

THE SPECIES COMPOSITION OF TRUE BUG ASSEMBLAGES
EXTRACTED WITH BERLESE FUNNELS
(DATA TO THE KNOWLEDGE ON THE GROUND-LIVING
HETEROPTERA OF HUNGARY, № 1)

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Abstract. A rich collection of Heteroptera extracted with Berlese funnel by Dr. I. Loksa between 1953–1974 in Hungary, has been examined. Altogether 157 true bug species have been identified. The great majority of them have been found in very low number, there are only 27 species of which more than 10 adult individuals have been found. Some species considered to be rare or very rare in Hungary have been collected in relatively great number (*Ceratocombus coleoptratus*, *Cryptostemma pusillum*, *C. waltli*, *Acalypta carinata*, *A. platycheila*, *Loricula ruficeps*, *Myrmedobia exilis*). The three families, which are more or less rich in species and have the highest ratio of extracted species, were Rhyparochromidae, Tingidae and Nabidae. Out of them, the family Rhyparochromidae has been found to be most diverse and most characteristic at the ground-level. Individuals of the families Tingidae, Hebridae and Rhyparochromidae have been found in greatest number. The occurrence of the lace bug *Campylosteira orientalis* Horváth, 1881 in Hungary has been verified by a voucher specimen. In respect to the environmental changes through the country, parallel changes have been observed in the zoogeographical distribution of the ground-living bugs.

Keywords: *Heteroptera, ground-level, Berlese funnel, species composition, zoogeography*

Introduction

The majority of the terrestrial heteropterans can be collected from plants in great number by the usual methods for Heteroptera collecting (sweep-netting, beating etc.). Collecting bugs from the ground-level needs great effort and generally has trifling result compared with collecting from the vegetation. Therefore, the species occurring mostly or exclusively on the ground usually escape the zoologists' attention. The methods for collecting ground-living invertebrates (pitfall trap, sifting, Berlese funnels etc.) are only occasionally used by heteropterologists. Consequently, our knowledge on the faunistical, ecological, cenological data of species occurring mostly or exclusively on the ground is far poorer than that of species collected regularly in great number from the vegetation.

On this account, the authors examined numerous materials and identified a great number of true bugs collected in Hungary with Berlese funnels and pitfall traps. The present work – which is the first part of a series of publications – deals with the true

bugs collected with Berles e funnel over 20 years in Hungary. Because of the identical way of collecting, the samples can be well compared on the basis of the true bugs found in them. In present paper the faunistic data and general observations on the species compositions as well as the zoogeographical analysis of Loksa's material are given.

Review of literature

The Heteroptera fauna of Hungary was investigated only sporadically before 1870. The first researcher was G. Horváth, who published numerous taxonomical, faunistical, ethological etc. data to the knowledge of the true bugs of Hungary from 1870 until his death in the year of 1937.

The results of the early exploration of the Hungarian fauna was summarized in a great and unique work, *Fauna Regni Hungariae*, which listed all of the animals known from the country at the time. The part „Hemiptera” was compiled by Horváth [39], who later published also additional data [41].

The organized research of the fauna of Hungary, especially in the protected areas, started after the Second World War. One of the first results was the volume *Bátorliget élővilága* [The Natural Life of Bátorliget] in 1953, which presented data on the flora and fauna of the Bátorliget Nature Reserves and listed 107 heteropteran species from the area [29]. Later some works dealing with the true bugs of certain Hungarian areas [10, 28] and the species of some groups of Heteroptera [11, 12, 13, 16, 30, 31] were also published. Some of them provide data on some ground-inhabiting species, too.

The monumental work, *Fauna Hungariae* has a goal to provide keys for the identification of all the animals occurring in Hungary. Five booklets of the series dealing with parts of the order Heteroptera have been published up to now [14, 32, 60, 62, 64], and a further booklet [45] is under publication.

In the 1970s, after the establishment of the first Hungarian national parks, the investigations of the fauna of these areas started with renewed effort. The results of the research are published in the series *Natural History of the National Parks of Hungary*, in which numerous studies dealing with true bugs have appeared up to now [6, 7, 8, 9, 26, 50, 63]. In addition to this series there are also many works providing data on the heteropteran fauna of certain areas of Hungary [1, 17, 22, 23, 24, 25, 42, 43, 47, 48, 49, 51, 52, 65, 67, 68]. The true bugs occurring in Bakony and Mátra mountains were investigated and the data were published mainly by the researchers of the Natural History Museum of Bakony (Zirc) and the Mátra Museum (Gyöngyös) [18, 19, 20, 21, 33, 34, 35, 36].

Recently Kondorosy [46] has compiled the most complete checklist of the Hungarian bug fauna.

As a summary, each of the above-mentioned works elaborates a taxonomical group of the true bugs occurring in a geographical area. If the subjects of the examination are the bugs inhabiting a certain habitat, so this is usually the water and/or the water surface. In the Hungarian literature, no publication discussing the Heteroptera inhabiting the ground-level is known. Also, in the international literature, data on the species living on the ground can be found only very sporadically, mostly as parts of great, comprehensive works discussing the soil-inhabiting animals, e.g. [27].

Materials and methods

The material examined

The investigations were carried out on the rich ground-living animal material collected by the staff of the Department of Systematic Zoology and Ecology of Eötvös Loránd University under the guidance of the late Dr. I. Loksa between 1953–1974. The material preserved in vials of 70% methyl alcohol was extracted from different substrata with Berlese funnels. All of the heteropteran specimens of Loksa's collection have been sorted and identified.

Altogether 3657 samples taken in all regions of Hungary have been examined. *Table 1* contains the list of the localities where heteropteran specimens have been collected, and their UTM codes. The localities are also shown in *Fig. 1*.

Species identification and nomenclature

The species have been identified by D. Rédei. For the identification of adults, the following works were used: Dipsocoromorpha, Aradidae: [62]; Nepomorpha: [60]; Gerromorpha, Leptopodomorpha, Nabidae, Reduviidae: [14]; Tingidae: [54]; Miridae: [69, 70, 71, 72, 73, 74]; Microphysidae: [53]; Lygaeidae sensu lato: [55, 56, 57]; Coreidae, Alydidae, Rhopalidae, Stenocephalidae, Pyrrhocoridae, Berytidae, Piesmatidae: [64]; Pentatomoidea: [44].

The larvae, apart from some exceptions, have been identified only at family level using Vásárhelyi's key [66]. Some elder larvae have been identified at subfamily, genus or species level using the works mentioned above as well as Benedek's key [15].

The classification and name of species are given according to the Catalogue of Aukema and Rieger [2, 3, 4, 5]. In case of taxa, which are not treated in this series, the nomenclature of the works used for identification are followed. To classify the Lygaeidae sensu lato taxa Henry's work [37] was followed.

