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Ryszard Haitlinger

ARTHROPODS COMMUNITIES OCCURRING ON SMALL
MAMMALS FROM WOODED AREAS OF URBAN
AGGLOMERATION OF WROCŁAW
ZGRUPOWANIA STAWONOGÓW WYSTĘPUJĄCE
NA DROBNYCH SSAKACH Z ZALESIONYCH OBSZARÓW
AGLOMERACJI MIEJSKIEJ WROCŁAWIA

Department of Zoology

Small mammals from various wooded areas of Wrocław were obtained (n = 472). 5446 arthropods belonging to 106 species were collected from them. The arthropod fauna in forests, field groves, parks and cemeteries was rich and in every one of them over 60 species were found. The richest arthropod fauna was found on *Clethrionomys glareolus*, *Apodemus agrarius* and *A. tauricus*.

KEY WORDS: Arthropods communities, small mammals, wooded areas, urban agglomeration

INTRODUCTION

The wooded areas, in the urban agglomeration of Wrocław, cover relatively not large territory. As a rule there are leafed forest, riverine or infrequently wet, surely considerably transformed remainder of the large complexes of riverside forest. The most of them is outside of the town. On suburbs of the town are also not large field groves, shrubs and meadow wet groves. In the urban agglomeration are situated parks and cemeteries, also completely or in part disconnected from exploitation. In this paper are discussed arthropods occurring on small mammals living in municipal wooded areas such as forests, field groves, meadow wet groves, parks and cemeteries. This paper is the last part of the continuing study on arthropods occurring on small mammals in various municipal biotopes. Previously were investigated fleas in urban agglomeration of Wrocław, arthropods on small mammals in areas of ruins and arthropods on non wooded areas [1, 5, 7]. Such investigation in wooded areas in Polish urban agglomeration has not yet been realised; arthropods living on small mammals in other environments in the town, except Wrocław, were investigated also in ports of Gdynia and Gdansk (arthropods associated with rats) [11].

MATERIAL AND METHODS

The animals were caught in the following biotopes and points of the town. 1. Forests. Relatively large forest areas are situated only in north and west part of the town. Investigations were realised in Wrocław-Jernaltów, Rędzin and Osobowice (all are situated in the suburbs of the town). Mainly there are leafed stands, hornbeam-oaken with addition other species of leafed trees. They have a rich brushwood, grasses and herbs. 2. Field groves, shrubs and roadside trees. These biotopes are situated in a many points of suburbs of the city. They are typical to agricultural areas in Lower Silesia. Small mammals were caught in Wrocław Swojczyce. 3. Wet groves and shrubs situated among meadows. They have different vegetation than in biotopes above mentioned. They are slightly penetrated by man and placed mainly along the river Oława (water-bearing areas). 4. Parks and cemeteries. They are situated in suburbs or at borders of centre of the town. They are closed enclaves and in the majority haven't contacts with other areas suitable live for small mammals. The investigations were carried on Jewish cemetery in Wrocław-Pilczyce, partially exclude from exploitation and in parks: Południowy, slightly implemented near water-bearing territory and in Park Szczytnicki – keep in proper state.

The studies were carried out in 1980–1985. Mammals were caught into snap-traps in all the seasons of the year. The animals caught were kept in linen sacks. After anaesthesia with chloroform the arthropods were combed out from their fur. Those attached to the skin were taken out under the binocular microscope.

In total 472 mammals belonging to 11 species were caught and 5446 arthropods representing at least 106 species collected from them (Table 1).

Table 1
Numbers of arthropods (A) and mammals (M) collected in various wooded areas in Wrocław

	Forest		Parks Cemeteries		Field groves		Meadow wet groves		Total	
	A	M	A	M	A	M	A	M	A	M
<i>Clethrionomys glareolus</i> (Schreber)	781	75	1428	108	634	44	593	27	3436	254
<i>Microtus arvalis</i> (Pallas)					24	3			24	3
<i>Pitymys subterraneus</i> de Sel. Long			24	1	11	1			35	2
<i>Apodemus agrarius</i> (Pallas)	15	3	389	68	327	43	208	30	939	144
<i>A. sylvaticus</i> (L.)	1	1				1			1	2
<i>A. tauricus</i> Pallas	433	17	262	21	24	2	47	6	766	46
<i>Mus musculus</i> L.					43	2			43	2
<i>Sorex araneus</i> L.	13	2	37	2	51	9	57	2	158	15
<i>Crocidura suaveolens</i> (Pallas)			9	1	1	1			10	2
<i>Erinaceus europaeus</i> L.	3	1							3	1
<i>Lepus capensis</i> L.							31	1	31	1
Total no. of arthropods	1246		2149		111		936		5446	
Total no. of mammals		99		201		106		66		472

The following categories of arthropods are adopted within the communities of arthropods: 1. eudominants – more than 15% of the collection; 2. dominants – 5.1–15%; 3. subdominants – 2.1–5.0%; 4. recedents – 1.1–2.0%; subrecedents – below 1.1%.

RESULTS

I. Arthropod communities on small mammals from municipal forests

A total 99 small mammals belonging to 6 species were caught. Numerous in this biotope occurred *Clethrionomys glareolus* Schreber; participated in 75.8% of the community. Somewhat frequently than other mammal also occurs *Apodemus tauricus* Pallas – 17.2%. The remaining four species were caught singly. A total 1250 arthropods belonging to at least 64 species was collected.

