
Pterostichus vernalis (Panzer, 1796)	C	W	I	8	0.08	3.25	5.61
Pterostichus aterrimus (Herbst, 1784)	C	W	I	1	0.01	0.41	0.93
Europhilus piceus (L., 1758)	C	W	I	4	0.04	1.63	2.80
Europhilus fuliginosus (Panzer, 1809)	C	W	I	12	0.11	4.88	5.61
Agonum permoestum Puel, 1930	C	W	I	2	0.02	0.81	1.87
Oodes gracilis A. et G.B. Villa, 1823	C	W	I	1	0.01	0.41	0.93
Dromius linearis (Olivier. 1795)	C	E	I	3	0.03	1.22	1.87
Odacantha melanura (L., 1767)	C	W	I	1	0.01	0.41	0.93
Hydrophilidae							
Coelostoma orbicularis (F., 1775)	D	W	I	6	0.06	2.44	3.74
Cercyon convexiusculus Stephens, 1829	D	W	I	2	0.02	0.81	0.93
Ptiliidae							
Ptenidium fuscicorne Erichson, 1845	F	E	I	21	0.20	8.54	5.61
Leiodidae							
Catops fuscus (Panzer, 1794)	N	E	T	2	0.02	0.81	0.93
Sciodrepoides watsoni (Spence, 1815)	N	E	T	11	0.10	4.47	1.87
Scydmaenidae							
Eutheia linearis Mulsant, 1861	C	E	T	1	0.01	0.41	0.93
Staphylinidae							
Carpelinus rivularis Motschuslky, 1860)	A	R	I	1	0.01	0.41	0.93
Carpelinus obesus (Kiesenwetter, 1844)	A	R	I	1	0.01	0.41	0.93
Paederus riparius (L., 1758)	C	R	I	9	0.08	3.66	5.61
Pseudomedon obsoletus (Nordmann, 1837)	C	W	I	7	0.07	2.85	3.74
Hyposcopaeus minimus Erichson, 1840	C	W	I	4	0.04	1.63	2.80
Lathrobium pallidum Nordmann, 1837	C	W	I	3	0.03	1.22	2.80
Ericsonius cinerascens (Gravenhorst, 1802)	C	W	I	1	0.01	0.41	0.93
Philonthus salinus Kiesenwetter,1844	C	W	I	17	0.16	6.91	4.67
Philonthus fumarius (Gravenhorst, 1806)	C	W	I	3	0.03	1.22	1.87
Quedius molochinus (Gravenhorst, 1806)	C	E	I	2	0.02	0.81	1.87
Habrocerus capillaricornis (Gravenhorst, 1806)	C	E	I	1	0.01	0.41	0.93
Sepedophilus pedicularius (Gravenhors, 1802)	C	E	I	1	0.01	0.41	0.93
Phylhygra palustris Kiesenwetter, 1844	A	W	I	41	0.39	16.67	10.28
Atheta triangulum (Kraatz, 1856)	A	E	I	2	0.02	0.81	1.87
Aleochara curtula (Goeze, 1777)	C	E	I	1	0.01	0.41	0.93
Helodidae							
Cyphon variabilis (Thunberg, 1787)	P (Nf)	W	I	33	0.31	13.41	14.95
Cantharidae							
Silis ruficollis (F., 1775)	C	E	I	1	0.01	0.41	0.93
Cerapheles terminatus (Ménétriés, 1832)	C	E	I	1	0.01	0.41	0.93
Dermestidae							
Dermestes undulatus Brahm, 1790	N	E	T	4	0.04	1.63	1.87
Dermestes murinus L., 1758	N	E	T				
Corylophilidae							
Sericoderus lateralis (Gyllenhal, 1827)	F	E	T	1	0.01	0.41	0.93
Coccinelidae							
Coccidula scutellata (Herbst, 1783)	C	W	I	2	0.02	0.81	1.87
Lathridiidae							
Corticaria impressa (Olivier, 1790)	F	E	T	15	0.14	6.10	12.15
Corticarina rubripes Mannerheim, 1844	F	E	T	10	0.09	4.07	8.41
Anthicidae							
Cordicomus gracilis (Panzer,1797)	D	R	I	8	0.08	3.25	7.48
Chrysomelidae							
Sphaeroderma rubidum (Graells, 1853)	P	W	I	2	0.02	0.81	0.93
Total				246	2.32	100.0	53.27

Explanations: T – trophic relationships (A – algivores, C – carnivores, D – detritophages, F – fungivores, N – necrophages, Nf – imagines not feeding, P – phytophages); H – relation to humidity (E – eurytopic species, W – wetland species s. l., R – ripicolous species); R – relation to bird nests (I – indifferent, T – trophic); I – number of individuals, M – average number of individuals in all nests; D – dominance; P – presence.

Ticks

In nests of the bearded tit the occurrence of *Dermacentor marginatus* (Sulzer, 1776) was recorded (1 nymph Illmitz, 2.V.2005 and 1 larva Illmitz, 6.VI.2006). This tick is chiefly a parasite of small mammals and most probably accessed or entered the nests by insectivores of the genus *Neomys* that abundantly occurred at this site, unlike other small mammals.

