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THE MITES (ACARI, MESOSTIGMATA) IN THE BIRDS' NESTS IN SLOVAKIA

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The extensive material of the mites of the suborder *Mesostigmata* from 144 nests of 29 species of birds from Slovakia is analysed. Altogether 43 species of mites were found in the nests. The nests of the birds nesting on water or wet sites are inhabited by the non-parasitic species. In other nests the parasitic mites were prevailing as to the number of species and the non-parasitic mites as to the number of individuals. The whole material was subjected tentatively to the cluster analysis and its results were compared with the intuitive ecological classification of the nests.

Key words: ecology, mites, nidobiology, birds' nests, Slovakia, cluster analysis, parasitology, faunistics.

The mites in the birds' nests in Czecho-Slovakia were studied by more authors. In spite to it the degree of their knowledge is unsufficient. Mrciak and Rosický (1956) mentioned some species of mites found in birds. Nosek and Lichard (1962) evaluated the representation of mites in the nests of *Ficedula albicollis, Parus major, Sturnus vulgaris, Turdus merula* and *Anas platyrhynchos*. Daniel and Černý (1963) occupied with the mites from the nests of *Anas platyrrhynchos*. Zeman (1979) and Zeman and Jurík (1981) evaluated the mites from the nests of more birds nesting in cavities from the faunistical and ecological aspects. Černý (1983) presented a list of the blood-sucking arthropods on birds.

In Central Europe the mites in birds' nests were studied by Nordberg (1936), Mahunka and Molnos (1962), Pirjanik and Akimov (1964), Marshalova (1980), Kojumdjieva (1981), Kaczmarek (1982, 1986), Petrova (1982) and Haitlinger (1987). All these authors presented mostly the faunistical and ecological results of investigations on different types of birds' nests. The aim of the present paper is to describe structure of the mites communities in several types of birds' nests and their mutual relations.

Material and methods

The nests were collected on 29 localities in Slovakia during the years 1978, 1979 and 1982 - 1988, always after the end of nesting. The nests were collected on the following localities.

Table 1
Representation of gamasoid mites in birds' nests

Breeder / Family, Species, Locality	*Cygnus olor*	*Anas platyrhynchos*	*Anas strepera*	*Netta rufina*	*Larus ridibundus*	*Turdus merula*	*Turdus philomelos*	*Hippolais icterina*	*Sylvia atricapila*	*Remiz pendulinus*	*Lanius collurio*	*Carduelis chloris*	*Hirundo rustica*	*Delichon urbica*	*Ciconia ciconia*	*Falco tinnunculus*	*Columba livia for. dom.*	*Luscinia svecica*	*Merops apiaster*	*Riparia riparia*	*Motacilla alba*	*Phoenicurus ochruros*
Total of the nests collected	2	2	1	2	12	30	31	1	3	3	24	40	13	24	1	6	12	1	4	108	3	8
Number of the nests positive for gamasoid mites	2	1	1	2	7	11	8	1	1	1	3	4	1	1	1	1	2	1	1	14	2	1
Breeders' groups classified according to the positions of nests	1					2a							2b		2c			3	4b		5	
Parasitidae *Parasitus /E./ lunulatus* Müller, 1859	–	–	–	–	1 J	–	3 B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Parasitus /E./ sp.	–	–	–	–	–	1 BL	2 B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Parasitus /V./ hyalinus Willmann, 1949	–	–	–	–	3 J	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Parasitus /N./ sp.	–	–	–	–	4 J	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Parasitus /C./ fimetorum Berlese, 1903	–	–	–	–	28 Se	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Parasitus /C./ sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1 VK	–	–	–	–	–	–	–
Trachygamasus sp.	1 J	1 J	–	–	17 J	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Saprogamasus ambulacralis Willmann, 1949	–	–	–	–	2 J	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Poecilochirus necrophori Vitzthum, 1930	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4 G	–	–
Pergamasus brevicornis Berlese, 1903	1 J	–	2 J	–	6 J	–	12 B, JB	–	–	–	1 JB	–	–	–	–	–	–	–	–	–	1 BŽ	–
Pergamasus crassipes Linaeus, 1758	–	–	–	–	–	5 JB	15 JB	–	1 BL	–	–	1 JB	–	–	–	–	–	–	–	–	–	–
Holoparasitus excipuliger Berlese, 1905	–	–	–	2 J	–	4 JB, BL	58 JB, D	–	–	–	–	2 JB	–	–	–	–	–	–	–	–	1 BŽ	–
Holoparasitus sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1 J	–	–	–	–
Veigaiaidae *Veigaia nemorensis* C. L. Koch, 1839	–	–	–	–	–	1 BL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 1 (continuation)