1. *Clethrionomys glareolus* Schreber

A total were caught 75 *C. glareolus* from which were obtained 782 arthropods belonging to at least 42 species (Tables 2–4). The group of host-nest parasites was the most frequent (58.6%); the host-dwelling group were less numerous (30.1%) and the nest-dwelling groups was the rarest (11.3%). The nest – and host-nest-dwelling groups were the richest in species comprising 20 and 16 species respectively. From 6 species of host-dwelling group only 4 species were permanently attached to their host species.

Table 2
Arthropods of host-dwelling group collected on mammals from municipal forests.

1 – *C. glareolus*, 2 – *A. tauricus*, 3 – *A. agrarius*

Species	1	2	3	Total
Anoplura				
1. <i>Hoplopleura edentula</i> Fahrenholz	77			77
2. <i>Polyplax serrata</i> (Burmeister)		12		12
Prostigmata				
3. <i>Radfordia lemnina</i> (Koch)	9			9
4. <i>Myobia musculi</i> (Schränk)		4		4
5. <i>Psorergates apodemi</i>		18		18
6. <i>Protomyobia onoi</i> Jameson, Dusbabek		1		1
Astigmata				
7. <i>Listrophorus brevipes</i> Dubinina	130			130
8. <i>Myocoptes japonensis</i> (Radford)	17	2		19
9. <i>M. musculus</i> (Koch)		1		1
10. <i>Trichoecius apodemi</i> Fain et al.		12		12
11. <i>Afrolistrophorus apodemi</i> (Fain)		124		124
Mesostigmata				
12. <i>Laelaps hiliaris</i> Koch	1			1
13. <i>L. agilis</i> Koch	1	71		72
14. <i>L. pavlovskiyi</i> Zachvatkin			2	2
Total	235	245	2	482

Table 3

Arthropods of host-nest group collected on small mammals from municipal forests.

1 - *C. glareolus*, 2 - *A. tauricus*, 3 - *A. agrarius*, 4 - *A. sylvaticus*,
5 - *S. araneus*, 6 - *E. europaeus*

Species	1	2	3	4	5	6	Total
Siphonaptera							
1. <i>Ctenophthalmus agyrtes</i> (Heller)	28	19		1			48
2. <i>C. assimilis</i> (Tasch.)	2	1					3
3. <i>Megabothris turbidus</i> (Rothschild)	12	2					14
4. <i>Nosopsyllus fasciatus</i> (Bosc)	1						1
5. <i>Hystrichopsylla talpae</i> (Curtis)	2						2
6. <i>Palaeopsylla soricis</i> (Dale)	2						2
Prostigmata							
7. <i>Hirsutiella zachvatkini</i> (Schluger)	176	25					201
8. <i>Neotrombicula autumnalis</i> (Shaw)		4					4
Astigmata							
9. <i>Glycyphagus hypuadei</i> (Koch)	103	58	7				168
10. <i>Acarus nidicolous</i> Griff.	10	5					15
11. <i>Xenoryctes krameri</i> (Michael)	24	11			1		36
12. <i>Orycterovenus soricis</i> (Oudemans)		1			3		4
13. <i>Otodectes cynotis</i> (Her.)						1	1
Ixodida							
14. <i>Ixodes ricinus</i> (L.)	29	38					67
15. <i>I. hexagonus</i> Leach						1	1
Mesostigmata							
16. <i>Haemogamasus nidi</i> (Mich.)	27		1				28
17. <i>H. hirsutosimilis</i> Willm.		1					1
18. <i>H. hirsutus</i> Berlese		3					3
19. <i>Androlaelaps fahrenheitzi</i> (Berlese)	5						5
20. <i>Echinonyssus isabellinus</i> (Oudemans)	14	1					15
21. <i>E. soricis</i> (Turk)					1		1
22. <i>E. sunci</i> (Wang)		2					2
23. <i>Eulaelaps stabularis</i> (Koch)	19	3					22
Total	454	174	8	1	5	2	644

Within this community 2 eudominants were noted: *Hirsutiella zachvatkini* (Schluger) (22.5%) and *Listrophorus brevipes* Dubinina (16.6%); 2 dominants: *Glycyphagus hypuadei* (Koch) and *Hoplopleura edentula* Fahrenholz; 7 subdominants, 4 recedents and 27 subcedents. Before from this material was described new species *Leptus clethrionomydis* Haitlinger and was stated the presence the first time on mammals nymph of *Erythraeus phalangoides* (mentioned as *E. dubiosus*).

Table 4

Arthropods of nest-dwelling group collected on small mammals from municipal forests.

