

Arthropod communities occurring on small mammals from non-wooded areas of urban agglomeration of Wrocław

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Abstract — HAITLINGER R. 1989. Arthropod communities occurring on small mammals from non-wooded areas of urban agglomeration of Wrocław. *Acta Parasitologica Polonica*, 34, 1, 45-66

Examination of 552 mammals belonging to 13 species revealed as many as 8560 arthropods 115 species. The structure of biological groups within arthropod communities is described as well as the pattern of dominance and mean intensity of infestation of mammalian hosts. The most diverse fauna of arthropods was observed on mammals inhabiting meadows. The richest fauna of arthropods (number of species) was noted on *Apodemus agrarius* and *Microtus arvalis*, while the highest mean intensity occurred on *Clethrionomys glareolus*.

In traditionally built urban agglomeration, non-wooded areas occupy most part of the territory; this is also the case of Wrocław. Tight building-up of the city centre gives the possibility to live to only 3 species of synantropic mammals. Only some fragments of the city centre, such as non-exploited or areas of ruins, allotment gardens, the borders of canals and railway embankments give living conditions to more species. These animals find fairly good conditions also in parks and cemeteries, in wasted gardens and zooparks. They may find almost natural conditions at the peripheries of dispersed buildings, in urban woods, meadows and fields as well as in shrubs along roads and canals.

In the present paper arthropod communities occurring on small mammals in non-wooded urban areas, such as near buildings, allotment gardens, municipal and house gardens, meadows and areas covered with herbaceous plants and railway embankments are described. Such an investigation has not yet been carried out in Poland except arthropod parasites of rats in ports of Gdynia and Gdańsk (WEGNER and KRUMINIS-ŁOZOWSKA 1984), fleas in urban agglomeration of Wrocław and arthropods on small mammals in areas of ruins (HAITLINGER 1971, 1986 c). The present paper is a part of the continuing study on arthropods occurring on small mammals in various biotopes of urban agglomeration of Wrocław.

Material and methods

Trapping of mammals was carried out with variable intensity throughout the year depending on the possibility of accomplishment. The most difficult areas in which to collect were those on factory premises and in house gardens — the material collected there was very scarce. More

canals in Sepolno, at flood banks and along canals in Swojczyce, on boggy meadows in Kowale and on meadows of the water supply system in Świątniki. The word "meadow" here means the area covered with grass, other herbaceous plants, reeds and single shrubs.

The investigation was carried out in 1980–1985. Mammals were caught into snap-traps in all the seasons of the year, from February to December. The animals caught were kept in linen sacks. After anesthetization with chloroform the arthropods were combed out from their fur; those attached to the skin were taken out under the binocular microscope.

In total 522 mammals belonging to 13 species were examined and 8560 arthropods, representing at least 115 species, collected from them (Table I with the data concerning ruin biotope after HAITLINGER 1986c added).

Results

Meadows and herbaceous plant areas

As many as 331 mammals belonging to 11 species were caught in meadows but only *Apodemus agrarius* and *Microtus arvalis* were fairly abundant and *Sorex araneus* frequent. Another species, *Talpa europaea*, also occurred frequently but due to difficulty of trapping only one specimen was examined.

Arthropod communities on *Apodemus agrarius*

A total of 135 *A. agrarius* were caught during the whole year except February and August in monthly samples of 2–35 specimens. The furnished 1185 arthropods belonging to at least 57 species (Tables II–IV). The group of host-dwelling parasites was the most frequent (67%) while the nest-dwelling species were the rarest (7%). The latter were represented by the greatest number of species (23) but usually by single specimens. The host-nest-dwelling group comprised also numerous species (22). The host-dwelling group was represented by 12 species, four of which were permanently attached to their host species. Within this community 2 eudominants were noted (more than 15% of the collection): *Listrophorus brevipes* and *Hoplopleura affinis*, 3 dominants (5.1–15): *Laelaps pavlovskyi*, *Polyplax serrata*, *Glycyphagus hypuadei*, 2 subdominants (2.1–5), 6 recedents (1.1–2.0), and 44 subrecedents (below 1.1%). Five dominant species formed as many as 70% of the community. The most numerous species, *L. brevipes*, was rarely recorded from *A. agrarius*. In the case described here the prevalence of this parasite was low. Among species characteristic of field mice, *Myobia agraria* (subrecedent) and *Trichoecius widawaensis*, were very rare. For the first time in Poland a coleopteran *Leptinus testaceus* was noted on *A. agrarius*.

Arthropod communities on *Microtus arvalis*

As many as 3305 arthropods representing 42 species (Tables II–IV) were found on 122 *M. arvalis* examined. The mammals were caught in all months of the year except February and August, in monthly samples of 3–44 specimens. The species representing the host-dwelling group had the greatest part in the community (63.6), those of the host-nest-dwelling group were less numerous

Table II. List of arthropods of host-dwelling group collected on mammals from meadows

Species	<i>A. agrarius</i>	<i>A. tauricus</i>	<i>M. minutus</i>	<i>C. glareolus</i>	<i>M. arvalis</i>	<i>P. subterraneus</i>	<i>S. araneus</i>	<i>S. minutus</i>	<i>C. suaeolens</i>	<i>T. europaea</i>	Total
<i>Anoplura</i>											
<i>Polyplax serrata</i> (Burmeister, 1839)	120						1				121
<i>Hoplopleura affinis</i> (Burmeister, 1839)	233										233
<i>Hoplopleura acanthopus</i> (Burmeister, 1839)					420		1				421
<i>Hoplopleura edentula</i> Fahrenholz, 1916				17			1				18
<i>Prostigmata</i>											
<i>Myobia agraria</i> Gorissen et Lukoschus, 1982	6										6
<i>Myobia micromydis</i> Lukoschus et Driessen, 1970		1									1
<i>Protomyobia onoi</i> Jameson et Dusbabek, 1971				1			32				33
<i>Protomyobia claparedei</i> (Poppe, 1896)							3				3
<i>Eadiea brevihamata</i> Haller, 1882									5		5
<i>Amorphacarus elongatus</i> (Poppe, 1896)							44	1			45
<i>Radfordia lemnina</i> (Koch, 1841)	1			27	12	1					41
<i>Psorergates polonicus</i> Haitlinger, 1986						12					12
<i>Psorergates olawaensis</i> Haitlinger, 1987									1		1
<i>Astigmata</i>											
<i>Listrophorus brevipes</i> Dubinina, 1968	288	1	2018	16	19	27					2369
<i>Myocoptes japonensis</i> (Radford, 1959)	1	1	20	7	7	3					39
<i>Myocoptes</i> sp.	8										8
<i>Trichoecius tenax</i> (Michael, 1889)	1		2	32	3						38
<i>Trichoecius widawaensis</i> Haitlinger, 1986	1										1
<i>Mesostigmata</i>											
<i>Hyperlaelaps microti</i> (Ewing, 1933)	1	1	5	141			1	1			150
<i>Laelaps pavlovskyi</i> Zachvatkin, 1948	125		1								126
<i>Laelaps hilaris</i> Koch, 1836	9		1	1546			1				1557
<i>Laelaps agilis</i> Koch, 1836		11									11
Total	794	12	3	2082	2174	42	114	2	1	5	5229

(29.9), and the nest-dwelling group was the rarest (4.5%). The nest- and host-nest-dwelling groups were the richest in species comprising 19 and 16 species respectively, while the host-dwelling group was represented by only 9 species. No foreign species was found in the host-dwelling group on *M. arvalis*.