Veigaia cervus Kramer, 1876	-	-	-	-	-	1 BL	2 JB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aceocejidae *Cheiroseius borealis* Berlese, 1904	-	-	2 J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhodacaridae *Euryparasitus emarginatus* C. L. Koch, 1839	-	-	-	-	-	-	1 JB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Macrochelidae *Macrocheles merdarius* Berlese, 1889	-	-	-	-	1 J	-	-	-	-	-	1 JB	-	-	-	20 VK	-	-	-	-	-	-	-
Macrocheles montanus Willmann, 1951	-	-	-	1 J	-	-	-	-	-	-	-	-	-	-	-	-	-	1 J	-	-	-	-
Macrocheles peniciliger Berlese, 1904	-	-	10 J	52 J	53 JH	-	-	-	-	-	-	-	-	-	-	6 BP	-	20 J	-	1 G	-	-
Macrocheles glaber Müller, 1860	1 SS	-	-	-	-	-	-	-	-	-	-	-	-	-	11 VK	-	-	-	-	-	-	-
Macrocheles matrius Hull, 1925	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 Dr	-	-
Macrocheles robustulus Berlese, 1904	-	-	-	-	1 J	-	-	-	-	-	-	-	-	-	17 VK	-	-	1 J	-	-	-	-
Macrocheles muscaedomesticae Sellnick, 1940	-	-	-	-	66 JH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Geholaspis longispinosus Kramer, 1876	-	-	-	-	-	1 JB	8 B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Holostapella exornata Filipponi et Pegazzane, 1967	5 J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dermanyssidae *Androlaelaps casalis* Berlese, 1887	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7 BP	-	-	-	15 Dr	-	-
Hypoaspis /G./ lubrica Oudemans et Voigts, 1904	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32 J, Dr	-	-
Hypoaspis /G./ sp.	-	-	-	-	-	1 JB	-	-	-	-	-	-	-	-	-	-	-	-	-	1 J	-	-
Hypoaspis /S./ miles Berlese, 1882	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 Dr	-	-
Hypoaspis /C./ vacua Michael, 1891	-	-	-	-	-	3 BL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hypoaspis /G./ nidicorva Evans et Till, 1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	136 JB
Hypoaspis /P./ hyatti Evans et Till, 1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Dr	-	-
Ololaelaps placentula Berlese, 1887	-	-	-	34 J	1 J	-	2 JB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eulaelaps stabularis C. L. Koch, 1836	-	-	-	18 J	-	-	1 JB	-	-	-	-	-	-	-	-	-	-	-	-	3 Dr	7 L	-
Haemogamasus nidi Michael, 1892	1 J	-	-	4 J	-	-	5 JB	-	-	-	-	-	-	-	-	-	-	-	5 V	-	-	-
Haemogamasus hirsutus Berlese, 1899	-	-	-	-	-	-	5 JB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 1 (continuation)

Dermanyssus gallinae Redi, 1674	-	-	-	-	-	-	-	-	-	-	-	-	163 JB	1 G	-	-	-	-	-	2 G	-	-
Dermanyssus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17 Bm	-	-	-	-	-
Ornithonyssus sylviarum Canestrini et Fauzago, 1877	-	-	-	-	-	-	-	3 JB	-	1 D	635 JB	145 D	-	-	-	-	-	-	-	-	306 L	-
Total	9	1	14	111	183	17	114	3	1	1	637	148	163	1	49	13	17	23	5	64	315	136
Average species number in positive nests	4,5	1	14	55,5	26,1	1,6	14,3	3	0,3	0,3	212,3	37	163	1	49	13	8,5	23	5	4,6	157,5	136
Average species number in all nests	4,5	0,5	14	55,5	15,3	0,6	3,7	3	1	1	26,5	3,7	12,5	0,1	49	2,1	1,4	23	1,3	0,6	105	17

Abbreviations of the localities names:

J – Jakubov
BL – Bratislava - Líštiny
B – Boheľov
Se – Senné
JB – Jur pri Bratislave
G – Gabčíkovo
BŽ – Bratislava - Železná studnička
D – Dobrohošť
H – Hroboňovo
VK – Veľké Kostolany
Dr – Drahovce
Ja – Jahodná
O – Oščadnica
Č – Číčov
R – Rohožník
Stp – Stankovany - Podšíp
Stf – Stankovany - Fedorov
BV – Bratislava - Vrakuňa
ŠS – Šaštín - Stráže
BK – Bratislava - Kopáč
MV – Moravany nad Váhom
BB – Bratislava - Biely Kríž
BZ – Bratislava - Záhorská Bystrica
RT – Rajecké Teplice
V – Vinohrady nad Váhom
L – Lozorno
KV – Kuchyňa - Vývrat
BPo – Bratislava - Podunajské Biskupice
BP – Bratislava - Petržalka
Bm – Bratislava mesto
S – Sološnica