1 - *C. glareolus*, 2 - *A. tauricus*, 3 - *A. agrarius*, 4 - *S. araneus*, 5 - *E. europaeus*

Species	1	2	3	4	5	Total
Prostigmata						
1. <i>Pygmephorus spinosus</i> (Kram.)	1	1		1		3
2. <i>Bakerdania</i> sp.	5	1	3			9
3. <i>Erythraeus regalis</i> (Koch)	1					1
4. <i>Hauptmannia kazimierae</i> Haitlinger		1				1
5. <i>Leptus clethrionomydis</i> Haitlinger	2					2
Astigmata						
6. <i>Glycyphagidae</i>	1			1		2
Cryptostigmata						
7. <i>Oribatida</i>	2	2				4
Mesostigmata						
8. <i>Proctolaelaps pygmaeus</i> (Müller)	7	1	1			9
9. <i>Parasitidae</i> g. sp.	7			1		8
10. <i>Vulgarogamasus kraepelini</i> (Berlese)		2				2
11. <i>V. remberti</i> (Oudemans)	5	6		1		12
12. <i>Porrhospaspis lunulata</i> (Müller)	4					4
13. <i>Poecilochirus carabi</i> G. et R. Canestrini	37			3	1	41
14. <i>P. subterraneus</i> (Müller)	5					5
15. <i>Eugamasus magnus</i> Kramer	1					1
16. <i>Pergamasus</i> sp.		2	1			3
17. <i>Macrocheles glaber</i> (Müller)		1				1
18. <i>M. tridentinus</i> (G. et R. Canestrini)	2	1				3
19. <i>Macrocheles</i> sp.	2					2
20. <i>Geholaspis longispinosus</i> (Kramer)	1					1
21. <i>Cyrtolaelaps mucronatus</i> (C. et R. Canestrini)	1			1		2
22. <i>C. minor</i> Willmann	1					1
23. <i>Pachylaelaps furcifer</i> Oud.	1	1				2
24. <i>Eviphis ostrinus</i> (Koch)	1					1
25. <i>Euryparasitus emarginatus</i> (Koch)		2				2
26. <i>Myonyssus rossicus</i> Breget.		1				1
27. <i>Amblyseius</i> sp.			1			1
Total	87	22	6	8	1	124

2. *Apodemus tauricus* Pallas

As many as 433 arthropods representing 37 species were collected from 17 *A. tauricus*. The most numerous in this community was species of the host-dwelling (56.6%) and host-nest (39.3%) groups. The greatest number of species was noted in nest-dwelling and host-nest groups, each 14. From 9 species of host-dwelling group only 6 species is permanent associated with this host.

Two eudominants: *Afrolistrophorus apodemi* Fain and *Laelaps agilis* Koch were detected; 3 dominants: *G. hypuadei*, *Ixodes ricinus* (L.) and *H. zachvatkini*; 5 subdominants, 2 recedents and 25 subrecedents also were noted.

Among species rare or exceptionally noted on small mammals *Trichoecius apodemi* Fain et al., *Hauptmannia kazimierae* Haitlinger and *Myonyssus rossicus* Bregetova ought to be mentioned.

General remarks

From 6 species of mammals collected in municipal forests were obtained 64 arthropod species. It is relatively large number but based mainly on two species: *C. glareolus* and *A. tauricus*. The remaining species: *Sorex araneus* L., *Apodemus agrarius* Pallas, *A. sylvaticus* (L.) and *Erinaceus europaeus* L. were collected singly. In examined forests numerous occurred 7 arthropod species, especially *H. zachvatkini* and relatively numerous *I. ricinus*. The most mean intensity of invasion was noted on *A. tauricus* – 25.5 and distinctly lower on *C. glareolus* – 10.4.

It may be well to add that *Otodectes cynotis* (Hering) was the first time found on *E. europaeus*.

II. Arthropod communities on small mammals from field groves, shrubs, and roadside trees

A total 106 small mammals belonging to 10 species were caught; from them 1115 arthropods belonging to at least 68 species were obtained. Two mammal species were found numerously – *C. glareolus* (41.5%) and *A. agrarius* (40.6%). The remaining ones occurred very rarely, except *S. araneus*.

1. *Clethrionomys glareolus* Schreber

From 44 *C. glareolus* examined 634 arthropods belonging to at least 42 species were collected (tables 5–7). The most numerous were host-nest-dwelling species making up 66.6% of the collection; the host-dwelling group formed 23.6%. The greatest number of species was noted in the host-nest-dwelling group – 18 and in the nest-dwelling group – 15.

One eudominant, *H. zachvatkini* was detected, 3 dominants: *G. hypuadei*, *H. edentula* and *L. brevipes*. Moreover, 6 subdominants, 5 recedents and 27 subrecedents were noted.

The arthropod fauna is very closed to noted on *C. glareolus* from municipal forests; it mainly concerns of dominant species. In lower number occurred *I. ricinus*. From rare species *Miyatrombicula muris* (Oudemans), *Neotrombicula japonica* (Tanaka et al.) and *Leptus holmiae* Southcott (in Poland earlier was mentioned as *L. ignotus*) were noted.

2. *Apodemus agrarius* (Pallas)

A total 43 *A. agrarius* were collected; from them 324 arthropods belonging to at least 44 species were obtained. The most numerous was the host-dwelling group (46.0%); the host-nest-dwelling – 36.7%, the nest-dwelling group – 17.1%. The greatest number of species was noted in the nest-dwelling group – 22 and the host-nest-dwelling group – 15). One eudominant *Polyplax serrata* was detected, 4 dominants: *H. affinis* (Burm.), *Ctenophthalmus agyrtes* (Hell.), *Echinomyssus sunci* (Wang) and *G. hypuadei*; 9 subdominants, 3 recedents and 27 subrecedents were noted. Lice were the most numerous; two species making up 37.3% of the collection. The number of species collected on

A. agrarius in this biotop was lower than in the meadows (44 to 57) but higher than other studied environments (Tables 5–7). The lowest number of species on *A. agrarius* was found in allotment gardens (24).