One eudominant was noted: *Laelaps hilaris*, 2 dominants: *G. hypuadei* and *Hoplopleura acanthopus*, 3 subdominants: *Hyperlaelaps microti*, *Xenoryctes krameri* and *Acarus* sp., 4 recedents and 32 subrecedents. The eudominant was much more numerous than other species, forming 46.9% of the community.

Table III. List of arthropods of host-nest group collected on mammals from meadows

Species	<i>A. agrarius</i>	<i>A. tauricus</i>	<i>A. sylvaticus</i>	<i>M. minutus</i>	<i>C. glareolus</i>	<i>M. arvalis</i>	<i>P. subterraneus</i>	<i>S. araneus</i>	<i>S. minutus</i>	<i>C. suaveolens</i>	<i>T. europaea</i>	Total
<i>Siphonaptera</i>												
<i>Ctenophthalmus agyrtus</i> (Heller, 1896)	59	1		13	51	1	1					126
<i>Ctenophthalmus assimilis</i> (Taschenberg, 1880)	2			1	42	2	2					49
<i>Megabothris turbidus</i> (Rothschild, 1909)	20			7	18		1					46
<i>Palaeopsylla soricis</i> (Dale, 1878)	1						34					35
<i>Hystrihopsylla talpae</i> (Curtis, 1826)	1			1								2
<i>Leptopsylla segnis</i> (Schönherr, 1811)	1											1
<i>Prostigmata</i>												
<i>Neotrombicula autumnalis</i> (Shaw, 1790)	8	4		5	16		1	1				35
<i>Neotrombicula talmiensis</i> (Schluger, 1955)	1											1
<i>Neotrombicula</i> sp.	1			2								3
<i>Hirsutiella zachvatkini</i> (Schluger, 1948)	16			44	30	4						94
<i>Miyatrombicula muris</i> (Oudemans, 1910)				2								2
<i>Cheladonta costulata</i> (Willmann, 1952)						2						2
<i>Astigmata</i>												
<i>Xenoryctes krameri</i> (Michael, 1886)	21	2	1	6	108	5	27	2	2			174
<i>Glycyphagus hypuadei</i> (Koch, 1841)	70	2	1	39	475	19	48	1	1			656
<i>Orycteroxenus soricis</i> (Oudemans, 1915)	8	1			4		84	3				100
<i>Acarus nidicolous</i> Griffiths, 1970	3	1			36							40
<i>Labidophorus talpae</i> Kramer, 1877										29		29
<i>Ixodida</i>												
<i>Ixodes ricinus</i> (L., 1746)	4					21		24				49
<i>Mesostigmata</i>												
<i>Echinonyssus sunci</i> (Wang, 1962)	41				2							43
<i>Echinonyssus isabellinus</i> (Oudemans, 1913)	9	2				59	1	2				73
<i>Echinonyssus carnifex</i> (Koch, 1839)											19	19
<i>Echinonyssus soricis</i> (Turk, 1945)								7				7
<i>Haemogamasus nidi</i> (Michael, 1892)	20	1			65		1					87
<i>Haemogamasus horridus</i> Michael, 1892	2											2
<i>Haemogamasus hirsutus</i> Berlese, 1889	1	1			2	6		1				11
<i>Androlaelaps fahrenheitii</i> (Berlese, 1911)	10					38						48
<i>Eulaelaps stabularis</i> (Koch, 1836)	6				3	11					1	21
Total	305	3	13	1	127	982	32	233	6	4	49	1755

Table IV. List of arthropods of nest-dwelling group collected on mammals from meadows

Species	<i>A. agrarius</i>	<i>A. tauricus</i>	<i>M. minutus</i>	<i>C. glareolus</i>	<i>M. arvalis</i>	<i>P. subterraneus</i>	<i>S. araneus</i>	Total
<i>Prostigmata</i>								
<i>Pygmephorus stammeri</i> Krczal, 1959	1							1
<i>Pygmephorus spinosus</i> (Kramer, 1877)	5				3			8
<i>Pygmephorus erlangensis</i> Krczal, 1959							1	1
<i>Bakerdania</i> sp.	5		1	4	9	2	2	23
<i>Eucheyletia flabellifera</i> (Michael, 1878)						1	1	2
<i>Anystis baccarum</i> (L. 1758)					1			1
<i>Erythraeus dubiosus</i> Schweizer, 1951					1			1
<i>Astigmata</i>								
<i>Acarus farris</i> (Oudemans, 1905)	1							1
<i>Acarus</i> sp.	3				90			93
<i>Acaridae</i>								
<i>Glycyphagidae</i>	5				2		1	1
<i>Prowichmannia spinifera</i> (Michael, 1901)	15						2	9
<i>Anoetus sapromyzarum</i> Dufour, 1839							1	16
<i>Cryptostigmata</i>								
<i>Oribatida</i>	5					6		11
<i>Mesostigmata</i>								
<i>Vulgarogamasus remberti</i> (Oudemans, 1912)	1			3	3			7
<i>Vulgarogamasus kraepelini</i> (Berlese, 1905)	2				1			3
<i>Amblygamasus septentrionalis</i> (Oudemans, 1902)	1							1
<i>Porrhostaspis lunulata</i> (Müller, 1859)	2			1	4			7
<i>Poecilochirus carabi</i> G. et R. Canestrini, 1882	1							1
<i>Pergamasus brevicornis</i> Berlese, 1903							1	1
<i>Pergamasus</i> sp.					1	1	1	3
<i>Parasitidae</i>								
<i>Ameroseius corbiculus</i> (Sowerby, 1806)	12	1		1	14	2	4	34
<i>Lasioseius corbiculus</i> (Sowerby, 1806)	1							1
<i>Lasioseius confusus</i> Evans, 1958	3			1	1			5
<i>Lasioseius berlesei</i> (Oudemans, 1938)					2		2	4
<i>Lasioseius</i> sp.	2							2
<i>Neojordensia levis</i> (Oudemans et Voigts, 1904)	1							1
<i>Proctolaelaps pygmaeus</i> (Müller, 1860)	16			21	3	7	3	50
<i>Macrocheles matrius</i> (Hull, 1925)					2			2
<i>Macrocheles glaber</i> (Müller, 1860)				1			2	3
<i>Macrocheles</i> sp.							1	1
<i>Eviplis ostrinus</i> (Koch, 1836)	1							1
<i>Euryparasitus emarginatus</i> (Koch, 1839)	1				4			5
<i>Zercon peltatus peltatus</i> (Koch, 1836)					1			1
<i>Uropodida</i>	1				1		1	3
<i>Coleoptera</i>								
<i>Leptinus testaceus</i> Müller, 1817	1							1
Total	86	1	1	32	149	13	24	306