Litle Carpathians (090);
Bratislava - Železná studnička (7769) - a beech forest in Little Carpathians;
Bratislava - Záhorská Bystrica (7768) - an orchard at the foot of Little Carpathians;
Lozorno (7668) - a beech forest;
Kuchyňa - Vývrat (7568) - an orchard surrounded by a beech forest in Little Carpathians;
Považský Inovec Mountains (100);
Moravany nad Váhom (7473) - a beech forest;
Strážske vrchy Hills (120);
Rajecké Teplice (6878) - margin of a pine forest neighbouring with a park and garden;
Veľká Fatra Mountains (150);
Stankovany - settelment Podšíp (6881) - margin of a beech forest
Stankovany - settelment Fedorov (6881) - margin of a beech-norway spruce forest;
Oščadnica (6579) - Tichá dolina - margin of a norway spruce forest Borská nížina Lowland (770);

Table 2

Representation of gamasoid mites in nesting boxes

Family / Species / Locality \ Breeder	*Ficedula albicollis*	*Parus caeruleus*	*Parus major*	*Parus sp.*	*Sitta europaea*	*Sturnus vulgaris*	*Passer domesticus*	*Passer montanus*	*3 + 8*	*6 + 7*	*7 + Apodemus sylvaticus*	*8 + Apodemus flavicollis*	*3 + Apodemus flavicollis*
Total of the nests collected	11	12	69	11	4	16	55	216	6	3	3	5	5
Number of the nests positive for gamasoid mites	4	2	14	2	1	3	4	37	2	2	1	4	1
	1	2	3	4	5	6	7	8	Nests used by more breeders				
Parasitidae													
Parasitus /E./ lunulatus Müller, 1859	-	4 BK	-	-	-	-	-	-	-	-	-	-	-
Parasitus /V./ sp.	-	-	20 O	-	-	-	-	-	-	-	-	-	-
Poecilochirus necrophori Vitzthum, 1930)	-	-	53 R,Stp Stf	-	-	-	-	4 BZ	-	-	-	-	-
Pergamasus brevicornis Berlese, 1903	-	-	2 RT	-	1 BL	-	-	-	-	-	-	-	-
Pergamasus crassipes Linnaeus, 1758	1 JB	-	-	6 BB	-	-	-	3 BL	-	-	-	-	-
Holoparasitus excipuliger Berlese, 1905	-	1 BK	-	-	-	-	-	-	-	-	-	-	-
Ameroseiidae													
Ameroseiella apodius Karg, 1971	-	-	-	-	-	-	-	1 R	-	-	-	-	-
Aceosejidae													
Proctolaelaps pygmaeus Müller, 1860	-	-	1 C	-	-	-	-	-	-	-	-	-	-
Paragarmania dentriticus Berlese, 1918	-	-	-	-	-	-	-	-	-	-	-	3 S	-
Rhodacaridae													
Cyrtolaelaps chiropterae Karg, 1971	-	-	1 BL	-	-	-	-	-	-	-	-	-	-
Euryparasitus emarginatus C.L.Koch, 1839	-	-	-	-	-	-	-	-	-	-	5 Ja	-	-
Macrochelidae													
Macrocheles penicilliger Berlese, 1904)	-	-	120 O	-	-	-	-	-	-	-	-	-	-
Macrocheles glaber Müller, 1860	-	-	1 BZ	-	-	-	-	5 KV	-	-	-	-	-

Table 2 (continuation)

Macrocheles scutatus Berlese, 1904	–	–	–	–	–	–	–	9 KV, BZ	–	–	–	–	–
Macrocheles vagabundus Berlese, 1889	–	–	–	–	–	–	–	2 R	–	–	–	–	–
Macrocheles /G./ americana Berlese, 1888	–	–	–	–	–	–	–	1 R	–	–	–	–	–
Macrocheles sp.	–	–	–	–	–	11 BL	–	–	–	1 Ja	–	–	–
Pachylaelaptidae *Pachylaelaps sp.*	–	–	–	1 BB	–	–	–	–	–	–	–	–	–
Dermanyssidae *Androlaelaps casalis* Berlese, 1887	16 BB, MV	9 BK	614 R,BL, BK	2 BB, BK	–	3 BL	5 S	203 S, R, BL, KV, BV, BZ, Bpo	12 R,BZ	25 Ja	–	16 KV	42 R
Hypoaspis /G./ lubrica Oudemans et Voigts, 1904	–	–	–	–	–	–	–	1 BL	–	–	–	–	–
Hypoaspis /G./ praesternalis Willmann, 1949	1 JB	–	–	–	–	–	–	–	–	–	–	–	–
Hypoaspis /G./ sp.	–	–	1 C	–	–	3 BL	–	–	–	–	19 Ja	–	–
Eulaelaps stabularis C. L. Koch, 1836	1 BB	–	–	–	–	–	1 BB	4 Ja	–	–	13 Ja	2 Ja	14 R
Haemogamasus nidi Michael, 1892	–	–	–	–	–	–	4 BB	–	–	–	4 Ja	–	12 R
Haemogamasus hirsutus Berlese, 1899	–	–	–	–	–	–	–	–	–	–	2 Ja	–	–
Hirstionyssus latiscutatus De Meillon et Lavoipierre, 1944	–	–	–	–	–	–	–	–	–	–	–	–	1 R
Hirstionyssus sp.	–	–	5 Stp	–	–	–	–	–	–	–	–	–	1 R
Dermanyssus gallinae Redi, 1674)	–	–	1 Stp	–	–	–	–	–	–	–	–	–	–
Dermanyssus sp.	–	–	–	–	–	–	15 S, R	14 S, R	–	–	–	16 R	–
Total	19	14	819	9	1	17	25	247	12	26	43	37	70
Average species number in positive nests	4,8	7	58,5	4,5	1	5,7	6,3	6,7	6	13	43	9,3	70
Average species number in all nests	1,7	1,2	11,9	0,8	0,3	1,1	0,5	1,1	2	8,7	14,3	7,4	14