3. Moreover were collected 6 mammals species all in small number (the most 9 *S. araneus*). Also the number of mites obtained from *S. araneus* – 15 (Tables 5–7).

Table 5
Arthropods of host-dwelling group collected on small mammals from field groves, shrubs and roadside trees. 1 – *C. glareolus*, 2 – *M. arvalis*, 3 – *P. subterraneus*, 4 – *A. agrarius*, 5 – *A. tauricus*, 6 – *M. musculus*, 7 – *S. araneus*, 8 – *C. suaveolens*

Species	1	2	3	4	5	6	7	8	Total
Anoplura									
1. Polyplax serrata (Burmeister)				95	1	1			97
2. Hoplopleura affinis (Burmeister)				26					26
3. H. edentula Fahrenholz	74								74
4. H. acanthopus (Burmeister)								1	1
Prostigmata									
5. Myobia agraria Gris. et Lukos.	1			12					13
6. M. musculi (Schr.)				3		39			42
7. Radfordia lemnina (Koch)	13	3							16
8. Amorphacarus elongatus (Poppe)							5		5
9. Protomyobia onoi Jameson, Dusbabek							6		6
10. Psorergates sp. Astigmata	4								4
11. Listrophorus brevipes Dubinina	33		1						34
12. Labidophorus sp.				2					2
13. Myocoptes japonensis (Radford)	16			1			3		20
14. Trichoecius tenax (Michael)	7	1							8
Mesostigmata									
15. Laelaps hilaris Koch	1	15	1	1					18
16. L. pavlovskiyi Zachvatkin	1			11					12
17. L. agilis Koch					16				16
18. Hyperlaelaps microti (Ewing)							1		1
Total	150	19	2	151	17	40	15	1	395

Table 6

Arthropods of host-nest-dwelling group collected on small mammals from field groves, shrubs and roadside trees. 1 - *C. glareolus*, 2 - *M. arvalis*, 3 - *P. subterraneus*, 4 - *A. agrarius*, 5 - *A. tauricus*, 6 - *M. musculus*, 7 - *S. araneus*

Species	1	2	3	4	5	6	7	Total
Siphonaptera								
1. <i>Ctenophthalmus agyrtus</i> (Heller)	32		3	18	1	1		55
2. <i>C. assimilis</i> (Taschenb.)	6		1	2				9
3. <i>Megabothris turbidus</i> (Rothschild)	8			9				17
4. <i>Peromyscopsylla silvatica</i> (Meinert)				1				1
5. <i>Hystrichopsylla talpae</i> (Curtis)					1			1
6. <i>Palaeopsylla soricis</i> (Dale)							3	3
Prostigmata								
7. <i>Hirsutiella zachvatkini</i> (Schluger)	205			1			2	208
8. <i>Neotrombicula autumnalis</i> (Shaw)	4			7				11
9. <i>N. japonica</i> (Tanaka et al.)	2							2
10. <i>Neotrombicula</i> sp.	1							1
11. <i>Miyatrombicula muris</i> (Oudemans)	3							3
Astigmata								
12. <i>Acarus nidicolous</i> Griffiths	1			3				4
13. <i>Glycyphagus hypuadei</i> (Koch)	83	2	1	23	1		3	113
14. <i>Oryctoxenus soricis</i> (Oudemans)							17	17
15. <i>Xenoryctes krameri</i> (Michael)	32			9			2	43
Mesostigmata								
16. <i>Echinonyssus sunci</i> (Wang)	1			21	1			23
17. <i>E. isabellinus</i> (Oudemans)	7							7
18. <i>Haemogamasus nidi</i> (Michael)	9	1		11				21
19. <i>H. hirsutus</i> Berlese	5		2	1				8
20. <i>Eulaelaps stabularis</i> (Koch)	14	1		2				17
21. <i>Androlaelaps fahrenheitzi</i> (Berlese)	3			1				4
Ixodida								
22. <i>Ixodes ricinus</i> (L.)	11			11	1		3	26
Total	427	4	7	120	5	1	30	594

Table 7

Arthropods of nest-dwelling group collected on small mammals from field groves, shrubs and roadside trees. 1 - *C. glareolus*, 2 - *M. arvalis*, 3 - *P. subterraneus*, 4 - *A. agrarius*, 5 - *A. tauricus*, 6 - *M. musculus*, 7 - *C. suaveolens*