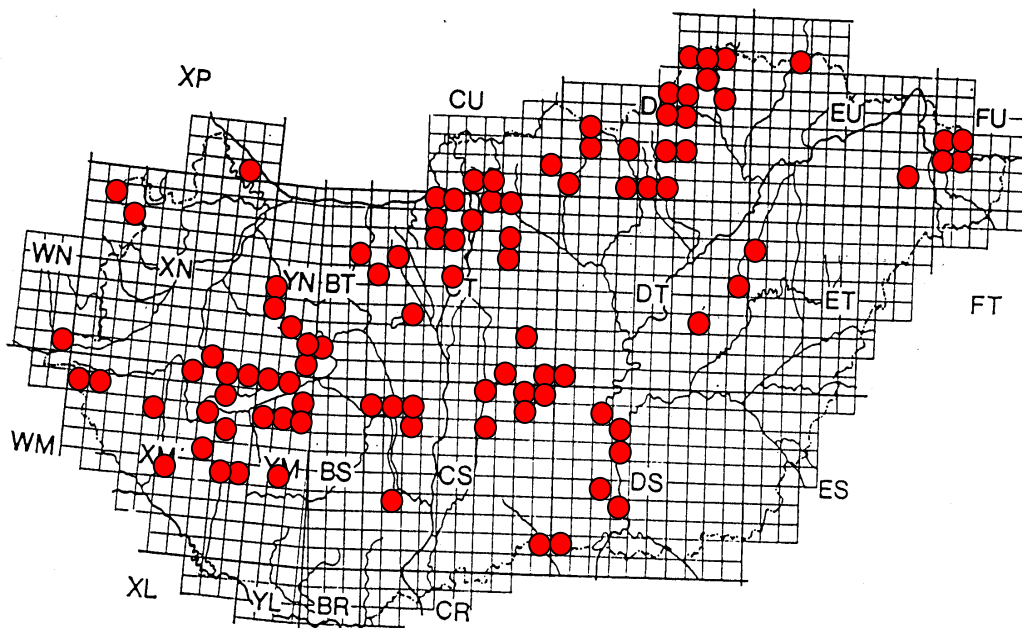


Figure 1. *The localities where heteropterans specimens have been collected.*

Table 1. List of the localities where heteropteran specimens have been collected, and their UTM codes.

Town / village	UTM	Town / village	UTM
1 Alsópetény	CU60	49 Kékkút	XM99
2 Alsószentiván	CS28	50 Kosd	CT69
3 Alsószuha	DU65	51 Kővágóörs	XM99
4 Andocs	YM27	52 Kunbaracs	CT70
5 Ábrahámhegy	XM98	53 Lajosmizse	CT90
6 Ágasegyháza	CS88	54 Lengyeltóti	YM07
7 Ásotthalom	DS01	55 Lesenceistvánd (Uzsabánya)	XN70
8 Ásványráró	XP80	56 Lovas	YN20
9 Bajánsenye	XM08	57 Marcali	XM86
10 Bak	XM47	58 Mátraszőlős	CU91
11 Bakonybél	YN03	59 Mesztegyő	XM85
12 Baktalórántháza	EU81	60 Mezőszilas	CS08
13 Balatonalmádi	BT71	61 Monoszló	YM09
14 Balatonberény	XM77	62 Nagybjom	XM94
15 Balástya	DS24	63 Nagyiván	DT95
16 Bánd	YN12	64 Nagykanizsa	XM43
17 Beregdaróc	FU13	65 Nagykovácsi	CT47
18 Bélapátfalva	DU52	66 Nagykőrös	DT00
19 Bódvarákó	DU87	67 Nagymaros	CT49
20 Böhönye	XM84	68 Nemesgulács	XM89
21 Budaörs	CT45	69 Nemesvid	XM75
22 Bükkszenterzsébet	DU32	70 Nemesvita	XM88
23 Cece	CS18	71 Nikla	XM96
24 Csanytelek	DS36	72 Ohat	ET07
25 Csaroda	FU03	73 Oroszlány	BT96
26 Csákvár	CT05	74 Pásztó	DU00
27 Csongrád	DS37	75 Pécel	CT76
28 Csöde	XM18	76 Piliscsaba	CT37
29 Csővár	CT79	77 Piliscsév	CT38
30 Dömös	CT39	78 Pilisszentkereszt	CT48
31 Eger	DU50	79 Pilisszentkereszt (Dobogókő)	CT48
32 Egerbakta	DU40	80 Pilisszentlászló	CT48
33 Esztergom	CT39	81 Pócsmegyer	CT58
34 Felsőörs	YN21	82 Pusztaszemes	YM28
35 Fenyőfő	YN04	83 Pusztavacs	CT82
36 Fülöpháza	CS89	84 Putnok	DU54
37 Gödöllő	CT77	85 Répáshuta	DU62
38 Gulács	FU02	86 Sándorfalva	DS33
39 Harka	XN27	87 Sajókaza	DU64
40 Jákfalva	DU65	88 Salgótarján	DU12
41 Jánd	FU03	89 Salgótarján (Somoskőújfalu)	DU13
42 Jósvafő	DU67	90 Simontornya	CS18
43 Kakasd	CS13	91 Sirok	DU30
44 Káptalantóti	XM99	92 Solymár	CT47
45 Kecskemét	CS99	93 Somogyaszaló	YM14
46 Kelebia	CS91	94 Somogytúr	YM17
47 Kelemér	DU55	95 Somogyzsitfa	XM75
48 Kenderes	DT73	96 Sopron	XN18

Table 1. (continued).

Town / village	UTM	Town / village	UTM
97 Szabadszállás	CS69	110 Tiszaalpár	DS28
98 Szár	CT16	111 Tornakápolna	DU76
99 Szendrőlád	DU85	112 Vajta	CS27
100 Szendehely	CU50	113 Vámosatya	FU03
101 Szentbékálla	XM99	114 Velence	CT23
102 Szentendre	CT58	115 Vindornyaszőlős	XM69
103 Szentgotthárd	WN90	116 Badacsony	*
104 Szenyér	XM84	117 Bakony	*
105 Szigetmonostor	CT58	118 Cserhát	*
106 Szögliget	DU77	119 Karancs	*
107 Tarpa	FU12	120 Naszály	*
108 Telkibánya	EU27	121 Putnoki-dombság (Hills)	*
109 Tihany	YM19	122 Somló	*

*The exact collecting place is unknown because Loksa recorded only the name of the region or geographic area.

Results

Faunistical results: an annotated checklist

A total number of 5060 heteropteran specimens have been found in the examined material. The specimens represent 157 species belonging to 31 families. The majority (57.63%) of the extracted specimens are larvae (*Table 2*).

Table 2. *The distribution of specimens examined.*

Level of identification	Number of specimens
adults identified at species level	2096
larvae identified at species level	118
adults identified to family or genus level (mostly defected)	48
larvae identified to family or genus level	2708
unidentified larvae (1 st and 2 nd instars)	90
altogether	5060

In the list below, the order of families follows the Palaearctic catalogue of Aukema & Rieger [2, 3, 4, 5]. The name of species or subspecies is followed by the recorded collecting localities marked by Arabic numbers in italics (see *Table 1*), then by Roman numerals referring to the month in which specimens were collected, and finally the enumeration of the examined material. When giving the time of samplings, duration (V–VII. e.g.) is only indicated when we have data from each month of the period.

CERATOCOMBIDAE

Ceratocombus (Ceratocombus) coleoptratus (Zetterstedt, 1819). 7, 12, 15, 23, 24, 25, 27, 32, 33, 46, 47, 57, 59, 62, 63, 69, 74, 83, 86, 95, 105, 113, 120. IV–XI. 24 ♂♂, 14 ♀♀, 43 larvae. — The only species of the family known from Hungary. A very limited number of specimens have been collected in the country before Loksa, who extracted large series of this species in some places. Based on this material, the species' distribution, coenology, wing polymorphism and phenology in Hungary were discussed by the authors [58].

DIPSOCORIDAE

The family is represented by 3 species in Hungary. A very limited number of specimens of each species have been collected in the country before. Only two of them have been captured by Loksa. The distribution, coenology, wing polymorphism and phenology of the species in Hungary based on Loksa's materials were discussed by the authors [58].

Cryptostemma (Pachycoleus) pusillum (J. Sahlberg, 1870). 7, 9, 15, 27, 33, 36, 40, 47, 49, 53, 56, 62, 75, 77, 100, 101, 103, 113, 118, 120, 121. III, V–VII, IX–XI. 24 ♂♂, 50 ♀♀, 56 larvae. — It is distributed all over the country. In some places a great number of it have been extracted with Berlese funnel.