Beyond this only 2 species were numerous: *H. acanthopus* and *G. hypuadei*. The community comprised species regarded as rare in the fauna of Poland, e.g. *Erythraeus dubiosus* (GABRYŚ and HAITLINGER 1986) or only occasionally occurring on mammals: *Zercon peltatus* and *Anystis baccarum* (HAITLINGER 1983, 1985).

Arthropod communities on *Clethrionomys glareolus*

Clethrionomys glareolus occurs rarely in non-wooded areas. They were found among reeds and in areas covered by herbaceous plants and single shrubs in the proximity of woods. Migratory specimens were caught most frequently, rarely reproducing ones or those staying for a longer time in meadows.

Only 18 specimens were caught mainly in the autumn (September–November, 1–13 per month). They furnished 2251 arthropods representing 29 species (Tables II–IV). The host-dwelling group made up 92.9% of the community with one species, *L. brevipes* (89.6% of the whole collection) responsible. The host-nest-dwelling group comprised 9 species including 4 species foreign for *C. glareolus*; the host-nest-dwelling group comprised 13 species and the nest-dwelling group 7 species. These atypical relations between numbers of species in particular groups indicated that *C. glareolus* was an unstable element in the biocenose examined.

One eudominant, *L. brevipes* was found, 3 recedents and 25 subprecedents. Great number of *Hirsutiella zachvatkini* collected (Tab. III) suggest that *C. glareolus* had frequent contacts with woods or shrubs. Among rare species *Lasioseius confusus* ought to be mentioned.

Arthropod communities on *Sorex araneus*

Forty one *S. araneus* examined from April to November (4–7 in various months) furnished as many as 371 arthropods belonging to 38 species (Tables II–IV). The most numerous were host-nest-dwelling species making up 60.9% of the collection. Those of the host-dwelling group formed 30.7, and the nest-dwelling species only 8.4%. The greatest number of species was noted in the nest-dwelling group – 15, the host-nest-dwelling group comprised 13, and the host-dwelling group – 10 species.

One eudominant, *Orycteroxenus soricis* (22.7%) was detected, 7 dominants: *Glycyphagus hypuadei*, *Amorphacarus elongatus*, *Palaeopsylla soricis*, *Proto-myobia onoi*, *Xenoryctes krameri*, *Listrophorus brevipes* and *Ixodes ricinus*. Moreover, 1 recedent and 29 subprecedents were noted.

The great diversity of the arthropod fauna occurring on *S. araneus* is a result of great mobility of this host species but in most cases the collected arthropods were only occasional parasites of this mammal. In the host-dwelling group only 2 species out of 10 were typical parasites of *S. araneus* (*A. elongatus* and *P. onoi*). The frequent occurrence of *I. ricinus* and the greater number of these ticks harboured by *S. araneus* out of all mammals examined is worth noting.

Arthropod communities on other species of mammals

Nine more species of small mammals were caught in meadows (Tables II–IV). In this number *Apodemus tauricus*, *A. sylvaticus* and *Crocidura suaveolens* were foreign species in the biocenosis, *Talpa europaea* was common while *Pitymys subterraneus* and *Sorex minutus* were rare. *Micromys minutus* was rare and difficult to catch. *Arvicola terrestris* and *Ondatra zibethicus* were also present in meadows but no specimens were examined.

Pitymys subterraneus was the most numerous in the present investigation: 6 specimens caught in May (2), June (3) and November (2) furnished 87 arthropods representing 16 species. The most numerous, *L. brevipes*, *G. hypuadei* and *Psorergates polonicus*, participated in 57.5% of the community. Except monoxenic *P. polonicus* no other species was characteristic of *P. subterraneus*.

The arthropod fauna of small mammals in meadows was enriched by *Laelaps agilis* from *Apodemus tauricus*; *Myobia micromydis* from *Micromys minutus*; *Psorergates olawaensis* from *Crocidura suaveolens*; and *Eadiea breviphamata*, *Echinonyssus carnifex* and *Labidophorus talpae* from *Talpa europaea*. The arthropod fauna of the mole was the most diverse out of all mammals mentioned in this chapter.

General remarks on arthropod communities on mammals occurring in meadows

The meadow biocenose in urban agglomeration is inhibited by the richest fauna of small mammals (in both quantitative and qualitative meanings). This is also manifested by the arthropod communities represented by at least 85 species (7300 specimens collected). In this biocenose *A. agrarius* and *M. arvalis* are especially numerous; *S. araneus* and *T. europaea* common; other species less frequent. These less common hosts may be separated into 2 groups: (1) stable components of the biocenose such as *M. minutus* and *P. subterraneus*, and (2) temporary components and wandering individuals such as *A. tauricus*, *A. sylvaticus* and *C. glareolus*. Penetration of meadows by these mammals may be especially frequent at the line bordering on other types of biocenoses. Under favourable conditions some individuals may stay for longer time and even reproduce. In consequence they may have a bearing on the structure of arthropod communities occurring on other mammals in meadows. The richest fauna of arthropods was found on *A. agrarius*: the species collected from this host formed 67.1, those from *M. arvalis* – 49.4, from *S. araneus* – 44.7 and from *C. glareolus* – 34.1% of all the species collected.

The arthropod fauna of mammals occurring in meadows of low productivity or not exploited is rich, e.g. 48 species of arthropods were recorded from *M. arvalis* from the meadow-type railway embankment in Błotnica near Niemcza (HAITLINGER 1981). This number is only slightly higher than that found in meadows of the water supply area in Wrocław. The arthropod fauna on *S. araneus* in Błotnica was richer (58 species) than that found on this host in

Wrocław (38 species), however, this result may be skewed due to the greater number of *S. araneus* examined from Błotnica (HAITLINGER 1984).