Species	1	2	3	4	5	6	7	Total
Prostigmata								
1. <i>Bakerdania</i> sp.	9		1	10	1	2	1	24
2. <i>Pygmephorus erlangensis</i> Krczal				1				1
3. <i>Eucheyletia flabellifera</i> (Michael)				1				1
4. <i>Leptus clethrionomydis</i> Haitlinger	1							1
5. Trombidiidae	1							1
6. <i>Tarsonemus</i> sp.				1			1	2
7. Tetranychidae				1				1
Astigmata								
8. <i>Prowichmannia spinifera</i> (Michael)				2			1	3
9. Glycyphagidae	4			7				11
10. Acaridae				1				1
Cryptostigmata								
11. Oribatida	7			1				8
Mesostigmata								
12. <i>Euryparasitus emarginatus</i> (Koch)				4				4
13. <i>Vulgarogamasus remberti</i> (Oudemans)	3	1		1				5
14. <i>V. kraepelini</i> (Berlese)	1			1				2
15. <i>Porhostaspis lunulata</i> (Müller)				2				2
16. <i>Pergamasus crassipes</i> (L.)	1							1
17. <i>Pergamasus</i> sp.	1			1				2
18. Parasitidae	2			4				6
19. <i>Macrocheles glaber</i> (Müller)				3				3
20. <i>Ameroseius corbiculus</i> (Sowerby)				1			1	2
21. <i>Amblyseius</i> sp.	1							1
22. <i>Hypoaspis austriacus</i> (Sell.)				1				1
23. <i>H. sardoa</i> (Berlese)	2			1				3
24. <i>H. vacua</i> (Michael)				1				1
25. <i>H. heselhausi</i> Oudemans	2							2
26. <i>Lasioseius berleseii</i> (Oudemans)				2				2
27. <i>Proctolaelaps pygmaeus</i> (Müller)	21		1	9			2	33
28. Uropodida	1				1			2
Total	57	1	2	56	2	2	6	126

III. Meadow wet groves

A total 66 small mammals belonging to 5 species were caught. Only two species: *A. agrarius* (45.4%) and *C. glareolus* (40.9%) were relatively numerous. 936 arthropods were obtained from them belonging to at least 49 species.

1. *Apodemus agrarius* (Pallas)

A total 30 *A. agrarius* were collected; of them 208 arthropods belonging to at least 26 species were obtained. The most numerous was host-nest dwelling group (69.7%) of the collection. The host-dwelling group making up 22.1% and nest-dwelling 8.2% of the collection. The greatest number of species was noted in the host-nest dwelling – 13; in the nest-dwelling group was found 9 species and in host-dwelling group only two species. One eudominant *G. hypuadei* (22.6%); four dominants: *H. zachvatkini* (13.5%), *L. pavlovskiyi* (11.0%), *I. ricinus* (10.1%) and *C. agyrtes* (9.1%); 6 subdominants, 3 recedents and 12 subprecedents were found.

The number of species is distinctly lower than from stripe field mouse from field groves (26 to 44). It is remarkable relatively low number of *P. serrata*.

Table 8

Arthropods of host-dwelling group collected on small mammals from meadow wet groves.
1 – *C. glareolus*, 2 – *A. agrarius*, 3 – *A. tauricus*, 4 – *S. araneus*, 5 – *L. capensis*

Species	1	2	3	4	5	Total
Anoplura						
1. <i>Polyplax serrata</i> (Burmeister)		10				10
2. <i>Hoplopleura affinis</i> (Burmeister)		5				5
3. <i>H. edentula</i> Fahrenholz	77					77
Prostigmata						
4. <i>Radfordia lemnina</i> (Koch)	3					3
5. <i>Myobia musculi</i> (Schrank)			1			1
6. <i>Protomyobia onoi</i> Jameson, Dusb.				12		12
7. <i>Amorphacarus elongatus</i> (Poppe)				8		8
Astigmata						
8. <i>Listrophorus brevipes</i> Dubinina	82	8				90
9. <i>Leporacarus gibbus</i> (Pagenstech.)					30	30
10. <i>Myocoptes japonensis</i> (Radford)	4					4
11. <i>Trichoecius tenax</i> (Michael)	1					1
Mesostigmata						
12. <i>Laelaps pavlovskiyi</i> Zachvatkin		23				23
13. <i>L. agilis</i> Koch			24			24
14. <i>Hyperlaelaps microti</i> (Ewing)	1					1
Total	168	46	25	20	30	289

2. *Clethrionomys glareolus* Schreber

A total 27 *C. glareolus* were caught; of them 593 arthropods belonging to 31 species were collected. The species representing the host-nest dwelling group had the greatest part in the community (68.8%), those of the host-dwelling group were less numerous (28.3 %), and the nest-dwelling group was the rarest (2.9%). The host-nest dwelling group were the richest in species comprising (15); only 10 species were in nest-dwelling group and host-dwelling group was represented by 6 species. Two eudominants were noted: *H. zachvatkini* (38.3%) and *G. hypuadei* (17.4%); two dominants: *H. edentula* (13.0%) and *L. brevipes* (13.8%); 3 subdominants, 2 recedents and 22 subprecedents. The community comprised species only occasionally occurring on mammals as *Eviphys ostrinus* (Koch).

The remaining mammals species were caught in low number (only 9 specimens) and had small number of mite species (Tables 8–10).