Cryptostemma (Pachycoleus) waltli (Fieber, 1860). 59. IX. 18 ♂♂, 15 ♀♀, 14 larvae. — It seems to be rare in Hungary. Several specimens have been extracted with Berlese funnel from the same locality.

PLEIDAE

Plea minutissima minutissima Leach, 1817. 46. XI. 1 ♂. — A single, probably overwintering specimen has been extracted from wet debris collected at waterside.

HEBRIDAE

Hebrus (Hebrus) pusillus pusillus (Fallén, 1807). 8, 40, 50, 51. IV, VI, X, XI. 5 ♂♂, 5 ♀♀. — According to literature data, it occurs sporadically in Hungary, frequent at some places [14]. However, Loksa has captured only a few specimens. Most of the specimens have been collected around waters, and one specimen has been found also in moss far from waters.

Hebrus (Hebrusella) ruficeps Thomson, 1871. 9, 15, 25, 26, 27, 28, 32, 33, 35, 36, 40, 47, 49, 50, 51, 62, 75, 76, 79, 91, 94, 101, 110, 115, 121. II, III, V–VII, IX–XII. 239 ♂♂, 168 ♀♀. — According to literature data, it occurs sporadically in Hungary, not frequent [14]. However, Loksa has extracted a great number of it. Specimens have been collected mainly at waterside places, and in other habitats, too.

HYDROMETRIDAE

Hydrometra gracilentata Horváth, 1899. 5. X. 1 ♀. — Quite rare in Hungary. A single specimen has been extracted from wet debris collected at waterside.

VELIIDAE

Microvelia reticulata (Burmeister, 1835). 51, 61, 115. X, XII. 14 ♂♂, 3 ♀♀, 2 larvae. — Each of the specimens has been collected at waterside places.

GERRIDAE

Gerris (Gerris) thoracicus Schummel, 1832. 1. XI. 1 ♀. — A single, probably overwintering female has been extracted from a sample collected at shore.

Gerris (Gerris) argentatus Schummel, 1832. 8, 59. IV, IX. 1 ♂, 1 ♀. — Specimens have been extracted from a sample collected at waterside.

SALDIDAE

Chartoscirta cincta cincta (Herrich-Schäffer, 1841). 14, 47. VIII, XI. 2 ♂♂.

Chartoscirta elegantula (Fallén, 1807). 5, 47. III, X. 1 ♂, 1 ♀. — For a long time it was known in Hungary only from Bátorliget [14], but lately it has been recorded from several places (Bugac, Tabdi [8], Budapest [43]). It seems to be rare everywhere in the country.

Saldula saltatoria (Linnaeus, 1758). 14, 51, 61, 113. VIII, X, XI. 5 ♂♂.

TINGIDAE

Campylosteria verna (Fallén, 1826). 13, 16, 18, 25, 26, 33, 37, 38, 42, 50, 58, 67, 68, 76, 78, 79, 80, 85, 98, 100, 109, 112, 113, 117. II–VII, IX–XII. 60 ♂♂, 101 ♀♀. — Distributed everywhere in Hungary. It has been found mainly in mountainous regions.

Campylosteira orientalis Horváth, 1881. 24. IX. 1 ♀. — Very rare, its life habits are practically unknown. It is mentioned in the literature as a species occurring in Hungary (f. n.: Tokaj [38],

- Budapest [62]; f. *suspecta* Horváth, 1892: Szentendre [40]). However, no voucher specimen is known [62]. Therefore, the only specimen (standing near to the form *suspecta*) collected by Loksa is regarded as the first specimen representing the species in Hungary. Data of collection: Csanytelek, 5. IX. 1972, 1 brachypterous ♀, leg. Loksa.
- Acalypta carinata** (Panzer, 1806). 59, 64, 85, 100, 108, 113. V–VII, IX. 26 ♂♂, 40 ♀♀. — For a long time it was recorded only from Zirc [39], but without voucher specimen. Later it was found at Bátorliget [61], and lately several specimens of it have been captured in this place with pitfall trap and by sifting [68]. Also the majority of the specimens collected by Loksa have been found in the territory to the east of the river Tisza (Vámosatya). It seems to be rare in Hungary, locally more frequent.
- Acalypta platycheila** (Fieber, 1844). 25, 26, 33, 35, 113. V, VI, VIII, IX. 4 ♂♂, 7 ♀♀. — Only a few specimens have been found in Hungary hitherto [7, 61, 62, 68]. Probably it occurs sporadically all over the country but it seems to be rare everywhere.
- Acalypta nigrina** (Fallén, 1807). 18. V, VII. 5 ♀♀. — Only a single specimen has been recorded from Hungary hitherto (Hegyalja [61, 62]). Loksa has also extracted some specimens from moss. One of the rarest *Acalypta* species in Hungary.
- Acalypta marginata** (Wolff, 1804). 18, 19, 23, 35, 60, 75, 78, 81, 85, 88, 89, 107, 108, 109, 113, 119. IV–VII. 18 ♂♂, 36 ♀♀. — Not frequent in Hungary but occurs sporadically all over the country. Several specimens have been extracted by Loksa.
- Acalypta parvula** (Fallén, 1807). 10, 13, 30, 33, 39, 44, 50, 58, 67, 68, 70, 76, 78, 79, 80, 85, 92, 96, 100, 103, 109, 119, 122. III–V, VII, IX–XII. 75 ♂♂, 70 ♀♀. — According to Vásárhelyi [61, 62] it is rare in Hungary and known only from a few localities. However, Loksa has extracted numerous specimens of this species. It seems to occur everywhere in the country and to be frequent.
- Acalypta gracilis** (Fieber, 1844). 19, 52, 81, 83, 109. V–VII, X. 3 ♂♂, 8 ♀♀. — Several localities are known from Hungary, mainly on the Great Hungarian Plain (Alföld) [7, 8, 62]. It seems to be quite rare in the country.
- Acalypta musci** (Schrank, 1781). 3, 11, 18, 19, 30, 31, 33, 42, 47, 50, 65, 70, 74, 78, 79, 80, 84, 85, 96, 99, 100, 102, 106, 110, 111, 117. II–XII. 201 ♂♂, 155 ♀♀, 1 adult (damaged specimen). — Frequent in Hungary. Most of the specimens captured by Loksa have been collected in the mountains Bükk. In some places, large series of this species have been extracted.
- Derephysia (Derephysia) foliacea** (Fallén, 1807). 32, 80, 85. VII, VIII. 2 ♂♂, 1 ♀.
- Stephanitis pyri** (Fabricius, 1822). 113. XI. 1 ♀.
- Lasiacantha capucina capucina** (Germar, 1836). 9, 21, 62, 65, 77, 112. III, X–XII. 3 ♂♂, 5 ♀♀.
- Tingis (Tingis) cardui** (Linnaeus, 1758). 117. ? 1 ♂, 1 ♀.
- Tingis (Tropidocheila) geniculata** (Fieber, 1844). 70. ? 1 ♀.
- Tingis (Tropidocheila) reticulata** Herrich-Schäffer, 1835. 79. X. 1 ♀.
- Catoplatus carthusianus** (Goeze, 1788). 21, 68. III. 2 ♀♀.
- Copium teucirii teucirii** (Host, 1788). ? 1 ♀. — This Mediterranean species is quite rare in Hungary, and known only from the environs of Budapest, the mountains Mátra [61, 62] and the area of the Aggtelek National Park [26]. The data on the single species collected by Loksa are lost.
- Physatocheila costata** (Fabricius, 1784). 20, 94. XI. 2 ♂♂, 1 ♀. — Hitherto known in Hungary only from few places (Göd, Kapuvár, Mosonmagyaróvár, Parád) [61, 62].
- Oncochila scapularis** (Fabricius, 1794). 53. XI. 1 ♀.
- Dictyla humuli** (Fabricius, 1794). 25. IX. 1 ♂.
- Dictyla rotundata** (Herrich-Schäffer, 1835). 42. IX. 1 ♂.
- Dictyla echii** (Schrank, 1781). 7, 44, 122. III, XI. 2 ♂♂, 2 ♀♀.
- Agramma (Agramma) confusum** (Puton, 1879). 7, 36, 53, 60, 62, 90. V, IX, XI. 5 ♂♂, 6 ♀♀.
- Agramma (Agramma) minutum** Horváth, 1874. 39, 52, 53. X, XI. 3 ♀♀.