Abbreviations of the localities names as in table 1.

Jakubov (7567) - fish ponds between a pine forest and fields;
Šaštín Stráže (7567) an abandoned orchard surrounded by fields;
Rohožník (7569) - a beech stand along a creek;
Sološnica (7569) - building of a farm in the centre of fields Podunajská rovina Plaine (790);
Jur pri Bratislave (7769) - bushes around the alder forest and ponds and buildings of the Biological Station of the Commenius University;
Bratislava - Petržalka (7868) - a housing estate;
Bratislava - Kopáč (7868) - a locust tree forest surrounded by fields;
Bratislava - Vrakuňa (7869) - a locust tree forest surrounded by fields;
Bratislava - Podunajské Biskupice (7868) - a wind shelter belt consisting of poplars;
Gabčíkovo (8171) - a building on the Danube bank;
Čičov (8271) - a secondary forest dominated by poplars and with a dense bushy etage;
Hroboňovo (8072) - ponds surrounded by fields and meadows;
Jahodná (7972) - an artificial poplar monoculture with a rich etage of shrubs on the place of a former branch of Small Danube river;
Dobrohošť (8070) - a poplar-wide flood plaine forest;
Drahovce (7272) - banks of a former gravel mine in the vicinity of the vilage;
Bratislava (7868) - lofts of the houses in the city centrum (the streets Sienkiewicova and Štefánikova);
Boheľov (8072) - fish-ponds surrounded by fields;
Veľké Kostoľany (7472) - a building in the vilage;
Nitrianska pahorkatina Highland (802);
Vinohrady nad Váhom (7672) - a sandy slope above the Váh river, fields in the surroundings;
Východoslovenská rovina Plaine (820);
Senné (7398) - an island in the lake surrounded by meadows.

The mites were extracted from the nests by the Tulgren's apparatus during 48 hours. The species spectra of mites in the nests of each bird species were subjected tentatively to the numerical classification. All nests were included into the classification, but the unidentified mite species including potentially two or more congeneric species were ommited. Due to the different abundance of individual species of birds our material consists of inequal number of nests in each breeder. So the significance of individual OTU's differs. This fact was taken in consideration during the interpretation of classification results. The unweight average linkage method was used as the clustering alghoritm. The Sorensen's index, Renkonen's index and Wishart's index were used as the similarity measures (Sneath and Sokal 1973, Podani 1980). At the evaluation of the results we have classified the nests according their position in the nature into the following ecological groups:
1/ Free nests found on the water surface, in wet habitats, on ground, on the islands in ponds and lakes: *Cygnus olor, Anas platyrhynchos, A. strepera, Netta rufina, Larus ridibundus.*
2/ Free nests found above the ground:
a - only in free nature: *Turdus merula, Turdus philomelos, Hippolais icterina, Sylvia atricapila, Remiz pendulinus, Lanius collurio, Carduelis chloris;*
b - only on the man-built objects: *Hirundo rustica, Delichon urbica;*
c - on both, natural and man-built objects: *Falco tinnunculus, Columba livia f. domestica, Ciconia ciconia;*
3/ Nests on the ground surface: *Luscinia svecica;*
4/ Nests from the hollows and cavities:
a - from the nesting boxes: *Ficedula albicollis, Parus caeruleus, Parus major, Sitta europea, Sturnus vulgaris, Passer domesticus, Passer montanus;*
b - from the hollows in the ground: *Merops apiaster, Riparia riparia;*
5/ Nests found on diverse sites: *Motacilla alba* - on the man built objects or on the ground, *Phoenicurus ochruros* - on the man built objects and in the grooves.