The mean intensity of infestation of *C. glareolus* by arthropods — 125.1 (due to massive incidence of *L. brevipipes*) is surprisingly high and shows no correspondence with data in the literature. The same index for *M. arvalis* (27.1) is relatively high, even higher than that noted in fields and pasture, but almost two times lower than in Błotnica (HAITLINGER 1981) and higher than that in areas of ruins in Wrocław (19.1 — after HAITLINGER 1986c). The above enumeration shows that arthropods occurring on *M. arvalis* and in its nests find good conditions for life in humid meadows of the Wrocław agglomeration. The mean intensity of infestation of *S. araneus* (9.0) and *A. agrarius* (8.8) are also high.

Table V. List of arthropods of host-dwelling group collected on mammals from allotment gardens

Species	<i>A. agrarius</i>	<i>A. sylvaticus</i>	<i>M. musculus</i>	<i>M. arvalis</i>	<i>C. glareolus</i>	Total
<i>Anoplura</i>						
<i>Polyplax serrata</i> (Burmeister, 1839)	11					11
<i>Hoplopleura acanthopus</i> (Burmeister, 1839)		1				1
<i>Hoplopleura edentula</i> Fahrenholz, 1916					3	3
<i>Hoplopleura affinis</i> (Burmeister, 1839)	1					1
<i>Prostigmata</i>						
<i>Myobia agraria</i> Gorissen et Lukoschus, 1982	1					1
<i>Myobia multivaga</i> Poppe, 1909		2				2
<i>Radfordia lancearia</i> (Poppe, 1909)		1				1
<i>Radfordia lemnina</i> (Koch, 1841)				1		1
<i>Psorergates muricola</i> Fain, 1961			30			30
<i>Astigmata</i>						
<i>Trichoecius widawaensis</i> Haitlinger, 1986	2					2
<i>Trichoecius tenax</i> (Michael, 1889)	3	1		5		9
<i>Myocoptes japonensis</i> (Radford, 1955)				4	1	5
<i>Myocoptes muscalinus</i> (Koch, 1844)			1			1
<i>Mesostigmata</i>						
<i>Laelaps pavlovskyi</i> Zachvatkin, 1948	4					4
<i>Laelaps agilis</i> Koch, 1836		24		1		25
<i>Laelaps hilaris</i> Koch, 1836				13		13
<i>Hyperlaelaps microti</i> (Ewing, 1933)				3		3
Total	22	29	31	27	4	113

Table VI. List of arthropods of host-nest- and nest-dwelling groups collected on mammals from allotment gardens

Species	<i>A. agrarius</i>	<i>A. sylvaticus</i>	<i>M. musculus</i>	<i>M. arvalis</i>	<i>C. glareolus</i>	Total
<i>Host-nest-dwelling group</i>						
<i>Siphonaptera</i>						
<i>Ctenophthalmus agyrtus</i> (Heller, 1896)	4	4		1	1	10
<i>Ctenophthalmus assimilis</i> (Taschenberg, 1880)				1		1
<i>Megabothris turbidus</i> (Rothschild, 1909)	1	2		2		5
<i>Prostigmata</i>						
<i>Hirsutiella zachvatkini</i> (Schluger, 1948)	1	3		10		14
<i>Neotrombicula autumnalis</i> (Shaw, 1790)					1	1
<i>Astigmata</i>						
<i>Glycyphagus hypuadei</i> (Koch, 1841)	3					3
<i>Xenoryctes krameri</i> (Michael, 1886)	1			1		2
<i>Mesostigmata</i>						
<i>Echinonyssus sunci</i> (Wang, 1962)	101	2				103
<i>Echinonyssus isabellinus</i> (Oudemans, 1913)	1	15		5		21
<i>Haemogamasus nidi</i> (Michael, 1892)	3					3
<i>Haemogamasus hirsutus</i> Berlese, 1889	1					1
<i>Ealaelaps stabularis</i> (Koch, 1836)		1		3	3	7
<i>Androlaelaps fahrenheitzi</i> (Berlese, 1911)	2	3		3		8
<i>Nest-dwelling group</i>						
<i>Prostigmata</i>						
<i>Bakerdania</i> sp.	1	1				2
<i>Pygmephorus spinosus</i> (Kramer, 1877)				1		1
<i>Prowichmannia spinifera</i> (Michael, 1901)		1				1
<i>Astigmata</i>						
<i>Glycyphagidae</i>	2	1		3		6
<i>Acaridae</i>	2					2
<i>Anoetidae</i>	1					1
<i>Mesostigmata</i>						
<i>Proctolaelaps pygmaeus</i> (Müller, 1860)	12	5		7		24
<i>Typhlodromus</i> sp.		2				2
<i>Vulgarogamasus remberti</i> (Oudemans, 1912)	1	1				2
<i>Eugamasus berlesei</i> Willmann, 1935	1					1
<i>Parasitidae</i>	1					1
<i>Macrocheles glaber</i> (Müller, 1860)		1				1
<i>Alliphis siculus</i> (Oudemans, 1905)		4	1	4		9
Total	139	46	1	41	5	232

Allotment gardens

Allotment gardens occupy a large area in the Wrocław agglomeration. Living conditions of small mammals depend on the location of these gardens. These situated in the centre and separated from other green areas have probably a poor fauna, however, the investigation has not been carried out in such territories. In the present investigation only the material from gardens situated at the periphery of the city, in close contact with fields, meadows and shrubs, was examined. Roadside shrubs especially allow penetration of gardens by small mammals in spring and autumn and give them refuge in winter. In late spring and autumn, sometimes in winter, small mammals are stable residents in gardens. However, possibilities of trapping were limited and the material collected was very small. The most numerous in this collection were *A. agrarius*, *M. arvalis* and *A. sylvaticus*.

Arthropod communities on *A. agrarius*

Twelve *A. agrarius* examined in April (1), September (10) and October (1) harboured as many as 161 arthropods representing 24 species (Tables V–VI). Only one eudominant, *Echinonyssus sunci*, was noted and 2 dominants, *Polyplax serrata* and *Proctolaelaps pygmaeus*. Other species were represented by single individuals. The dominant species are not typical parasites of *A. agrarius*, especially *P. pygmaeus*. The number of 101 *E. sunci* collected from gardens is higher than the whole collection of this species from other biotopes. The high number of arthropod species occurring on *A. agrarius* indicates great mobility of field mice and frequent contacts with shrubs. Among rare species *Trichoecius widawaensis* was noted and *Eugamasus berlessei*, rarely recorded from mammals.