Table 9

Arthropods of host-nest-dwelling group collected on small mammals from meadow wet groves.
1 – *C. glareolus*, 2 – *A. agrarius*, 3 – *A. tauricus*, 4 – *S. araneus*

Species	1	2	3	4	Total
Siphonaptera					
1. <i>Ctenophthalmus agyrtes</i> (Heller)	12	19	4	2	37
2. <i>C. assimilis</i> (Taschenberg)	3	1	1		5
3. <i>Megabothris turbidus</i> (Rothschild)	9	2	1		12
4. <i>Nosopsyllus fasciatus</i> (Bosc)	1				1
5. <i>Palaeopsylla soricis</i> (Dale)				13	13
Prostigmata					
6. <i>Hirsutiella zachvatkini</i> (Schluger)	227	28	4		259
7. <i>Miyatrombicula muris</i> (Oudemans)	13	4	1		18
8. <i>Neotrombicula</i> sp.	2				2
Astigmata					
9. <i>Glycyphagus hypuadei</i> (Koch)	103	47	3		153
10. <i>Acarus nidicolous</i> Griffiths	6	2		2	10
11. <i>Xenoryctes krameri</i> (Michael)				1	1
Ixodida					
12. <i>Ixodes ricinus</i> (L.)	24	21	1		46
Mesostigmata					
13. <i>Echinonyssus sunci</i> (Wang)		6	1		7
14. <i>E. isabellinus</i> (Oudemans)	3	1			4
15. <i>E. soricis</i> (Turk)				1	1
16. <i>Haemogamasus nidi</i> (Michael)	2	8	3		13
17. <i>H. hirsutus</i> Berlese	1	2	1		4
18. <i>Eulaelaps stabularis</i> (Koch)	1	4	1		6
19. <i>Androlaelaps fahrenheitzi</i> (Berlese)	1				1
Total	408	145	21	19	593

Table 10

Arthropods of nest-dwelling group collected on small mammals from meadow wet groves.

1 - *C. glareolus*, 2 - *A. agrarius*, 3 - *A. tauricus*, 4 - *S. araneus*, 5 - *L. capensis*

Species	1	2	3	4	5	Total
Prostigmata						
1. Pygmephorus spinosus (Kramer)	1					1
2. Bakerdania sp.	4	5		2		11
3. Cheyletus eruditus Schrank					1	1
Astigmata						
4. Acarus farris (Oudemans)	2					2
5. Acaridae	1					1
6. Glycyphagidae		1				1
Cryptostigmata						
7. Oribatida	4	4				8
Mesostigmata						
8. Vulgarogamasus remberti (Oud.)		1				1
9. Poecilochirus carabi G. et R. Canestrini			1			1
10. Parasitidae	1	1		16		18
11. Eviphis ostrinus (Koch)	1	1				2
12. Alliphis halleri (G. et R. Canestrini)	1					1
13. Lasioseius confusus Evans		2				2
14. Hypoaspis sardoa (Berlese)	1					1
15. H. aculeifer (Canestrini)		1				1
16. Proctolaelaps pygmaeus (Müll.)	1	1				2
Total	17	17	1	18	1	54

IV. Parks and cemeteries

As many as 201 small mammals belonging to 6 species were caught in these environments but only *C. glareolus* (108 - 53.7%) and *A. agrarius* (68 - 3.8%) were fairly abundant and *A. tauricus* relatively frequent. A total 2146 mites were obtained belonging to at least 69 species.

1. *Clethrionomys glareolus* Schreber

From *C. glareolus* examined, 1428 arthropods belonging to at least 47 species were collected. The group of host-nest-dwelling arthropods was the most frequent (55.7%) while the nest-dwelling species were the rarest (11.6%). The nest-dwelling group was represented by the greatest number of species (23). The host-nest-dwelling group comprised also numerous species (15). The host-dwelling group was represented by 9 species, of which 3 were permanently attached to their host species. Within this community 2 eudominants were noted: *Hoplopleura edentula* (25.8) and *G. hypuadei* (17.9%); two dominants: *C. agyrtes* and *H. nidi*; 8 subdominants, 4 recedents and 31 subrecedents. Four dominant species formed as many as 60% of the community. Among species rarely noted

on mammals was found *Hypoaspis helianthi* Samš. and 3 undetermined species belonging to the genus *Zercon*.

2. *Apodemus agrarius* (Pallas)

As many as 389 arthropods representing 38 species were collected from 68 *A. agrarius* (Table 11-13). Proportionally the greatest part of the collection constituted arthropods representing the host-dwelling group (44.5%), less numerous were those of the host-nest-dwelling group (42.7%) and the nest-dwelling group (12.8%). Two eudominants *P. serrata* (21.3%) and *C. agyrtes* (18.7%) were noted, 3 dominants: *L. pavlovskyi* (14.3%), *H. nidi* (6.6%) and *H. affinis* (6.1%); 4 subdominants, 8 recedents and at least 21 subrecedents.

Table 11

Arthropods of host-dwelling group collected on small mammals from parks and cemeteries.