From the total of 747 nests of 29 birds; species and of two species of mammals the mites were found in 144 mites. Altogether we have obtained 3364 mites belonging to 43 species of eight families (tab. 1 and 2).

Results and discussion

a/ Ecological groups of mites according to their relation to hosts

According to the relation of the nymphae and adult mites to the host (nesting bird) the individual species can be classified into two ecological groups. The first group includes the haematophagous mites *(Dermanyssus gallinae, Ornithonyssus sylviarum)* which obligatorly suck blood on the birds and the facultative parasites *(Androlaelaps casalis)*. A special position within this group is taken by the blood-sucking mites from the small mammals and from their nests like *Eulaelaps stabularis, Haemogamasus nidi, H. hirsutus* and *H. latiscutatus*. The occurrence of this group of species is caused by a relatively frequent contact of some small rhodents *(Apodemus flavicollis, A. sylvaticus* etc.) with the nests of birds, especially with those from the nesting boxes.

The second group consists of 41 non-parasitic free-living species. They occupy more trophical levels, predators - destruents, in the nests. The destruents are represented by the species *Macrocheles glaber, M. excipuliger, M. muscadomesticae*. Together with other nidicolous arthropods they serve as a food basis for the abundant predaceous mites represented in our material by the species *Pergamasus brevicornis, P. crassipes, Euparasitus marginatus, Macrocheles peniciliger, M. matrius* etc. Besides other arthropods they eat also the eggs of fleas and attack the blood-sucking mites. P e t r o v a (1982) supposes them to have a relation to the circulation of some pathogens with the natural focality. Other authors consider the predaceous mites to have no medical and epidemiological significance (D a n i e l and Č e r n ý , 1963). The possible circulation of pathogens can be substantially influenced also by the active migration of the mites between individual species of breeders.

The average number of mites in individual nests (in the positive nests and in all nests) fluctuates within the wide limits of 0.3 - 212 and 0.1 - 105 respectively (tab. 1 and 2). The blood-sucking species *Dermanyssus gallinae, Ornithonyssus sylviarum* and *Androlaelaps casalis* are the most responsable for these numbers.

b/ Representation of the mites in the nests according to their allocation

The species composition of the mites communities in the nests is influenced not only by the sources suplied by the host's body. The nests is always situated in an etage of the surrounding geobiocoenosis and it is strongly influenced by the local abiotical and biotical factors. This is the reason for our interest in the quantitative structural changes in the mites communities in differently alocated nests.

The mites in the free nests found on water surface, in wet sites and on the island were represented by the high number of the non-parasitic mites. The direct contact of these nests with the microfauna in the immediate surroundings results in the increase of representation of the saprophagous and coprophagous species *(Macrocheles muscadomesticae, M. glaber)* and of the soil predators *(M. peniciliger)* in the nests. The birds' nests built on the ground are penetrated by the mites living on the small mammals. The representation of individual ecological groups of mites in the nests situated above the ground, which have been classified according to their relation to the human habitations, was similar, but the obligatory birds' haematophages dominated quantitatively. *O. sylviarum* is considered to be a transition between a nidicolous parasite and a typical body parasite reproducing and developing on the host's body in his feathers or hairs (B o r i s o v a , 1977).

The zoophagous parasitids (e. g. *Parasitus lunulatus, Pergamasus brevicornis, P. crassipes and Holoparasitus excipuliger)* were relatively abundant in the nests situated above the ground in free landscape. However they were absent in the nests situated on the man-built objects.

In the nests of *Hirundo rustica* and *Delichon urbica* we have registered only one species *Dermanyssus gallinae*. But it is doubles that the parasitocoenosis in their nests will be richer (Kaczmarek, 1986) and in regard to the immediate contact with the human habitations it will be significant parasitologically.

The species *A. casalis* was eudominant in the majority of nests in nesting boxes. *Androlaelaps casalis* is a facultative haematophag prefering higher relative humidity which is ussual in closed nests and cavities. *A. casalis* is known to occure in nests of *Parus major, Passer domesticus* and *P. montanus*. It is confirmed also by other authors (Pirjanik and Akimov, 1964, Zeman and Jurík 1981, Nosek and Lichard, 1963). Infiltration of some species of mites from the small mammals is made possible by the above mentioned occupation of birds' nests by some rodents.

Among the nests from the soil cavities the richest material has been obtained from the nests of *Riparia riparia*, where the species of the genus *Hypoaspis* dominated qualitatively and quantitatively. The most abundant species was *H. lubrica*. It conforms with the observation of Marshalova (1980) from Karelia.

