

The Orthoptera fauna of Börzsöny Mountains, Hungary

Arnold Erdélyi, Barnabás Nagy, Gellért Puskás & Gergely Szövényi

Abstract

The Orthoptera fauna of the Börzsöny Mountains is relatively unknown. After a comprehensive field investigation, carried out in the last years, and an inspection of the available old data, altogether 2800 records of 60 species from this region are published here. Nearly twenty new localities of *Paracaloptenus caloptenoides* (strictly protected species in Hungary) and two new occurrences of *Saga pedo* (legally protected) are listed, whilst *Arcyptera fusca* (legally protected) was only found in the older records. Several further, regionally valuable species were recorded, which occur close to their northern distribution: *Aiolopus thalassinus*, *Oedalus decorus*, *Pachytrachis gracilis*, *Phaneroptera nana*, *Pezotettix giornae*, *Rhacocleis germanica*, *Ruspolia nitidula* and *Tessellana veyseli*.

Zusammenfassung

Zur Heuschreckenfauna des Börzsöny-Gebirges ist relativ wenig bekannt. Nach umfassenden Felduntersuchungen, welche in den letzten Jahren durchgeführt wurden, und einer Sichtung der bereits vorhandenen Altdaten, werden hier insgesamt 2800 Datensätze von 60 Arten aus dieser Region veröffentlicht. Während *Arcyptera fusca* (gesetzlich geschützt) nur mittels Altdaten nachgewiesen werden konnte, werden fast zwanzig neue Fundorte von *Paracaloptenus caloptenoides* (streng geschützte Arten in Ungarn) und zwei neue Vorkommen von *Saga pedo* (gesetzlich geschützt) aufgeführt. Zudem werden einige regionale Besonderheiten vorgestellt, die hier nahe ihrer nördlichen Arealgrenze vorkommen: *Aiolopus thalassinus*, *Oedalus decorus*, *Pachytrachis gracilis*, *Phaneroptera nana*, *Pezotettix giornae*, *Rhacocleis germanica*, *Ruspolia nitidula* und *Tessellana veyseli*.

Introduction

The exploration of Hungary's Orthoptera fauna looks back on a notable past, although the gathered knowledge shows high geographical variance (NAGY 2005). The majority of the available data were collected from different protected areas. Faunistic and eco-faunistic monographies of Hungarian national parks started to appear since the 80's (Hortobágy National Park (NAGY 1983), Kiskunság NP (RÁCZ 1986b), Bükk NP (NAGY & RÁCZ 1996), Őrség NP (NAGY & SZÖVÉNYI 1997), Körös-Maros NP (NAGY & SZÖVÉNYI 1999), Aggtelek NP (NAGY et al. 1999) and Fertő-Hanság NP (NAGY & SZIRÁKI 2002)). Nevertheless, most of the detailed studies focused on smaller areas, as typical grassland remains of the Pannonian lowlands (e.g. RÁCZ & VARGA 1978, NAGY 1985, NAGY 1990, NAGY & SZÖVÉNYI 1998, SZÖVÉNYI 2007) and mountain ranges, which include variable grassland habitats (e.g. NAGY 1948, RÁCZ 1979, NAGY et al. 1998, SZÖVÉNYI &

NAGY 1999, NAGY & NAGY 2000, SZÖVÉNYI et al. 2007, KENYERES 2010, SZÖVÉNYI et al. 2010, SZÖVÉNYI et al. 2013).