MICROPHYSIDAE

The family is represented by 5 species in Hungary [46]. A very limited number of specimens of each species have been collected in the country before because of their minute size and cryptic life habits.

Loricula pselaphiformis Curtis, 1833. 78. VI. 1 ♂. — Recorded only from Eger [62], Bazsi [34] and Bátorliget [68] so far.

Loricula ruficeps (Reuter, 1844). 26, 37, 85, 113. V–VIII. 4 ♂♂, 16 ♀♀. — Very rare in Hungary, only one place of occurrence has been recorded in the country up to now (Tahi [62]). However, in one occasion Loksa extracted 11 female specimens from the same sample.

- Loricula elegantula** (Bärensprung, 1858). 50. VI. 1 ♂, 5 ♀♀. — Rare in Hungary, only some specimens have been collected so far, mainly in the highlands [62].
Myrmedobia exilis (Fallén, 1807). 12, 42, 55, 62, 69, 104, 115. VI, VIII, IX. 11 ♀♀. — Recorded only from Budapest [62], Bátorliget [68] and Darány [48] so far.

MIRIDAE

- Monalocoris (Monalocoris) filicis** (Linnaeus, 1758). 47. IX. 1 ♀. — Boreo-montaneous species, rare in Hungary.
Deraeocoris (Knightocapsus) lutescens (Schilling, 1837). 3, 109. XI. 1 ♂, 1 ♀.
Lygus rugulipennis Poppius, 1911. 5, 87, 113. X, XI. 3 ♂♂, 2 ♀♀.
Lygus pratensis (Linnaeus, 1758). 44, 80. III, XII. 2 ♀♀.
Lygus gemellatus gemellatus (Herrich-Schäffer, 1835). 47, 52. XI. 2 ♀♀.
Orthops (Orthops) campestris (Linnaeus, 1758). 58. XI. 1 ♂.
Orthops (Orthops) kalmii (Linnaeus, 1758). 58. XI. 1 ♂.
Stenodema (Brachystira) calcarata (Fallén, 1807). 8. IV. 1 ♀.
Halticus apterus apterus (Linnaeus, 1758). 74. VI. 1 ♂.
Tytthus pygmaeus (Zetterstedt, 1838). 61. X. 1 ♀. — Can be found in humid meadows, bogs, etc., probably mainly at the ground-level. Although its occurrence in Hungary has only been proved recently [68], the species does not seem to be rare in suitable places.

NABIDAE

- Alloeorhynchus (Alloeorhynchus) flavipes** (Fieber, 1836). 37, 100. IV, VII. 1 ♀, 1 larva. — Rare in Hungary, known mainly from lowlands.
Himacerus (Aptus) mirmicoides (O. Costa, 1834). 5, 18, 44. II, III, X. 2 ♂♂, 2 ♀♀.
Nabis (Nabis) rugosus (Linnaeus, 1758). 55, 58. VIII, XI. 1 ♂, 1 ♀.
Nabis (Nabis) ferus (Linnaeus, 1758). 13, 83, 112, 113. III, XI, XII. 1 ♂, 5 ♀♀.
Nabis (Nabis) pseudoferus pseudoferus Remane, 1949 ♂♂. 18, 20, 58, 79, 117. III, X, XI. 5 ♂♂.
Nabis (Nabis) pseudoferus pseudoferus Remane, 1949 and **N. (N.) punctatus punctatus** A. Costa, 1847 ♀♀. 5, 43, 47, 61, 113. IX–XI. 5 ♀♀. — Because of the very difficult distinguishing, the females of this two species have not been identified.

REDUVIIDAE

- Phymata crassipes** (Fabricius, 1775). 81. VI. 1 larva. — Not rare in Hungary, distributed mainly in the mountainous regions.

ARADIDAE

- Aradus cinnamomeus** Panzer, 1806. 112. XII. 1 ♀, 1 larva. — According to the literature [62], the species overwinters as adult. However, a 5th instar larva has also been extracted from a sample taken in December (03. XII). This suggests that occasionally elder larvae can also overwinter.
Aradus distinctus Fieber, 1860. 37, 68. XII. 2 ♂♂.
Aneurus (Aneurodes) avenius (Dufour, 1833). 113. XI. 1 ♂.
Aneurus (Aneurus) laevis (Fabricius, 1775). ?. X. 1 ♂.

PIESMATIDAE

- Piesma capitatum** (Wolff, 1804). 7, 19, 112. XI, XII. 4 ♂♂.
Piesma maculatum (Laporte, 1833). 25, 29, 38, 43, 48, 63, 72, 74, 93, 104, 113. IV, VI, IX, XI. 19 ♂♂, 18 ♀♀.
Parapiesma quadratum (Fieber, 1844). 45, 53. X, XI. 3 ♀♀.
Parapiesma silenes (Horváth, 1888). 45, 122. X, XI. 1 ♂, 1 ♀. — Far more rare than the species before, known mainly from the Great Hungarian Plain.
Parapiesma salsolae (Becker, 1867). 7, 45, 83, 112. X–XII. 5 ♂♂, 3 ♀♀.
Parapiesma kochiae (Becker, 1867). 7, 112. XI, XII. 4 ♂♂, 3 ♀♀. — Relatively rare in Hungary, known mostly from the territory between the rivers Danube and the Tisza.

BERYTIDAE

Berytinus (Berytinus) minor minor (Herrich-Schäffer, 1835). 74. VI. 1 ♀.

Berytinus (Lizinus) signoreti (Fieber, 1859). 58. XI. 1 ♀. — Rare in Hungary, known only from the environs of Budapest, the Bakony Mountains and Velem [64]. Its life habits and phenology are unknown but its occurrence in late autumn suggests that it overwinters as adult.

Berytinus (Lizinus) montivagus (Meyer-Dür, 1841). 58, 68, 78, 86, 117. VII, IX, XI. 3 ♂♂, 3 ♀♀.

Berytinus (Lizinus) geniculatus (Horváth, 1885). 109. ?. 1 ♀. — Relatively rare in Hungary, known mostly from the lowlands.

LYGAEIDAE

Horvathiolus superbus (Pollich, 1781). 18. V. 1 ♂. — Rare in Hungary, only a few places of occurrence are known.

Lygaeosoma sardeum sardeum Spinola, 1837. 70. ?. 1 ♀.

Nysius senecionis senecionis (Schilling, 1829). 29, 83. XI. 1 ♂, 1 ♀.

CYMIDAE

Cymus glandicolor Hahn, 1832. 46. XI. 1 ♂.

Cymus aurescens Distant, 1833. 3, 62. XI. 3 ♀♀. — The rarest species of the genus in Hungary, known mainly from the highlands.

BLISSIDAE

Dimorphopterus spinolae (Signoret, 1857). 7, 48, 52, 97. IV, XI. 6 ♂♂, 2 ♀♀.

Dimorphopterus doriae (Ferrari, 1874). 23, 52, 90, 112. V, X, XII. 16 ♂♂, 6 ♀♀.

GEOCORIDAE

Geocoris (Geocoris) ater (Fabricius, 1787). 112. XII. 1 ♂, 1 ♀.

HETEROGASTRIDAE

Platyplax salviae (Schilling, 1829). 44. ?. 1 ♂.