Beetles

Among the total of 106 nests of the bearded tit, beetles occurred in 57 nests, in which in total 246 individuals of 40 species were found (Table 2). The highest in number of individuals and number of species were Staphylinids and Carabids (Fig. 1), represented by 24 species (61.5%) and 126 individuals (51.2%). They were followed by Helodids, Lathridiids Ptini-

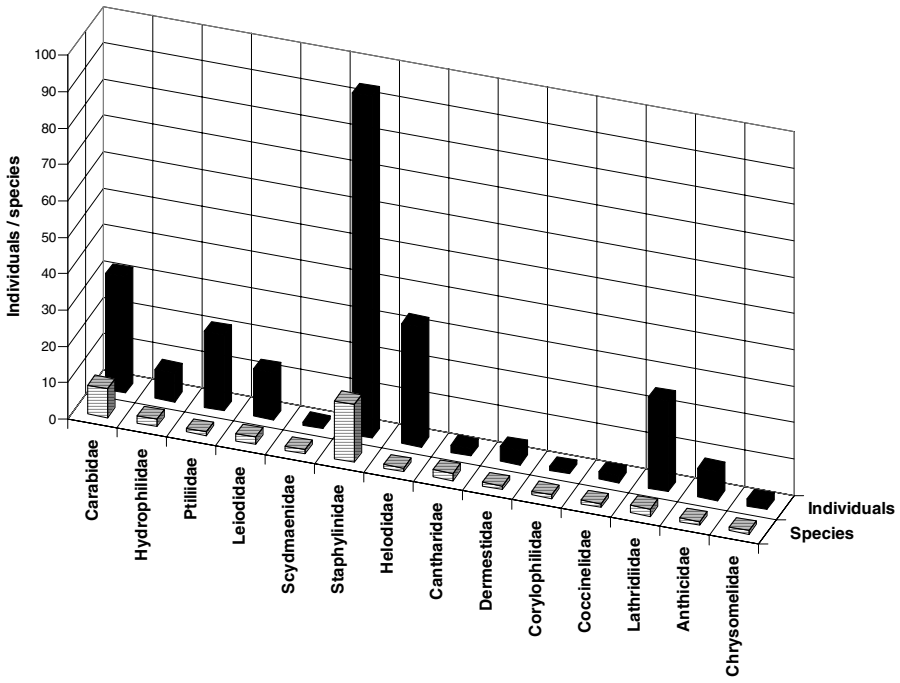

Fig. 1. Number of individuals and species of beetle families in nests of the bearded tit (arranged in systematic order).

ids and Leiodids (Catopinae), which were represented by 1–2 species only, but whose number of individuals ranged from 13 to 33 (5.3–13.4% of the total catch). Together these families represented 37.4% of all individuals. The other eight families (Table 2) were represented by 1–2 species, but the number of their individuals was low (altogether 11.4%). Only five species were eudominant or dominant, viz. the algivorous and hydrophilous staphylinid *Phylhygra palustris* Kiesenwetter, 1844, the hygrophilous not feeding helodid *Cyphon variabilis* (Thunberg, 1787), the fungivorous ptiliid *Ptenidium fuscicorne* Erichson, 1845 and the carnivorous staphylinid *Philonthus salinus* Kiesenwetter, 1844. The average number of individuals per one nest was very low (0.01–0.39) (Table 2). Only three species [*C. variabilis, Corticaria impressa* (Olivier, 1790) and *P. palustris*] were present in more than 10% of nests (Table 2).

The throphic structure of the beetles was heterogenous (Table 2, Fig. 2). Carnivores dominated, representing 59.0% of individuals and 35.0% of species. Quantitative representation of other trophic groups (Fig. 2) was relatively balanced (5.1–10.3%), but as to number of species the algivores, fungivores and phytophags showed and increased representation (14.2–19.1% of species). Other trophic groups, especially necrophags were concentrated only in few nests, where the chicks died.

Although predominance of carnivores is a characteristic feature of the nest fauna of many bird species (Nordberg 1936; Jurík & Šustek 1978; Šustek & Jurík 1980; Krištofík et al. 1994, 1996, 2001, 2002, 2005; Šustek & Krištofík 2002, 2003), in this case their composition strongly differed from other bird nests as to the relation of individual species to the nest environment or to the species composition in general. No nidicolous species were found in the nests of the bearded tit. All carnivores had an indifferent relation (Table 2, Fig. 3) to the nest and were inhabitants of water body shores, river banks and wetlands, some of them were eurytopic, without any clear habitat preference (Fig. 4). This situation was also found in most other trophic groups. All these species represented a small portion of fauna associated with soil surface or herbage stratum in reed or cat's tail stands or water body shores (Obrtel 1972; Šustek unpublished). They can be considered as individuals ascending the reed stems during the periods of increased water level, during migration or penetrating into the nests situated immediately above