Arthropod communities on *M. arvalis*

From 12 *M. arvalis* examined in September (10) and October (2) 68 arthropods belonging to 18 species were collected (Tables V–VI). The most numerous were *Laelaps hilaris* and *Hirsutiella zachvatkini*. The small number of arthropod species found on *M. arvalis* is a result of the rare penetration of adjacent areas by this rodent. Sometimes, however, these mammals wander to areas covered by shrubs as is shown by presence of *H. zachvatkini* on them. Among rare species *Alliphis siculus* ought to be noted.

Arthropod communities on *A. sylvaticus*

At present the species is rare in the territory of Wrocław. Most specimens were caught in gardens. Seven specimens examined in June (1), September (2) and October (4) furnished 74 arthropods representing 20 species (Tables V–VI). Dominant species: *Laelaps agilis* and *Echinonyssus isabellinus*, rare: *Myobia multivaga* and *Radfordia lancearia*.

A small number of arthropods was also collected from 2 *C. glareolus* and 1 *M. musculus* (Tab. VI). *Psorergates muricola* found on *M. musculus* is a new species record in the fauna of Poland (HAITLINGER 1987).

Despite the poor material collected from allotment gardens it may be stated that mammals inhabiting these areas at least during some time bear a fairly diverse fauna of arthropods. It is supposed that the species composition of this fauna depends on the character of neighbouring areas – the more diverse are neighbouring territories the richer the fauna of arthropods which occurs on small mammals. The group of nest-dwelling arthropods comprises species occurring usually in compost, dunghills etc. and from these habitats these arthropods wander to mammals, e.g. *A. siculus*.

Municipal and house gardens

House gardens in urban agglomeration occupy great area but are difficult to investigate. Only two trappings were performed in Wrocław–Biskupin. Municipal gardens, corresponding to house gardens (especially the Botanic Gardens), are much easier to investigate. The ZOO gardens, although maintained in less good order due to great number of buildings and many people walking here and there correspond to conditions found in house gardens. The present material was collected mainly in ZOO. Only one species, *A. agrarius*, was frequent (in ZOO and house gardens) while *R. norvegicus* (in ZOO) and *M. musculus* (in Botanic Gardens) were less numerous. All gardens investigated are situated in the city centre or near to it.

Arthropod communities *A. agrarius*

Thirty four *A. agrarius* examined in April (6), May (7), June (1) and November (17) furnished 162 arthropods representing 30 species (Tables VII–VIII). The material comprised 2 eudominants: *H. affinis* and *L. pavlovskyi*, and 4 subdominants. The most numerous *P. serrata* participated only in 19.1% of the collection. Among species rarely noted on mammals, *Pygmephorus stammeri*, *Hypoaspis sardoa*, *H. aculeifer* and *Geholaspis longispinosus* are recorded.

Arthropod communities on *R. norvegicus*

The rat is very common in the whole city but difficult to catch. For this reason all 12 rats examined were obtained only from ZOO in May (2) and December (10). They furnished 103 arthropods representing 12 species (Tables VII–VIII). The most numerous, *Polyplax spinulosa* participated in 60.2% of the community. *Hypoaspis lubrica*, rarely recorded from mammals, was also numerous (11.7%) as well as *Notoedres muris* (10.7%). For the first time *H. lubrica*, *Macrocheles glaber* and *P. pygmaeus* were noted on *R. norvegicus* in Poland. In qualitative and quantitative senses the collection of arthropods from *R. norvegicus* was poor.

Table VII. List of arthropods of host- and host-nest-dwelling groups collected on mammals from municipal gardens

Species	<i>A. agrarius</i>	<i>A. tauricus</i>	<i>M. musculus</i>	<i>R. norvegicus</i>	<i>C. glareolus</i>	Total
Host-dwelling group						
<i>Anoplura</i>						
<i>Polyplax serrata</i> (Burmeister, 1839)	31					31
<i>Polyplax spinulosa</i> (Burmeister, 1839)				62		62
<i>Hoplopleura affinis</i> (Burmeister, 1839)	24					24
<i>Prostigmata</i>						
<i>Myobia agraria</i> Gorissen et Lukoschus, 1982	4		1			5
<i>Myobia musculi</i> (Schrank, 1781)			6			6
<i>Psorergates apodemi</i> Fain, Lukoschus et Hallmann, 1966		20				20
<i>Radfordia ensifera</i> (Poppe, 1896)				2		2
<i>Astigmata</i>						
<i>Myocoptes musculinus</i> (Koch, 1844)			95			95
<i>Notoedres muris</i> (Megnin, 1880)				11		11
<i>Mesostigmata</i>						
<i>Laelaps pavlovskiyi</i> Zachvatkin, 1948	14		1			15
Host-nest-dwelling group						
<i>Siphonaptera</i>						
<i>Ctenophthalmus agyrtus</i> (Heller, 1896)	25	1	1			27
<i>Megabothris turbidus</i> (Rothschild, 1909)	2					2
<i>Nosopsyllus fasciatus</i> (Bosc, 1800)				1		1
<i>Doratopsylla dasyncema</i> (Rothschild, 1897)	1					1
<i>Astigmata</i>						
<i>Xenoryctes krameri</i> (Michael, 1886)	3					3
<i>Labidophorus talpae</i> Kramer, 1877			2			2
<i>Mesostigmata</i>						
<i>Echinonyssus sunci</i> (Wang, 1962)	4	2				6
<i>Echinonyssus laticutatus</i> (de Meillon et Lavoipierre, 1944)			3			3
<i>Androlaelaps fahrenheitsi</i> (Berlese, 1911)	1					1
<i>Eulaelaps stabularis</i> (Koch, 1836)	1		1			2
<i>Haemogamasus nidi</i> (Michael, 1892)	3	3	1		1	8
<i>Haemogamasus hirsutus</i> Berlese, 1889	2					2
<i>Ixodida</i>						
<i>Ixodes ricinus</i> (L., 1746)			1			1
Total	115	26	112	76	1	330

Table VIII. List of arthropods of nest-dwelling group collected on mammals from municipal gardens