The following species *Parasitus hyalinus, P. fimetorum, Saprogamasus ambulacralis, Cheiroseisus borealis, Cyrtolaelops chiropterae* and *Ameroseiella* apodius are new for tha fauna of Slovakia.

c/ The numerical classification of the mites communities in the nests of birds.

The nests of individual breeders were classified on the base of mites communities according to three similarity criteria. The classification of the nests according to species similarity can be strongly biased by an occasional occurrence of a species and by rather unequal number of nests of individual breeders in our material, but on other hand it can reflect better the coenogenetical relations than the quantitative criteria do.

The classification of the nests according to species similarity (fig. 1) is richly structurized. The cluster I contains the nests of *Delicheon urbica* (14) and *Hirundo rustica* (13) belonging to the group 2b. This cluster arizes due to the common or nearly exclusive occurrence of the blood-sucking mite *Dermanyssus gallinae*. Thanks to it the nests of both breeders have a strongly isolated position among other nests. Their isolated position is preserved also in the classification according to the renkonen's and Wishart's indices (fig. 2 and 3).

The clusters II consist of two subclusters. The subcluster II b (18+4+3) contains the nests with the simultaneous occurrence of *Macrocheles peniciliger* and *M. robustus*. The subcluster IIa (19+33+7) contains the nests with simultaneous occurrence of *Eulaelaps stabularis*, *Ololaelaps placentula* and *Haemogamasus nidi*. The breeders joint in the cluster II belong to the group 1, 2a or 3. The classification of these nests according to quantitative criteria differs considerably (fig. 2 and 3) and only the subcluster IIb (18+4+3) preserves its independent position as the subcluster V in both dendrograms.

The cluster III is formed by the mites from the nests of *Riparia riparia* (20), *Passer domesticus* (29), *P. montanus* (30), *Parus caeruleus* (24), *P. major* (25), *Parus sp.* (26), *Sturnus vulgaris* (28), *Ficedula albicollis* (23), *Falco tinnunculus* (16), *Sylvia atricapila* (9), *P. major* and *P. domesticus* (31), *S. vulgaris* and *P. domesticus* (32) and by the nests used simultaneously by *P. montanus* and *Apodemus flavicollis* (34). This cluster arizes due to the presence of the mite *Androlaelaps casalis* in all these nests and it consists of four following subclusters. The subcluster IIIa (30+20+25) is characterized by the presence of *Poecilochirus necrophori* and *Eulaelaps stabularis*. The subcluster III b (34+29+35) is characterized by the combination of the mites *Haemogamasus nidi* and *Eulaelaps stabularis*. The subcluster IIIc (32+31+28+16+24) joins the nests with the nearly exclusive occurrence of *Androlaelaps casalis* and the subcluster IIId (26+23+9) consists of the nests with *A. casalis* accompanied by *Pergamasus crassipes*. The great majority of nests included in the cluster III (fig. 1) form a single homogenously structurized cluster also according to the quantitative criteria (the cluster III in figures 2 and 3). The mite species spectra from the nests of individual breeders join consecutively to the species spectra staying in these clusters on high similarity level and exhibiting the high dominance of *Androlaelaps casalis*. The nests in the cluster III belong to the breeders nesting in hollows and cavities. The mites living in the litter and in decaying plant rests dominate in these nests.

The cluster IV (21 - 27) consists of the mites from the nests of *Hippolais icterina* (8), *Lanius collurio* (11), *Carduelis chloris* (12), *Remiz pendulinus* (10) and *Motacilla alba* (21). The mites from the nests of *Sitta europea* (27) have an isolated position in this cluster due to the presence of the only species *Pergamasus brevicornis*. The cluster IV arizes due to the occurrence of the typical blood-sucking species *Ornithonyssus sylviarum*. In the nests of *Carduelis chloris* and *Motacilla alba* the mite *Ornithonyssus sylviarum* is accompanied by the predaceous mite Pergamasus crassipes living usually in the decaying plant rests. Four breeders in this cluster belong to the group 2a, 4a