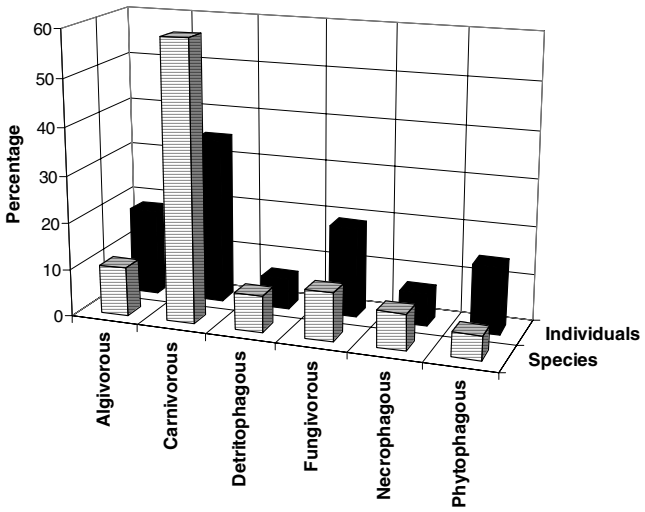

Fig. 2. Representation of individual throphic groups of beetles in nests of the bearded tit.

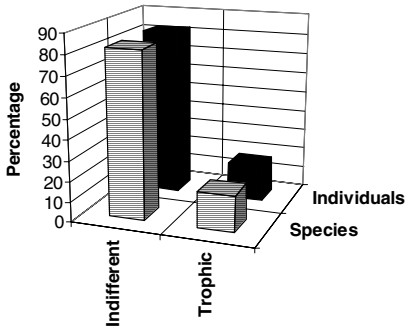

Fig. 3. Representation of beetles in nests of the bearded tit according to their relationship to the nests.

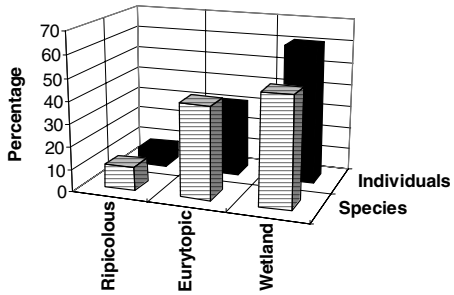

Fig. 4. Representation of beetles in nests of the bearded tit according to their habitat preference.

the ground. Two carabid species are typical inhabitants of reed (*O. melanura*) or grass stems (*D. linearis*).

Only two trophic groups – fungivores, represented predominantly by Lathriidids (eating moulds on nest construction material), and necrophages (attracted by chick carrions in several nests) had a direct throphic relation to the nests, comparable to other birds studied thus far. However, they had no direct relation to the nesting birds or their living chicks and represented only commensals.

When compared with nest fauna of other bird species, the most similar composition was found in nests of the great reed warbler and the reed warbler (Krištofík et al. 2001), which also nest above the water surface. Fauna in their nests consisted mainly of species representing hygrophilous fauna of soil surface and herbage stratum of reed stands, predominantly Staphylinids and Carabids. However, unlike nests of the bearded tit, the major part (almost 65% of individuals) of the warblers nests fauna comprised imagines and larvae of *Coccidula scutellata* (Herbst, 1783), a highly specialized species eating aphids living on reed. At some sites (fishponds in South Moravia, Jurík & Šustek unpublished), this species occurred in extensive numbers in the nests of reed warblers, representing almost 98% of all beetles. The role of position of nests closely above the water surface is clearly illustrated by beetle fauna in the nests of the marsh warbler (Krištofík et al. 2005), nesting above the ground in shore vegetation. The proportion of soil surface fauna was much lower than in nests of the great reed warbler and the reed warbler. However, there were a high proportion of mycetophagous commensals in the nests, which was similar to beetle fauna in nests of other bird species. The common feature of beetle fauna in nests of all four bird species nesting in reed above water surface or in shore vegetation close to standing water bodies was a complete absence of typical nidicolous species occurring frequently in nests of other birds, especially Passeriformes (Jurík & Šustek 1978; Krištofík et al. 2002; Šustek & Krištofík 2002, 2003). A special case, among the birds nesting near water bodies, is beetle fauna in the nests of the penduline tit (Krištofík et al. 1993, 1995), which is enormously poor and consists almost exclusively of very small Lathriidids being able to move in the dense felt-like nest.

Fleas

In nests of the bearded tit, 131 males and 200 females of *Ceratophyllus garei* Rothschild, 1902 were found. The fleas were recorded in 44 nests (prevalence 41.5%, mean intensity 7.5) and their number per nest ranged from 1 to 36 individuals. The results show that the bearded tit is akin to other hosts of *C. garei*, such as the great reed warbler, the reed warbler and the marsh warbler (Krištofík et al. 2001, 2005). The prevalence of *C. garei* in nests of bearded tits was 1.8, 8 and 2.6 times higher than in the nests of the great reed warbler, reed warbler and marsh warbler, respectively. The mean intensity of *C. garei* was almost equal to that of nests of the marsh warbler and the reed warbler and 9.6 times lower than in nests of the great reed warbler (Krištofík et al. 2001, 2005). This difference is probably connected with much larger body size and nest size of the great reed warbler, which is about 2.5 times larger than nests of the other two congeners and gives more space for development of *C. garei*.

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