1 - *C. glareolus*, 2 - *P. subterraneus*, 3 - *A. agrarius*, 4 - *A. tauricus*,5 - *S. araneus*, 6 - *C. suaveolens*

Species	1	2	3	4	5	6	Total
Anoplura							
1. Polyplax serrata (Burmeister)	1		83	1			85
2. Hoplopleura affinis (Burmeister)			24	2			26
3. H. edentula Fahrenheit	368			1			369
Prostigmata							
4. Myobia agraria Gorissen et Luk.			7				7
5. M. musculi (Schrank)	2			2			4
6. Protomyobia onoi James. et Dus.					1		1
7. Amorphacarus elongatus (Poppe)					1		1
8. Radfordia lemnina (Koch)	13		1		1		15
9. Psorer gates apodemi Fain et al.				60			60
Astigmata							
10. Listrophorus brevipes Dubinina	22	18	1				41
11. Afrolistrophorus apodemi (Fain)					7		7
12. Myocoptes japonensis (Radford)	57					1	58
13. M. musculus (Koch)			1				1
14. Trichoecius tenax (Michael)	3					1	4
Mesostigmata							
15. Laelaps pavlovskyi Zachvatkin			56		1		57
16. L. agilis Koch				73	1		74
17. L. hilaris Koch	1						1
18. Hyperlaelaps microti (Ewing)	1						1
Total	468	18	173	139	12	2	812

Table 12

Arthropods of host-nest-dwelling group collected on small mammals from parks and cemeteries.
1 – *C. glareolus*, 2 – *P. subterraneus*, 3 – *A. agrarius*, 4 – *A. tauricus*, 5 – *S. araneus*,
6 – *C. suaveolens*

Species	1	2	3	4	5	6	Total
Siphonaptera							
1. Ctenophthalmus agyrtes (Heller)	121	1	73	12		1	208
2. C. assimilis (Taschenberg)	1						1
3. Monopsyllus sciurorum (Schrank)	1						1
4. Hystrichopsylla talpae (Curtis)			2	1			3
5. Palaeopsylla soricis (Dale)	1				1		2
6. Megabothris turbidus (Roths.)	30	1	8	1			40
Prostigmata							
7. Miyatrombicula muris (Oudemans)	62						62
8. Neotrombicula autumnalis (Shaw)			1	1			2
9. Hirsutiella zachvatkini (Schluger)	39						39
Astigmata							
10. Orycterovenus soricis (Oudem.)					26		26
11. Glycyphagus hypuadei (Koch)	256		5	19			280
12. Acarus nidicolous Griffiths	20		6	3			29
13. Xenoryctes krameri (Michael)	35		11				46
Ixodida							
14. Ixodes ricinus (L.)	64		11	14			89
Mesostigmata							
15. Echinonyssus isabellinus (Oudemans)	29		1				30
16. E. sunci (Wang)			5	4			9
17. Haemogamasus nidi (Michael)	112	1	26	25	2		166
18. H. hirsutus Berlese	2		3				5
19. Eulaelaps stabularis (Koch)	20		11	12			43
20. Androlaelaps fahrenheitzi (Berlese)	2		3				5
Total	795	3	166	92	29	1	1086

Among species rarely noted on mammals can be mentioned *E. ostrinus*, *Lasioseius berlesei* and *Eugamasus berlesei*.

3. *Apodemus tauricus* Pallas

21 *A. tauricus* examined gave 262 arthropods belonging at least to 24 species (part of species non identified) (Tables 11–13). The group of host-dwelling species was the most frequent (55.7%). The host-nest dwelling group less numerous (34.7%) and the nest-dwelling group was the rarest (9.5%). Two eudominants: *L. agilis* (27.9%) and *Psorergates apodemi* (22.9%) were noted; 3 dominants: *H. nidi* (9.5%), *G. hypuadei* (7.3%) and *I. ricinus* (5.3%); 5 subdominants, 4 recedents and 10 subprecedents. The important species *I. ricinus*, in examined environments is the most numerous on *A. tauricus* (on *C. glareolus* – 4.5% and *A. agrarius* – 2.8%).

Table 13

Arthropods of nest-dwelling group collected on small mammals from parks and cemeteries.
1 – *C. glareolus*, 2 – *P. subterraneus*, 3 – *A. agrarius*, 4 – *A. tauricus*,
5 – *S. araneus*, 6 – *C. suaveolens*

Species	1	2	3	4	5	6	Total
Prostigmata							
1. Bakerdania sp.	37	1	11	6	1		56
2. Eucheyletia flabellifera (Michael)	4	1					5
3. Pygmephorus spinosus (Kramer)	2						2
Astigmata							
4. Prowichmannia spinifera (Michael)	10		8	1			19
5. Glycyphagidae	2						2
6. Acarus sp.	2						2
7. Tetranychidae	2			1			3
Cryptostigmata							
8. Oribatida	9		4				13
Mesostigmata							
9. Porrhostaspis lunulata (Müller)	4		5				9
10. Vulgarogamasus remberti (Oud.)	5		3	7			15
11. V. kraepelini (Berlese)	2		2				4
12. Eugamasus berlesei Willmann			1				1
13. E. magnus Kramer	1						1
14. Poecilochirus carabi G. et R. Canestrini				1			1
15. Pergamasus brevicornis Berlese			1				1
16. Pergamasus sp.	1						1
17. Parasitidae	15			3	1	1	20
18. Geholaspis longispinosus (Kramer)	2						2
19. Macrocheles matrius (Hull)	1						1
20. Eviphis ostrinus (Koch)			1				1
21. Cyrtolaelaps mucronatus (G. et R. Canestrini)	1		1		1	1	4
22. C. minor Willmann			1				1
23. Hypoaspis heselhausi Oudemans		1					1
24. H. helianthi Samšinak	1						1
25. Androlaelaps sp.			1				1
26. Euryparasitus emarginatus (Koch)	1		2	1			4
27. Lasioseius berlesei (Oudemans)			1				1
28. Proctolaelaps pygmaeus (Müll.)	57		8	4		4	73
29. Zercon sp.	3						3
30. Uropodida	2			1			3
Total	164	3	50	25	3	6	251

DISCUSSIONS AND CONCLUSIONS

1. From four various wooded areas examined in Wrocław in total were obtained 472 small mammals. From them were collected 5446 arthropods belonging to at least 106 species.