OXYCARENIDAE

Oxycarenum (Oxycarenum) modestus (Fallén, 1829). 94. XI. 1 ♂.

Macroplax preysleri (Fieber, 1837). 6, 45, 112. X, XII. 8 ♂♂, 2 ♀♀.

Macroplax fasciata fasciata (Herrich-Schäffer, 1835). 50. X. 1 ♂.

Metopoplax origani (Kolenati, 1845). 45, 48, 76, 112. IV, X–XII. 5 ♂♂, 1 ♀.

Camptotelus lineolatus lineolatus (Schilling, 1829). 109. ?. 1 ♂.

Tropidophlebia costalis (Herrich-Schäffer, 1850). 114. V. 1 ♂, 1 ♀. — Rare in Hungary, has been found at Barcs, Bugac, Fülöpháza, Nagyszénás and the environs of Budapest up to now [45].

RHYPAROCHROMIDAE

Plinthisus (Plinthisus) brevipennis (Latreille, 1807). 37, 47, 50, 55, 83, 85, 109. III–VIII, X–XII. 14 ♂♂, 13 ♀♀.

Plinthisus (Plinthisus) longicollis Fieber, 1861. 68, 70, 112. IX, XII. 1 ♂, 5 ♀♀. — It occurs sporadically throughout the country but is quite rare.

Plinthisus (Plinthisomus) pusillus (Scholtz, 1847). 2, 23, 44, 54, 55, 58, 65, 66, 69, 83, 85, 95, 97, 109, 112. V, VII–IX, XI, XII. 12 ♂♂, 17 ♀♀.

Stygnocoris sabulosus (Schilling, 1829). 33, 55, 78, 83, 117. VI–VIII, X. 2 ♂♂, 4 ♀♀.

Stygnocoris pygmaeus (R. F. Sahlberg, 1848). 19, 26, 50, 55, 83. VII, VIII, XI. 5 ♂♂, 3 ♀♀. — According to the literature [56], the species overwinters in the egg stage. However, an adult has also been collected in late November (29. XI).

Acompus pallipes (Herrich-Schäffer, 1834). 86. IX. 1 ♀.

Drymus (Sylvadrymus) sylvaticus (Fabricius, 1775). 9, 25, 68, 82. VII, IX, X. 2 ♂♂, 2 ♀♀.

- Drymus (Sylvadrymus) ryeii** Douglas & Scott, 1865. 26, 44, 61, 64, 77, 115. V, VI, VIII, X–XII. 6 ♂♂, 4 ♀♀.
- Drymus (Sylvadrymus) brunneus brunneus** (R. F. Sahlberg, 1848). 25, 59, 62, 64, 88. VI, IX, XI. 10 ♂♂, 6 ♀♀.
- Eremocoris podagricus** (Fabricius, 1775). 1, 13, 34, 43, 44, 49, 83, 96. III, V, X, XI. 7 ♂♂, 5 ♀♀.
- Eremocoris plebejus** (Fallén, 1807). 9. X. 1 ♂. — Rare in Hungary, distributed mainly in the mountainous regions.
- Scolopostethus thomsoni** Reuter, 1875. 47, 96, 113. V, IX, XI. 1 ♂, 4 ♀♀.
- Scolopostethus affinis** (Schilling, 1829). 17, 50, 67, 114. IV, V, X. 3 ♂♂, 2 ♀♀.
- Scolopostethus puberulus** Horváth, 1887. 33, 37. X. 1 ♂, 1 ♀. — According to literature data [45], it is very rare in Hungary.
- Scolopostethus pilosus pilosus** Reuter, 1874. 12, 47, 85. V, IX, XI. 2 ♂♂, 4 ♀♀.
- Ischnocoris punctulatus** Fieber, 1861. 44, 63, 76. III, IV, IX. 1 ♂, 2 ♀♀. — Very rare in Hungary, it has been collected only at two localities (Budapest, Sátoraljaújhely) so far [45].
- Ischnocoris hemipterus** (Schilling, 1829). 44, 70, 92. X. 4 ♂♂, 1 ♀.
- Tropistethus holosericus** (Scholtz, 1846). 18, 37, 43, 44, 63, 68, 69, 70, 87, 109, 113. III, IV, VIII, IX, XI. 13 ♂♂, 6 ♀♀.
- Pionosomus opacellus** Horváth, 1895. 112. XII. 1 ♂, 2 ♀♀. — A lowland species, known exclusively from the Great Hungarian Plain (Alföld).
- Emblethis verbasci** (Fabricius, 1803). 97, 117. XI. 1 ♂, 1 ♀.
- Emblethis griseus** (Wolff, 1802). 37. XII. 1 ♂, 1 ♀.
- Emblethis denticollis** Horváth, 1878. 45. X. 1 ♂, 1 ♀.
- Emblethis ciliatus** Horváth, 1875. 112. XII. 3 ♂♂.
- Trapezonotus (Trapezonotus) arenarius arenarius** (Linnaeus, 1758). 5, 44, 45, 50, 51, 112. X, XII. 5 ♂♂, 1 ♀.
- Trapezonotus (Trapezonotus) dispar** Stål, 1872. 85. X. 1 ♂.
- Aphanus rolandri** (Linnaeus, 1758). 46. XI. 1 ♂.
- Megalonotus chiragra** (Fabricius, 1794). 41, 85, 122. II, VIII, IX. 1 ♂, 3 ♀♀.
- Megalonotus sabulicola** (Thomson, 1870). 1, 5, 37, 50, 62, 68, 100, 109, 117. III, IX–XI. 4 ♂♂, 9 ♀♀.
- Megalonotus antennatus** (Schilling, 1829). 78, 100. III, X. 1 ♂, 1 ♀. — Quite rare in Hungary, more frequent in the highlands.
- Megalonotus praetextatus** (Herrich-Schäffer, 1835). 83, 112. XI, XII. 2 ♀♀.
- Peritrechus geniculatus** (Hahn, 1832). 19. XII. 1 ♂.
- Peritrechus gracilicornis** Puton, 1877. 7, 15, 25, 45. IX–XI. 4 ♀♀.
- Peritrechus nubilus** (Fallén, 1807). 44, 83. V, XI. 2 ♂♂.
- Beosus maritimus** (Scopoli, 1763). 33, 94. X, XI. 1 ♂, 1 ♀.
- Graptopeltus lynceus** (Fabricius, 1775). 19, 117. VIII, X. 4 ♀♀.
- Raglius alboacuminatus** (Goeze, 1778). 37. X. 1 ♂.
- Rhyparochromus pini** (Linnaeus, 1758). 122. XI. 1 ♀.
- Rhyparochromus vulgaris** (Schilling, 1829). 47, 106. III, VI, IX, XI. 3 ♂♂, 14 ♀♀.
- Pachybrachius fracticollis** (Schilling, 1829). 9, 12, 28, 95, 103. VIII–X. 1 ♂, 4 ♀♀.

PYRRHOCORIDAE

- Pyrrhocoris apterus** (Linnaeus, 1758). 16. V. 1 ♀.
- Pyrrhocoris marginatus** (Kolenati, 1845). 50. X. 1 ♀.

COREIDAE

- Coreus marginatus** (Linnaeus, 1758). 94. XI. 1 ♀.
- Spathocera obscura** (Germar, 1842). 52, 112. X, XII. 1 ♂, 1 ♀. — Rare in Hungary, known only from the Great Hungarian Plain.
- Bathysolen nubilus** (Fallén, 1807). 68, 117. V. 1 ♂, 1 ♀. — Quite rare in Hungary.
- Coriomeris denticulatus** (Scopoli, 1763). 70. IV. 2 ♀♀.
- Ceraleptus gracilicornis** (Herrich-Schäffer, 1835). 37, 68. X. 3 ♂♂, 2 ♀♀.