Species	<i>A. agrarius</i>	<i>A. tauricus</i>	<i>M. musculus</i>	<i>R. norvegicus</i>	<i>C. glareolus</i>	Total
<i>Prostigmata</i>						
<i>Pygmephorus stammeri</i> Krczal, 1959	1					1
<i>Pygmephorus spinosus</i> (Kramer, 1877)	1				1	2
<i>Bakerdania</i> sp.	4					4
<i>Cheyletus</i> sp.				1		1
<i>Astigmata</i>						
<i>Prowichmannia spinifera</i> (Michael, 1901)			1			1
<i>Glycyphagidae</i>	3		1	3		7
<i>Acarus</i> sp.				3		3
<i>Cryptostigmata</i>						
<i>Oribatida</i>	8					8
<i>Mesostigmata</i>						
<i>Pergamasus crassipes</i> (L. 1758)	1					1
<i>Pergamasus</i> sp.	3	3				6
<i>Porrhostaspis lunulata</i> (Müller, 1859)	2					2
<i>Parasitidae</i>	11	1	4		1	17
<i>Geholaspis longispinosus</i> (Kramer, 1876)	2		1			3
<i>Macrocheles glaber</i> (Müller, 1860)				4		4
<i>Macrocheles</i> sp.	1					1
<i>Hypoaspis sardoa</i> (Berlese, 1911)	1					1
<i>Hypoaspis aculeifer</i> (Canestrini, 1884)	2					2
<i>Hypoaspis claviger</i> (Berlese, 1883)			4			4
<i>Hypoaspis lubrica</i> Oudemans et Voigts, 1904				12		12
<i>Androlaelaps fenilis</i> (Megnin, 1876)			2			2
<i>Proctolaelaps pygmaeus</i> (Müller, 1860)			12	2		14
<i>Typhlodromus</i> sp.	1					1
<i>Amblyseius</i> sp.					1	1
<i>Cyrtolaelaps mucronatus</i> (G. et R. Canestrini, 1881)	1				1	2
<i>Ameroseius</i> sp.				1		1
<i>Uropodida</i>	2			1		3
<i>Euryparasitus emarginatus</i> (Koch, 1839)	3					3
Total	47	4	25	27	4	107

Arthropod communities on *M. musculus*

From 8 mice examined in May (2), June (2) and August (4) 137 arthropods belonging to 17 species were collected (Tables VII–VIII). *Myocoptes musculinus* was dominant in the community (69.3%), while *Echinonyssus laticutatus* and *Hypoaspis claviger* rare. Finding of *Labidophorus talpae* indicates frequent contacts of mice with moles. *Geholaspis longispinosus*, *Myobia agraria*, *L. pavlovskyi*, *Androlaelaps fenilis* and *Prowichmannia spinifera* are for the first time recorded on mice. Relatively great number of arthropod species occurring on *M. musculus* shows that this host species is frequently in contacts with other habitats.

The fauna of arthropods occurring on small mammals inhabiting house and city gardens is poor in comparison with that from meadows. Synantropic mice and rats (*M. musculus* and *R. norvegicus*) commonly inhabit these biotopes while other species can persist there for only a short time – their nests and burrows are destroyed during cultivation of the soil.

Railway embankments

Railway embankments occupy a great area in Wrocław agglomeration being situated at the periphery as well as in the centre. Most frequently they are inhabited by mammals permanently living in this biotope, or embankments may serve as migratory routes for some individuals. In many places the embankments are in contact with allotment gardens, areas of ruins, meadows and etc. that allow the exchange of mammals and frequent contacts between inhabitants of various biotopes. Due to these facts the arthropod fauna of small mammals living on the embankments was treated distinctly in the present investigation.

The research was carried out on the embankment covered with grass, other plants and blackberry shrubs. This part of the embankment was in contact with a factory the territory of which resembled a ruin biotope. Mammals, represented by 7 species, furnished 443 arthropods belonging to at least 48 species. The most frequent was *A. agrarius* while *M. musculus* and *M. arvalis* were common. Beside areas of ruins the embankment was the only biotope in which *C. suaveolens* occurred permanently (it was only an occasional visitor in meadows).

Arthropod communities on *A. agrarius*

As many as 193 arthropods representing 31 species were collected from 39 *A. agrarius* examined from April to November in monthly samples of 2–7 individuals (Tables IX–X). Proportionally the greatest part of the collection constituted arthropods representing the host-nest-dwelling group (53.9), less numerous were those of the host-dwelling group (25.3) and the nest-dwelling group (20.8%). One eudominant, *E. sunci*, was noted (17.1%), 5 dominants: *C. agyrtes*, *P. serrata*, *A. fahrenheitzi*, *H. affinis* and *P. pygmaeus*, and 4 subdominants.

Two facts are worth mentioning: dominance of *H. sunci* (but not so high as in allotment gardens) and presence of a non-parasitic species, *P. pygmaeus*. Among rare species the following ones were noted: *Criniscansor apodemi* (new record in the fauna of Poland – HAITLINGER 1987), *Hypoaspis karawaiewi* (first record from mammals) and *Neotrombicula japonica*.

Arthropod communities on *M. arvalis*

Out of 18 *M. arvalis* examined in May (4), July (1) and September to November (1–4) as many as 112 arthropods belonging to 21 species were collected (Tables IX–X). The most numerous were arthropods of the host-nest-dwelling group (52.7) and the host-dwelling group (40.2%). One eudominant was distinguished: *L. hilaris*, and 4 dominants: *Haemogamasus nidi*, *Ctenophthalmus assimilis*, *A. fahrenheitzi* and *Radfordia lemnina*. The occurrence of a mallophagan species *Myrsidella consimilis** (*Myrsidea*) (first record from mammals), as well as the rather surprising finding of *N. japonica* and *H. zachvatkini* in an urban agglomeration are noted.

Arthropod communities on *M. musculus*

Mice commonly occurred on the embankment, probably they wandered from the neighbouring factory premises. Fifteen mice examined in May–June and September–November (2–5 specimens per month) gave only 40 arthropods belonging to 13 species (Tables IX–X). *M. musculus* was the only species numerous in the collection.

Arthropod communities on other species of mammals

Seven *C. suaveolens* examined in June (3), July (2) and November (2) gave 40 arthropods belonging to 12 species including numerous representatives of *Acaridae* (non identified) and *X. krameri*.

Five *S. araneus* examined in April (2) and August (3) furnished 52 arthropods representing 13 species with the most numerous *Echinonyssus soricis*, *Palaeopsylla soricis* and *Orycteroxenus soricis* were fairly frequent.

Very poor fauna of arthropods was noted on 1 *A. sylvaticus* and 2 *C. glareolus* examined (Tables IX–X).