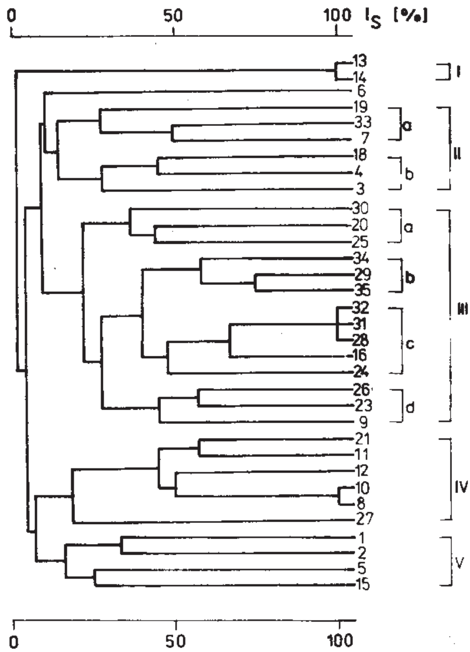

Fig. 1. Clustering of mites in the nests of individual species of birds according to the species similarity (IS - Sorensen's index, 1 - *Cygnus olor*, 2 - *Anas platyrhynchos*, 3 - *Anas strepera*, 4 - *Netta rufina*, 5 - *Larus ridibundus*, 6 - *Turdus merula*, 7 - *Turdus philomelos*, 8 - *Hippolais icterina*, 9 - *Sylvia atricapila*, 10 - *Remiz pendulinus*, 11 - *Lanius collurio*, 12 - *Carduelis chloris*, 13 - *Hirundo rustica*, 14 - *Delichon urbica*, 15 - *Ciconia ciconia*, 16 - *Falco tinnunculus*, 17 - *Columba livia f. domestica*, 18 - *Luscinia svecica*, 19 - *Merops apiaster*, 20 - *Riparia riparia*, 21 - *Motacilla alba*, 22 - *Phoenicurus ochruros*, 23 - *Ficedulla albicollis*, 24 - *Parus coeruleus*, 25 - *Parus major*, 26 - *Parus sp.*, 27 - *Sitta europea*, 28 - *Sturnus vulgaris*, 29 - *Passer domesticus*, 30 - *Passer montanus*, 31 - *Parus major* + *Passer montanus*, 32 - *Sturnus vulgaris* + *Passer domesticus*, 33 - *Passer domesticus* + *Apodemus sylvaticus*, 34 - *Passer montanus* + *Apodemus flavicollis*, 35 - *Parus major* + *Apodemus flavocollis*).

and *Motacilla alba* belongs to the group 5. These nests form an separate cluster also in the classification on the base of quantitative criteria (cluster II in fig. 2 and cluster I in fig. 3).

The cluster V (fig. 1) contains mite species spectra from the nests of three breeders of the group 1 and from the nests of *Ciconia ciconia* (15, group 2c). The mite species spectra from the nests of *C. ciconia* (15) and *Larus ridibundus* (5) form a separate cluster due to the occurrence of the saprophilous mites *Macrocheles merdarius, M. peniciliger* and *M. robustus*. The nests of *Cygnus olor* (1) and *Anas platyrhynchos* (2) form a separate cluster due to the evidently occasional presence of *Trachygamasus sp.* The connection of both subclusters is caused by *Pergamasus brevicornis* (tab. 1). Both mites live in decaying plant rests and prefere wet substrates. Due to it the cluster V contains the mite species spectra from the nests of the group 1 and one nest of the group 1c *(C. ciconia)*, which has, however, a close relation to the wet sites. It correspond also with the ecological requirements of the mites found in the nests of *Ciconia ciconia*. The cluster V (fig. 1) corresponds with the cluster VII in fig. 2 (with one exception). According to the abundance similarity, these

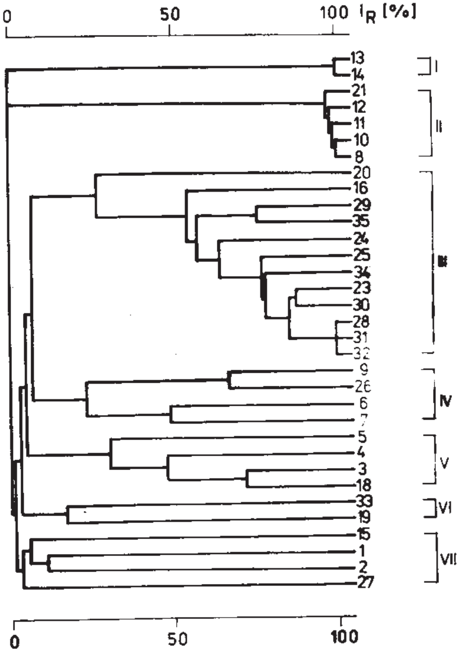

Fig. 2. Clustering of mites in the nests of individual species of birds according to the proportional similarity (IR - Renkonen'sindes, for the number of bird species see fig. 1).