RHOPALIDAE

Rhopalus (Rhopalus) subrufus (Gmelin, 1788). 62. XI. 1 ♂.

Brachycarenum tigrinus (Schilling, 1817). 50, 58, 109. III, XI. 2 ♂♂, 2 ♀♀.

CYDNIDAE

Microporus nigrinus (Fabricius, 1794). 37, 68. V, XII. 1 ♂, 1 ♀.

Cydnus aterrimus (Forster, 1771). 44. III. 1 ♂.

Legnotus limbosus (Geoffroy, 1785). 18, 19, 29, 37, 44, 57, 59, 62, 68, 70, 73, 79, 80, 83, 95, 106, 109, 122. III–XII. 35 ♂♂, 40 ♀♀.

Tritomegas bicolor (Linnaeus, 1758). 57, 71. VII. 1 ♂, 1 ♀.

Adomerus biguttatus (Linnaeus, 1758). 103. X. 1 ♂.

THYREOCORIDAE

Thyreocoris scarabaeoides (Linnaeus, 1758). 4, 22, 43, 54, 59, 62, 68, 79. VI, VII, IX–XI. 5 ♂♂, 3 ♀♀.

— Occurs sporadically in Hungary, nowhere frequent.

SCUTELLERIDAE

Eurygaster austriaca (Schrank, 1776). 29, 37, 68, 112, 113, 122. VII, XI, XII. 3 ♂♂, 3 ♀♀.

Eurygaster maura (Linnaeus, 1758). 47, 68, 70, 76, 122. IV, IX–XI. 3 ♂♂, 3 ♀♀.

Eurygaster testudinaria (Geoffroy, 1758). 47, 50, 68, 93, 116, 122. III, XI. 2 ♂♂, 8 ♀♀.

PENTATOMIDAE

Podops inuncta (Fabricius, 1775). 1. XI. 1 ♂.

Sciocoris (Sciocoris) cursitans (Linnaeus, 1758). 44, 117. III, V. 2 ♂♂, 2 ♀♀.

Sciocoris (Aposciocoris) homalonotus Fieber, 1851. 44, 50, 68, 70, 78, 79, 80, 109, 116. III, V, VI, X. 16 ♂♂, 22 ♀♀. — According to literature data [32], it is rare in Hungary, occurs only sporadically.

However, Loksa has extracted a great number of it.

Sciocoris (Aposciocoris) microphthalmus Flor, 1860. 50. VI. 1 ♂.

Dyrodere umbraculatus (Fabricius, 1775). 44. III. 1 ♀.

Aelia acuminata (Linnaeus, 1758). 16, 44, 47, 50. III, V, IX–XI. 7 ♂♂, 5 ♀♀.

Aelia rostrata Boheman, 1852. 44. III. 1 ♀.

Neottiglossa leporina (Herrich-Schäffer, 1830). 52. XI. 1 ♂.

Eusarcocoris aeneus (Scopoli, 1763). 3. XI. 1 ♀.

Dolycoris baccarum (Linnaeus, 1758). 117. ?. 1 ♂.

Palomena prasina (Linnaeus, 1758). 70. ?. 1 ♀.

Eurydema ventrale Kolenati, 1846. 122. XI. 1 ♂.

Eurydema oleraceum (Linnaeus, 1758). 11, 116. III, X. 1 ♂, 1 ♀.

ACANTHOSOMATIDAE

Elasmucha grisea (Linnaeus, 1758). 96. XI. 1 ♂. — Quite rare in Hungary.

Species composition

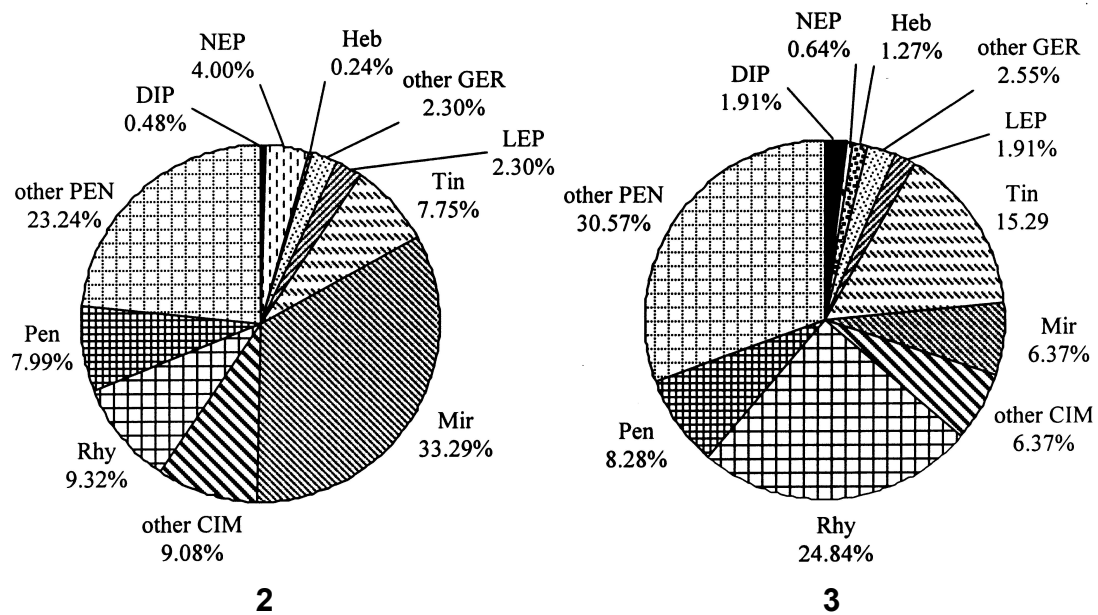
The number of species and specimens belonging to different families are summarized in *Table 3*. The ratio of species and specimens belonging to some major groups of Heteroptera are shown in *Figs. 2–4*.

Table 3. The number and ratio of the species known from Hungary and identified from Loksa's materials, and the ratio of the number of the collected specimens (N = number, % = percentage).

Family	Species known from Hungary*		Identified species found in Loksa's materials		$\left(\frac{N(1)}{N(2)}\right)$ %	Adult specimens found in Loksa's materials	
	$N(1)$	%	$N(2)$	%		N	%
Ceratocombidae	1	0.12	1	0.64	**	38	1.81
Dipsocoridae	3	0.36	2	1.27	**	107	5.10
Nepidae	2	0.24	—	—	—	—	—
Corixidae	23	2.78	—	—	—	—	—
Naucoridae	1	0.12	—	—	—	—	—
Aphelocheiridae	1	0.12	—	—	—	—	—
Notonectidae	5	0.61	—	—	—	—	—
Pleidae	1	0.12	1	0.64	**	1	0.05
Mesoveliidae	2	0.24	—	—	—	—	—
Hebridae	2	0.24	2	1.27	**	417	19.90
Hydrometridae	2	0.24	1	0.64	**	1	0.05
Veliidae	6	0.73	1	0.64	**	17	0.81
Gerridae	9	1.09	2	1.27	**	3	0.14
Saldidae	18	2.18	3	1.91	16.67	9	0.43
Leptopodidae	1	0.12	—	—	—	—	—
Tingidae	64	7.75	24	15.29	37.50	854	40.74
Microphysidae	5	0.61	4	2.55	**	38	1.81
Miridae	275	33.29	10	6.37	3.64	17	0.81
Nabidae	16	1.94	5	3.18	31.25	18	0.86
Anthocoridae	31	3.75	—	—	—	—	—
Cimicidae	3	0.36	—	—	—	—	—
Reduviidae	20	2.42	1	0.64	5.00	—	—
Aradidae	22	2.66	4	2.55	18.18	5	0.24
Piesmatidae	7	0.85	6	3.82	**	61	2.91
Berytidae	15	1.82	4	2.55	26.67	9	0.43
Lygaeidae	24	2.91	3	1.91	12.50	4	0.19
Cymidae	4	0.48	2	1.27	**	4	0.19
Blissidae	3	0.36	2	1.27	**	30	1.43
Geocoridae	6	0.73	1	0.64	**	2	0.10
Artheneidae	2	0.24	—	—	—	—	—
Heterogastridae	5	0.61	1	0.64	**	1	0.05
Oxycarenidae	10	1.21	6	3.82	**	21	1.00
Rhyparochromidae	77	9.32	39	24.84	50.65	243	11.59
Pyrrhocoridae	2	0.24	2	1.27	**	2	0.10
Stenocephalidae	3	0.36	—	—	—	—	—
Coreidae	23	2.78	5	3.18	21.74	12	0.57
Alydidae	3	0.36	—	—	—	—	—
Rhopalidae	17	2.06	2	1.27	11.76	5	0.24
Plataspidae	2	0.24	—	—	—	—	—
Cydnidae	20	2.42	5	3.18	25.00	81	3.86
Thyreocoridae	2	0.24	1	0.64	**	8	0.38
Scutelleridae	15	1.82	3	1.91	20.00	22	1.05
Pentatomidae	66	7.99	13	8.28	19.70	65	3.10
Acanthosomatidae	7	0.85	1	0.64	**	1	0.05
Altogether	826	100.00	157	100.00	19.01	2096	100.00