In various parts of embankments the fauna of arthropods occurring on mammals is different depending on the character of the ground and plants growing there. Parts of the embankment under investigation resembled ruin environment (HAITLINGER 1986c). Differences in the arthropod fauna of the most common *A. agrarius* in both these biotopes were not great. However in mice from ruin areas 40 species of arthropods were recorded while only 3 on the embankment, similarly as in municipal and allotment gardens. Only in meadows the number of arthropod species was higher. This suggests that the embankments enable transfer and exchange of arthropods between mammals from various biotopes being in contact with them.

* Determined by J. Zlotorzycska.

Table IX. List of host- and host-nest-dwelling groups collected on mammals from railway embankment

Species	Anthropod communities on small mammals in Wrocław							Total	
	1	2	3	4	5	6	7		8
		<i>A. agrarius</i>	<i>A. sylvaticus</i>	<i>M. musculus</i>	<i>M. arvalis</i>	<i>C. glareolus</i>	<i>S. araneus</i>	<i>C. suaveolens</i>	
	1	2	3	4	5	6	7	8	9
Host-dwelling group									
<i>Anoplura</i>									
<i>Polyplax serrata</i> (Burmeister, 1839)		20		2					22
<i>Hoplopleura affinis</i> (Burmeister, 1839)		16							16
<i>Prostigmata</i>									
<i>Myobia agraria</i> Gorissen et Lukoschus, 1982		1							1
<i>Myobia musculi</i> (Schrank, 1781)		1	9						10
<i>Radfordia lemnina</i> (Koch, 1841)					7				7
<i>Astigmata</i>									
<i>Criniscansor apodemi</i> Fain, Munting et Lukoschus, 1969		2							2
<i>Myocoptes japonensis</i> Radford, 1955					5				5
<i>Myocoptes musculus</i> (Koch, 1844)			15						15
<i>Trichoecius tenax</i> (Michael, 1889)				5			3		8
<i>Listrophorus</i> sp.							2		2
<i>Mesostigmata</i>									
<i>Laelaps pavlovskyi</i> Zachvatkin, 1948		9							9
<i>Laelaps hilaris</i> Koch, 1836			1	25					26
<i>Hyperlaelaps microti</i> (Ewing, 1933)				2					2
<i>Mallophaga</i>									
<i>Myrsidea (Myrsidella) consimilis</i> (Piaget, 1880)					1				1
Host-nest-dwelling group									
<i>Siphonaptera</i>									
<i>Ctenophthalmus agyrtes</i> (Heller, 1896)		27	1	2	5	1	1	1	38
<i>Ctenophthalmus assimilis</i> (Taschenberg, 1880)		5		1	10	1	1	1	19
<i>Megabothris turbidus</i> (Rothschild, 1909)		3		2	3	1			9
<i>Hystrihopsylla talpae</i> (Curtis, 1826)		1							1
<i>Palaeopsylla soricis</i> (Dale, 1878)							12		12
<i>Prostigmata</i>									
<i>Neotrombicula japonica</i> (Tanaka, Kaiwa, Teramura et Kagaya, 1930)		2			1				3
<i>Hirsutiella zachvatkini</i> (Schluger, 1948)					1				1
<i>Astigmata</i>									
<i>Glycyphagus hypuadei</i> (Koch, 1841)		2			4		1		7

Anthropod communities on small mammals in Wrocław

Species	Anthropod communities on small mammals in Wrocław							Total		
	1	2	3	4	5	6	7		8	9
<i>Xenoryctes krameri</i> (Michael, 1886)		1		1	3				9	14
<i>Orycteroxenus soricis</i> (Oudemans, 1915)							9			9
<i>Mesostigmata</i>										
<i>Echinonyssus sunci</i> (Wang, 1962)		33								33
<i>Echinonyssus isabellinus</i> (Oudemans, 1913)					5	2				7
<i>Echinonyssus soricis</i> (Turk, 1945)							17	1		18
<i>Haemogamasus nidi</i> (Michael, 1892)		8			16		1			25
<i>Androlaelaps fahrenheitzi</i> (Berlese, 1911)		19	1		8					28
<i>Eulaelaps stabularis</i> (Koch, 1836)		3			3		1	1		8
Total		153	1	34	104	5	43	18		358

Table X. List of arthropods of nest-dwelling group collected on mammals from railway embankment

Species	Anthropod communities on small mammals in Wrocław						Total
	<i>A. agrarius</i>	<i>M. musculus</i>	<i>M. arvalis</i>	<i>C. glareolus</i>	<i>S. araneus</i>	<i>C. suaveolens</i>	
<i>Prostigmata</i>							
<i>Pygmephorus spinosus</i> Kramer, 1877	4						10
<i>Bakerdania</i> sp.	6	2	1			1	10
<i>Astigmata</i>							
<i>Prowichmannia spinifera</i> (Michael, 1901)	2			1	5		8
<i>Acarus</i> sp.	1				1		2
<i>Acaridae</i>						15	15
<i>Glycyphagidae</i>	2				1		3
<i>Cryptostigmata</i>							
<i>Oribatida</i>	3			1		1	5
<i>Mesostigmata</i>							
<i>Hypoaspis sardoa</i> (Berlese, 1911)	1						1
<i>Hypoaspis karawaiewi</i> (Berlese, 1903)	1						1
<i>Hypoaspis claviger</i> (Berlese, 1883)	3						3
<i>Porrhostaspis lunulata</i> Müller, 1859	1	1				1	3
<i>Vulgarogamasus remberti</i> (Oudemans, 1912)	2		4				6
<i>Pergamasus</i> sp.					1		1
<i>Parasitidae</i>	2	1				1	4
<i>Geholaspis longispinosus</i> (Kramer, 1876)						1	1
<i>Proctolaelaps pygmaeus</i> (Müller, 1859)	11	2	2				16
<i>Alliphis siculus</i> (Oudemans, 1905)	1						1
<i>Cyrtolaelaps mucronatus</i> (G. et R. Canestrini, 1881)			1				1
Total	40	6	8	3	9	19	85

Buildings

Trapping was performed at two sites: in garrets and cellars of houses in the city centre and in a warehouse at the periphery (Wrocław-Złotniki). Fourteen mice examined from July to December (1–5 per month) gave 36 arthropods representing 5 species. The most numerous *M. musculus* (18 specimens) participated in 50% of the community. Undetermined adult representatives of *Glycyphagidae* were also numerous (15 specimens). Single *Echinonyssus laticutatus*, *M. musculus* and *Cheyletus eruditus* were also collected. The last mentioned species has been only occasionally recorded from mammals (HAITLINGER 1983).