2. The arthropod fauna in three biotopes: forests, field groves and parks and cemeteries were rich and above 60 species were found.

3. The richest arthropod fauna was found on *C. glareolus*, *A. agrarius* and *A. tauricus*.

4. *Ixodes ricinus*, mite of epidemiological importunes was noted in the most number in the meadow wet groves – 0.70 (the mean intensity of invasion counted for all examined mammals) and in municipal forests – 0.68. Relatively high index was found also in parks and cemeteries – 0.44; distinctly lower it was in field groves – 0.24 and meadows – 0.15 (noted earlier by Haitlinger [8]). The most infected small mammals by *I. ricinus* were *A. tauricus* from forests – 2.23 and parks and cemeteries – 0.65; also *C. glareolus* from the meadow wet groves – 0.89, parks and cemeteries – 0.59 (in forests barely – 0.39). Two very numerous species in the town, *A. agrarius* and *M. arvalis* were infested by *I. ricinus* relatively weakly, except *A. agrarius* from the meadow wet groves – 0.70. Above mentioned values were relatively low (except *A. tauricus*). Vlcek and Maca [12] stated higher values for small mammals living in dumps placed in various environments at Ceske Budejovice, f. e. the mean intensity of invasion for *C. glareolus* was varied between 1.50 – 3.78, *M. arvalis* 0.54 – 2.24 and in *S. araneus* 0.17 – 6.20.

5. The structure of mammals fauna have obviously an effect on structure of arthropod fauna. The most number of the mite species in Wrocław agglomeration were found by Haitlinger [8] on meadows – 85; relatively many species were found also on small mammals from ruins [5], parks and cemeteries, field groves and municipal forests (above 60).

6. Generally richness of arthropod fauna in Wrocław are determined by 6 species: *C. glareolus*, *M. arvalis*, *A. agrarius*, *A. tauricus*, *S. araneus* and *C. suaveolens* but in different degree in various biotopes. Among two the most numerous small mammals in Wrocław, *A. agrarius* and *C. glareolus* in the examined biotopes the most number of mite species was noted in the field groves for *A. agrarius* [14] and parks and cemeteries for *C. glareolus* [47]. Also *C. glareolus* living in the field groves had high number of mite species [42].

7. Haitlinger [4] was given the mean intensity of invasion counted for non-wooded areas of urban agglomeration of Wrocław for the commonest small mammals in the town. The highest mean intensity was noted on *C. glareolus* – 77.5, but this index was counted for the whole population of Wrocław is a many lower – 20.28. Namely the highest mean intensity of invasion was found on *C. suaveolens* 23.02, relatively high this index was found also on *M. arvalis* 19.42 and *A. tauricus* 17.04; relatively low index was on *S. araneus* 8.73 and *A. agrarius* 7.32.

8. Is interesting comparison of arthropod fauna from urban agglomeration with such fauna from exactly examined mountains such as Góry Sowie (Middle Sudetes), Pieniny Mts. and Babia Góra [2, 3, 7]. The total in Wrocław agglomeration was stated 136 mite species, when in Góry Sowie was found 118 species, in Pieniny 98 species and in Babia

Góra only 86 species, although greater numbers of mammals species in these mountain areas and the presence of the specific mountainous mite species were noted.

9. From small mammals living in urban agglomeration were collected the species very rare noted on them or never hitherto not found on small mammals. Besides of 7 species mentioned by Haitlinger [8] to such species belong *Hauptmannia kazimierae* Haitlinger, *Leptus clethrionomydis* Haitlinger, *Podothrombium* sp. (near *P. proti* Haitlinger obtained from *A. agrarius* collected in ZOO – in paper from 1989 not mentioned), *Balaustium* sp. from *T. europaea* (as above), *Hypoaspis helianthi* Samšínak, *Poecilochirus subterraneus* (Müll.) (in Poland was noted on *Sciurus vulgaris* L., usually stated on some scarabaeids and *Otodectes cynotis* (Hering) [4, 6, 8, 9, 10].

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**ZGRUPOWANIA STAWONOGÓW WYSTĘPUJĄCE
NA DROBNYCH SSAKACH Z ZALESIONYCH OBSZARÓW
AGLOMERACJI MIEJSKIEJ WROCŁAWIA**

S t r e s z c z e n i e

W różnych zalesionych obszarach badanych we Wrocławiu złowiono 472 drobne ssaki. Zebrano z nich 5446 stawonogów należących do 106 gatunków. Fauna stawonogów w lasach, laskach śródpolnych, parkach i cmentarzach była bogata i w każdym z nich stwierdzono ponad 60 gatunków. Najbogatszą faunę stawonogów stwierdzono na *Clethrionomys glareolus*, *Apodemus agrarius* i *A. tauricus*.

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