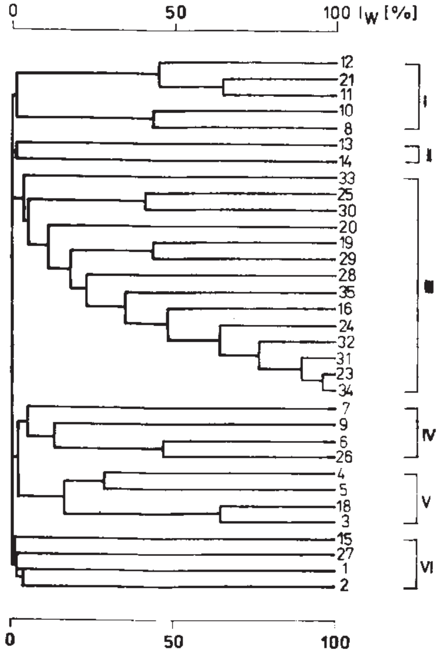

Fig. 3. Clustering of mites in the nests of individual species of birds according to the abundance similarity (IW - Wishart's index, for the numbers od bird species see fig. 1).

nests entry into the cluster V and VI (fig. 3). It reflects the different richnes of the material of mites from individual nests. The mites from the nests of *Phoenicurus ochruros* belong to the only species *H. nidicorum*. This species was found only in these nests, due to it they are completly isolated within our material and they are not presented in the dendrograms (fig. 1 - 3).

The classification of the mite species spectra on the base of quantitative criteria is strongly biased by the different number of nests of individual breeders and, consecutively, by the strongly different number of species and individuals of mites (tab. 1 and 2). In spite to it, both classifications based on the quantitative data confirm the existence of clusters arizen on the base of binary data.

So the clusters I in fig. 2 and cluster II in fig. 3 are identical with the cluster I in fig. 1. The strongly different number of *Ornithonyssus sylviarum* in the nests of *Delichon urbica* and *Hirundo rustica* is responsable for the low similarity of mite species spectra in the nests of both breeders (fig. 3).

The cluster V in fig. 2 and 3 is nearly identical with the subcluster IIb in fig. 1. The clustering pattern is managed by the number of individuals of *Macrochelesa peniciliger* and their share in whole material (tab. 1 and 2).

The cluster III in fig. 2 and 3 is also nearly identical with the cluster III in the fig. 1. The species spectra with high dominance, but with relatively low number of individuals of *Androlaelaps casalis* stay on the highest similarity levels in these clusters.

The subcluster IV (fig. 2 and 3) arizes from some nests included in the subcluster IIId in fig. 1. It is caused by the occasional presence of *Pergamasus crassipes*. It is highly probale that a little richer material would change considerably this result of classification because there are joint species spectra from the breeders with different nidobiology.

The cluster II (fig. 2) and I (fig. 3) are identical with the cluster IV in fig. 1. The deep structural differencies between both clusters are caused by low number of mites in the nests of *Hippolais icterina* and *Remiz pendulinus*.

The cluster VII (fig. 2) and VI (fig. 3) are nearly identical with the cluster V in fig. 1. The position of the species spectra of *Sitta europea* and *Larus ridibundus* in the dendrograms is changed. In *Sitta europea* it is occasional, while the nests of *Larus ridibundus* find their natural position within the group 1.

The numerical classification confirmes completly existence of the nest group 1 and 2b and relatively well that of the group 2a and 4a. Classification of the species spectra from some nests, like those of *Ciconia ciconia*, is more influenced by the nest material and by the place, where the nest was collected than by its allocation. The classification results are biased also by absence of the nests of *Columba livia* and *Phoenicurus ochruros* in the dendrograms. Their nests had no mite species common with other nests or it was ommited. The congruence of the intuitive classification of the nests and numerical classification of the mites communites in them is higher than in the spider /cf. Gajdoš, Krištofík and Šustek, 1991).

Conclusions

The material of 43 species and of 3364 individuals of *Mesostigmata* obtained from 144 nests of birds was evaluated according more criteria. The non-parasitic species dominated in the nests of the birds nesting on the water surface or in wet places. In other types of the nests, the parasitic mites were dominant as to the species number, while the non-parasitic species were dominant as to the number of individuals. The numerical classification of the mites communities has confirmed the intuitive ecological classification of the nests in majority of cases. Six species were found to be new for the fauna of Slovakia (*Parasitus hyalinus, P. fimetorum, Saprogamasus ambulakralis, Ameroseiella apodius, Cheiroseius borealis* and *Cyrtolaelaps chiropterae*).

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ROZTOČE (ACARI, MESOSTIGMATA) VO VTÁČÍCH HNIEZDACH NA SLOVENSKU

Michal Ambros, Ján Krištofík, Zbyšek Šustek

Práca sa zaoberá rozborom rozsiahleho materiálu roztočov z poradu *Mesostigmata* získaného zo 144 hniezd 29 druhov vtákov na Slovensku. V hniezdach sme zistili celkove 43 druhov roztočov. V hniezdach vtákov hniezdiacich na vodnej hladine a na mokrinách sa vyskytujú najmä neparazitické roztoče. V ostatných hniezdach parazitické roztoče prevažujú počtom druhov a neparazitické počtom jedincov. Celý materiál sa podrobil zhlukovej analýze. Jej výsledky v zásade potvrdili správnosť intuitívnej ekologickej klasifikácie hniezd na základe ich umiestnenia.

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