*According to Kondorosy [46]. The occurrences of some other species in Hungary have been proved since Kondorosy's checklist. However, for the sake of simplicity we took no notice of these species.

**Percentage is given, for practical reasons, in the case of larger numbers only.



Figures 2–3. 2. The ratio of the species known from Hungary belonging to major groups of Heteroptera. 3. The ratio of the species identified from Loksa's materials belonging to major groups of Heteroptera. CIM = Cimicomorpha, DIP = Dipsocoromorpha, GER = Gerromorpha, LEP = Leptodomorpha, NEP = Nepomorpha, PEN = Pentatomomorpha, Heb = Hebridae, Mir = Miridae, Pen = Pentatomidae, Rhy = Rhyarochromidae, Tin = Tingidae.

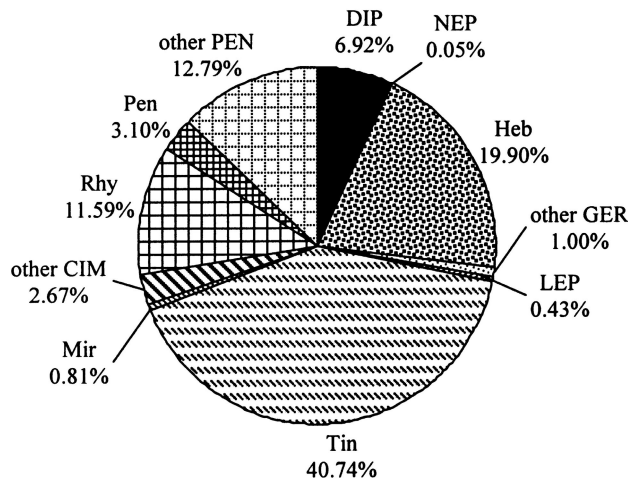


Figure 4. The ratio of the adult specimens identified from Loksa's materials belonging to major groups of Heteroptera. Abbreviations as on Fig. 2 and 3.

Zoogeographical distribution

Loksa collected samples in all of the great phytogeographical provinces of Hungary (Fig. 5). The numbers of samples taken in the provinces Praeillyricum, Praenoricum and in the Arrabonicum district of province Eupannonicum are considerable lower than that of the other provinces. Therefore, only the samples collected in provinces Eupannonicum (except Arrabonicum), Bakonyicum and Matricum have been compared.

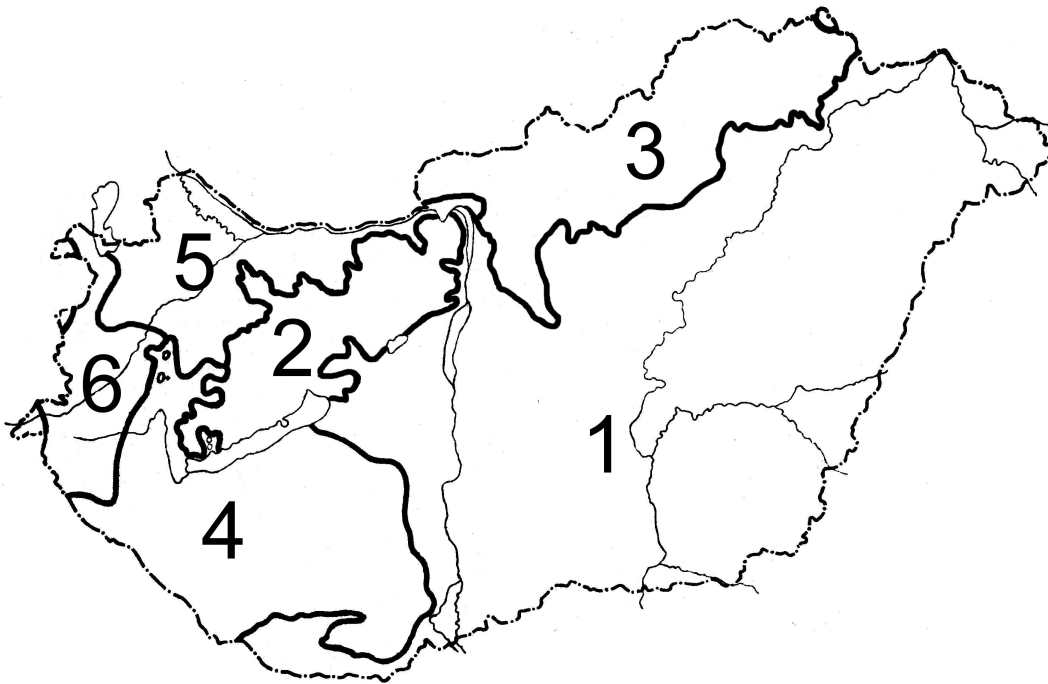


Figure 5. The great phytogeographical provinces of Hungary (after Soó [59], modified). 1 = Eupannonicum (except Arrabonicum), 2 = Bakonyicum, 3 = Matricum, 4 = Praellyricum, 5 = Eupannonicum (Arrabonicum), 6 = Praenorikum.

The zoogeographical distribution of heteropteran species and specimens collected in the three most exhaustively investigated provinces in Hungary are shown in *Table 4* and 5.

Table 4. The zoogeographical distribution of heteropteran species collected in the three most exhaustively investigated provinces in Hungary (*N* = number of species, % = percentage).

Zoogeographical distribution	Eupannonicum		Bakonyicum		Matricum		altogether	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Cosmopolite	—	—	1	1.20	—	—	2	1.26
Holarctic	3	4.17	5	6.02	4	5.26	6	3.77
Palaeartic (+ Ethiopian)	12	16.67	12	14.46	13	17.11	30	18.87
Eurosiberian (+ Nearctic)	21	29.17	17	20.48	16	21.05	34	21.38
South-Eurosiberian	5	6.94	3	3.61	1	1.32	7	4.40
West-Eurosiberian	3	4.17	2	2.41	3	3.95	5	3.14
West-Palaeartic	3	4.17	9	10.84	10	13.16	14	8.81
European	7	9.72	12	14.46	11	14.47	18	11.32
Euro-Mediterranean (+ Middle-Asian)	8	11.11	14	16.87	10	13.16	22	13.84
Mediterranean (+ Middle-Asian)	1	1.39	3	3.61	3	3.95	6	3.77
Ponto-Mediterranean (+ Middle-Asian)	5	6.94	1	1.20	1	1.32	7	4.40
North-Mediterranean-European (+ Middle-Asian)	4	5.56	2	2.41	2	2.63	5	3.14
Boreo-montaneous	—	—	2	2.41	2	2.63	3	1.89
altogether	72	100	83	100	76	100	159	100

Table 5. The zoogeographical distribution of heteropteran specimens collected in the three most exhaustively investigated provinces in Hungary (N = number of specimens, % = percentage).