Domestic mice, living in buildings in the city centre and having no contacts with other biotopes favouring accession of arthropods of the nest-dwelling and host-nest-dwelling and host-nest-dwelling groups, show a very poor fauna of arthropods limited to host-dwelling and non parasitic species occasionally occurring on mammals. The last mentioned arthropods are especially frequent on mice living in were- and farmhouses. Some mice living in buildings are free of parasites in contrast to those from laboratory breeds which may be abundantly infested. E.g. mass appearance of *M. musculus* was recorded by KLAUSA and ZŁOTORZYCKA 1979.

Conclusions

The above described results of investigation as well as earlier publications (HAITLINGER 1986, 1987) gave the basis for the following conclusions:

1. The most diverse fauna of mammals in an urban agglomeration, comparable to that from outside the city, occurs in meadows. The arthropod communities found on them may be regarded as representative for the zone of meadows in the valley of Odra and its tributaries (Lower Silesia, Opole distr.).

2. The mammals inhabiting meadows bore the highest number of arthropods – 85 species, similarly to these from Babia Góra National Park (83 species – HAITLINGER in press). This is 42 species more than in allotment gardens, 35 more than in municipal gardens, 37 more than in railway embankments and 16 species more than in areas of ruins. The wide range of the number of mammals examined in particular biotopes made statistical verification of the differences observed impossible. It seems that these differences result from (1) various degrees of human interference in the environment (e.g. nests and burrows in meadows not destroyed), (2) a different quantity of mammalian hosts living in a particular biotope, and (3) the size of the area of each biotope examined and the degree of its differentiation (floristic, aquatic and soil conditions).

3. The highest number of nest-dwelling species was observed on mammals inhabiting meadows (36 species) and on those from areas of ruins (32 species – HAITLINGER 1986 c), municipal gardens (27) and railway embankments (18). The lowest number of species of this group occurred on mammals from allotment gardens (13).

4. Arthropods of epidemiological importance, such as *I. ricinus* and to lower degree *N. autumnalis* and *H. zachvatkini*, are concentrated mainly in meadows at the periphery of the city, but occasionally they migrate to the city centre, e.g. single specimens of *I. ricinus* were noted in ZOO and in areas of ruins. *I. ricinus* and *N. autumnalis* were observed in great numbers in avenues in the centre of Praha (ČERNÝ and DANIEL 1980, 1985).

5. The richest fauna of arthropods in non-wooded areas (together with areas of ruins – HAITLINGER 1986c) occurs on *A. agrarius* (77 species) and *M. arvalis* (60 species). Forty five species were recorded from *S. araneus*, 36 from *C. glareolus*, 35 from *M. musculus*, 31 from *C. suaveolens* and 12 from *R. norvegicus*. These data indicate also that the fauna of arthropods depends on the numbers of mammalian hosts, diversity of their biotopes and size of the inhabited area. The rat, living mainly in buildings, has a poor fauna of arthropods. Similarly the fauna of arthropods on mammals leading a specific mode on life (e.g. *C. suaveolens*) is also poor.

6. The highest mean intensity of infestation was noted on *C. glareolus* (77.5 – counted together with the data from areas of ruins), a lower intensity was observed on *C. suaveolens* (23.8) and *M. arvalis* (19.6). The lowest indices were noted on *A. agrarius* (8.9), *R. norvegicus* (8.4), *S. araneus* (8.3) and *M. musculus* (7.2). High infestation of *C. glareolus* and *C. suaveolens* was a result of massive incidence of *L. brevipennis* and *P. reclinata* (in areas of ruins – HAITLINGER 1986c) of the host-dwelling group. Such phenomena have been rarely recorded.

7. Arthropod communities on individual hosts of the same species inhabiting various biotopes differ in quantitative and qualitative character, e.g. 37 species were noted on *A. agrarius* from meadows while 39 from areas of ruins, 31 from embankments, 30 from municipal gardens and 24 from allotment gardens.

8. The arthropod fauna of small mammals in an urban agglomeration is very rich; it comprises many common but also rare species. *Criniscansor apodemi*, *Myobia multivaga*, *Psorergates muricola* (HAITLINGER 1987) and *Erythraeus dubiosus* (GABRYŚ and HAITLINGER 1986) are new records in Poland while *Trichoecius widawaensis*, *Psorergates polonicus* and *P. olawaensis* (HAITLINGER 1986a,b, 1987b) are new to science.

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Zgrupowania stawonogów występujące na drobnych ssakach obszarów bezleśnych aglomeracji miejskiej Wrocławia

Streszczenie

Na obszarach bezleśnych aglomeracji Wrocławia stwierdzono obecność 13 gatunków ssaków. Z 522 złowionych osobników uzyskano 8560 stawonogów należących do 115 gatunków. Najbogatszą faunę stawonogów (85 gatunków) stwierdzono na miejskich łąkach, najuboższą w zabudowaniach. Na peryferiach oraz nielicznie w śródmieściu przebywają gatunki mające znaczenie sanitarno-epidemiologiczne: *Ixodes ricinus* (ZOO i obszary ruderalne), *Hirsutiella zachvatkini* i *Neotrombicula autumnalis*.

Najbogatszą faunę stawonogów na obszarach bezleśnych posiadają *Apodemus agrarius* – 77 gatunków (1701 stawonogów), *Microtus arvalis* – 60 (3485 stawonogów) i *Sorex araneus* 45 gatunków (423 stawonogi). Fauna stawonogów ssaków synantropijnych oraz o bardzo określonych wymaganiach ekologicznych jest uboga (*Rattus norvegicus*, *Crocidura suaveolens*).

Najwyższą średnią intensywność zarażenia stwierdzono u *Clethrionomys glareolus* – 77,5 (łącznie z obszarem ruderalnym – Haitlinger 1986), najmniejszą u *Mus musculus* – 7,2 i *S. araneus* – 8,3.

Zgrupowania stawonogów u osobników tego samego gatunku zamieszkujących różne środowiska różnią się ilościowo i jakościowo. Np. u *A. agrarius* z łąk stwierdzono 57 gatunków (1185 stawonogów), na terenie ruderalnym 39 (741 stawonogi) a w ogródkach działkowych 24 gatunki stawonogów (161 stawonogów).

Fauna stawonogów drobnych ssaków aglomeracji Wrocławia jest bardzo bogata. Wchodzą w jej skład gatunki bardzo rzadkie. W trakcie badań stwierdzono 4 gatunki nowe dla fauny Polski: *Crimiscansor apodemi*, *Myobia multivaga*, *Psorergates muricola* i *Erythraeus dubiosus* oraz 3 nowe dla wiedzy: *Trichoecius widawaensis*, *Psorergates polonicus* i *P. olawaensis*.