Zoogeographical distribution	Eupannonicum		Bakonyicum		Matricum	
	N	%	N	%	N	%
Cosmopolite	—	—	1	0.14	—	—
Holarctic	7	1.43	11	1.59	10	1.31
Palaeartic (+ Ethiopian)	49	10.00	35	5.04	19	2.48
Eurosiberian (+ Nearctic)	166	33.88	83	11.96	93	12.16
South-Eurosiberian	7	1.43	5	0.72	1	0.13
West-Eurosiberian	126	25.71	112	16.14	148	19.35
West-Palaeartic	3	0.61	88	12.68	99	12.94
European	73	14.90	243	35.01	360	47.06
Euro-Mediterranean (+ Middle-Asian)	10	2.04	66	9.51	26	3.40
Mediterranean (+ Middle-Asian)	3	0.61	41	5.91	3	0.39
Ponto-Mediterranean (+ Middle-Asian)	37	7.55	1	0.14	1	0.13
North-Mediterranean-European (+ Middle-Asian)	9	1.84	6	0.86	3	0.39
Boreo-montaneous	—	—	2	0.29	2	0.26
altogether	490	100	694	100	765	100

Discussion

As compared to the great effort of collecting, it can be said that the number of heteropteran specimens collected is low. There are only 27 species of which more than 10 adult individuals have been found. Out of these, *Ceratocombus coleopratus*, *Cryptostemma pusillum*, *C. waltli*, *Acalypta carinata*, *A. platycheila*, *Loricula ruficeps*, *Myrmedobia exilis* have been considered to be rare or very rare in Hungary. However, these species have been collected with Berlese funnel in relatively great numbers. Most of them must live mostly at ground-level of suitable plant communities, therefore can not or only accidentally be collected by the usual methods for Heteroptera collecting.

The majority of the species have been collected in very low numbers. Some of these have been also regarded as rare species in Hungary. Such species are *Acalypta nigrina*, *Physatocheila costata*, *Loricula pselaphiformis*, *L. elegantula*, *Tytthus pygmaeus*, *Acompus pallipes*, *Bathysolen nubilus*, *Spathocera obscura* and *Sciocoris homalonotus*. Many of them might to be far more frequent in Hungary as expected. However, they usually escape the heteropterists' attention because they live mostly at ground-level or in related substrata.

No adult individuals belonging to the following families have been collected: Nepidae, Corixidae, Naucoridae, Aphelocheiridae, Notonectidae (aquatic life habits); Mesoveliidae (semi-aquatic life habits); Leptopodidae (usually under stones); Cimicidae (parasitic life habits); Artheneidae, Stenocephalidae, Alydidae, Plataspidae (only few, not characteristic ground-living species in Hungary, it is only accidental that none of them have been collected). The following taxa, more or less rich in species, are represented by only a few species in the material collected: Nepomorpha (aquatic life habits); Gerromorpha (mostly semi-aquatic life habits); Saldidae (the relatively rare species have a relatively big ratio); Miridae (usually on plants), Reduviidae (the

relatively rare species and those on plants, in buildings etc. have a relatively big ratio); Aradidae (usually under bark), Rhopalidae (usually on plants).

The three families, which are more or less rich in species and have the highest ratio of extracted species, are Rhyparochromidae (50.65%), Tingidae (37.50%) and Nabidae (31.25%). Out of them, the family Rhyparochromidae is the most diverse and most characteristic at the ground-level. Most tingid species have been collected in very low numbers, only some members of the genera *Campylosteira* and *Acalypta* have been extracted in great numbers. The number of the nabid specimens has also been low.

The three families having the highest ratio of extracted individuals are Tingidae (40.74% of the total specimens), Hebridae (19.90%) and Rhyparochromidae (11.59%). Out of the family Tingidae, the *Campylosteira* and *Acalypta* species – first of all *A. musci* – are the most characteristic, often occurring in great numbers in ground substrata. Specimens of the 2 *Campylosteira* and the 7 *Acalypta* species represent 94.96% of the total tingid specimens extracted. Out of the species of these two genera, *A. musci* was the most dominant, having a relative dominance of 41.80%. 97.60% of the total hebrid specimens belong to the species *Hebrus ruficeps*. This species seems to be characteristic at the ground-level of suitable (mostly riparian or other humid) plant communities. The family Rhyparochromidae, containing mainly seed-feeder species, occurs widely at the ground-level.

By exploring the zoogeographic distribution of the heteropteran species collected in the Hungarian provinces, the followings have been concluded. In case of the province Eupannonicum (except district Arrabonicum) is the percentage of the species with Mediterranean and Ponto-Mediterranean distribution especially high (8.33% of the species, 8.16% of the specimens). No boreo-montaneous species have been found in this area. The total ratio of the West-Palaeartic, European and Euro-Mediterranean species is the lowest (25.00% of the species, 17.55% of the specimens), whereas that of the Eurosiberian, South-Eurosiberian and West-Eurosiberian species is the highest (40.28% of the species, 61.02% of the specimens) in this area out of the three examined phytogeographical provinces. Consequently, the ground-living bug assemblage of the province Eupannonicum has a relation to the considerable continental and a far less important subatlantic climatic influence of this area.

In the province Bakonyicum, the ratio of the Mediterranean and Ponto-Mediterranean elements is lower than in the province Eupannonicum (4.81% of the species, 6.05% of the specimens). Two species with boreo-montaneous distribution have also been found (*Megalonotus antennatus*, *Tytthus pygmaeus*; 2.41% of the species, 0.29% of the specimens). The total percentage of the West-Palaeartic, European and Euro-Mediterranean species is relatively low (42.17% of the species, 63.40% of the specimens), whereas that of the Eurosiberian, South-Eurosiberian and West-Eurosiberian species is high (26.50% of the species, 28.82% of the specimens) in this province.

Also in the phytogeographic province Matricum, the percentage of the Mediterranean and Ponto-Mediterranean species is far less than in the province Eupannonicum (5.27% of the species, 0.52% of the specimens). Two boreo-montaneous elements have been found in this area (*Megalonotus antennatus*, *Monalocoris filicis*; 2.63% of the species, 0.26% of the specimens). The total percentage of the West-Palaeartic, European and Euro-Mediterranean species is relatively low (40.79% of the species, 50.93% of the specimens), whereas that of the Eurosiberian, South-

Eurosiberian and West-Eurosiberian species is high (26.32% of the species, 31.64% of the specimens) in this area.

As a summary, in respect to the environmental changes through the country, different parallel changes can be observed in the zoogeographical distribution of the ground-living heteropteran communities of the different provinces. The percentage of the fauna elements indicating continentality (Eurosiberian, South-Eurosiberian and West-Eurosiberian) is the highest in the province Eupannonicum. Their ratio is far lower in the two hilly provinces. The percentage values of the species preferring humid subatlantic climate (West-Palaeartic, European and Euro-Mediterranean) show an increase in the direction Eupannonicum → Matricum → Bakonyicum, consequently are the highest in the western part of the country. The Mediterranean and Ponto-Mediterranean fauna elements have been collected in the lowlands (province Eupannonicum) in greatest number. Boreo-montaneous elements have been found only in the two hilly provinces (Bakonyicum and Matricum).

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