The North Hungarian Mountains form the longest (approximately 250 km), and highest (maximum elevation: 1014 m a.s.l.) mountain range in the country. During the last two decades comprehensive studies were published about the Bükk Mountains (NAGY & RÁCZ 1996), Zemplén-Slanské Mountains (NAGY et al. 1998), Aggtelek Karst (NAGY et al. 1999, NAGY 2008), Cserhát Hills (SZÖVÉNYI et al. 2013) and its unique, westernmost part, the Naszály Mountain (SZÖVÉNYI et al. 2010). However, only scattered data were listed in papers from the other two ranges, Börzsöny and Mátra Mountains (e.g. NAGY 1981, NAGY 1987, RÁCZ 1986a, RÁCZ et al. 2005, KOLICS et al. 2008, CSÓKA et al. 2010, NAGY et al. 2010). There is also a publication partly about the Visegrád Mountains (NAGY 1987), which lies on the other side of River Danube. It is geographically separated, but geologically and biographically considered to be a part of the North Hungarian Mts. as well. In the present article we tried to gather all published data and also all available, so far unpublished records of the Orthoptera from Börzsöny Mountains.

The first publication, which includes this region without any exact location deals with *Saga pedo* (NAGY 1965). In HARZ (1969) three species records are mentioned, whilst in HARZ (1975) 12 data of 9 species can be found. Two data of two species were published in an overview of the Orthoptera collection of Natural History Museum in Gyöngyös, Hungary (RÁCZ 1986a). Furthermore, 27 data of 22 species are listed in two publications about the Orthoptera collection of the Hungarian Natural History Museum (RÁCZ 1992, RÁCZ et al. 2005). Besides of these, few data of six species are mentioned in NAGY et al. (1983), NAGY (1987), KENYERES et al. (2002) and KOLICS et al. (2008). Altogether, only 56 records of 34 species were published until now.

The study area

Börzsöny Mountains forms the westernmost bastion of the North Hungarian Mts., which is the southernmost part of the (North-)Western Carpathians' inner volcanic belt (Figure 1). River Ipoly borders the mountain range in the North and its flood plains in the West. The south perimeter - including the spectacular Danube Band - is marked by River Danube, and in the East the Nógrád Basin separates the mountain range from the other parts of the Northern Range. Its recent shape was determined mainly by Miocene volcanic activities and later on by fluvial, wind and frost erosion (KARÁTSON 2002, SZÉKELY & KARÁTSON 2004). The bedrock is typically built up from andesite, its tuffs and agglomerates. However, in some lower parts limestone and Pleistocene loess can also be found (KARÁTSON 2002). The drainage network is extensive, but permanent streams cannot be found in the center of the mountains. The annual average temperature is between 7.5 and 10 °C. The annual average precipitation is between 600 and 780 mm, although even more can fall in the higher areas (DÖVÉNYI, 2010).

Börzsöny belongs to the flora region of the North Hungarian Mts. (*Matricum*), and it reflects the Carpathian and Pannonian flora as well (BORHIDI 2003). It is

classified with Cserhát Hills into one subregion (*Neogradense*), except the southern part, which is handled together with Visegrád Mountains and Naszály Mountain (*Visegradense*) (HORÁNSZKY 1964). The greatest part of the mountain range is covered by acidophilous, closed beech, sessile oak-hornbeam and Pannonian-Balcanic *Quercus cerris-Quercus petraea* woodlands (KIRÁLY et al. 2008). There are three smaller inhabited basins with extensive agricultural fields, hay meadows and *Robinia pseudoacacia* plantations. This kind of land use characterizes the peripheral areas of the range as well. The most precious grassland habitats of the Börzsöny Mts. are the rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*) and mountain hay meadows, but slope steppes on stony soils, siliceous open rocky grasslands, semi-dry grasslands, forest-steppe meadows, mesotrophic wet meadows, *Arrhenantherum* hay meadows, wood pastures and uncharacteristic dry and semi-dry grasslands (MOLNÁR et al. 2008 & KIRÁLY et al. 2008) could also be emphasized as important habitats for grasshoppers. Due to logging activities and natural processes temporary, opened forest patches could also be relevant for Orthopterans. Besides the reforestation of mountain hay meadows, excessive keep of indigenous grazers, wild boar (*Sus scrofa*) and the introduced moufflon (*Ovis aries*) are the primary threatening factors for the characteristic grasslands of Börzsöny Mountains.

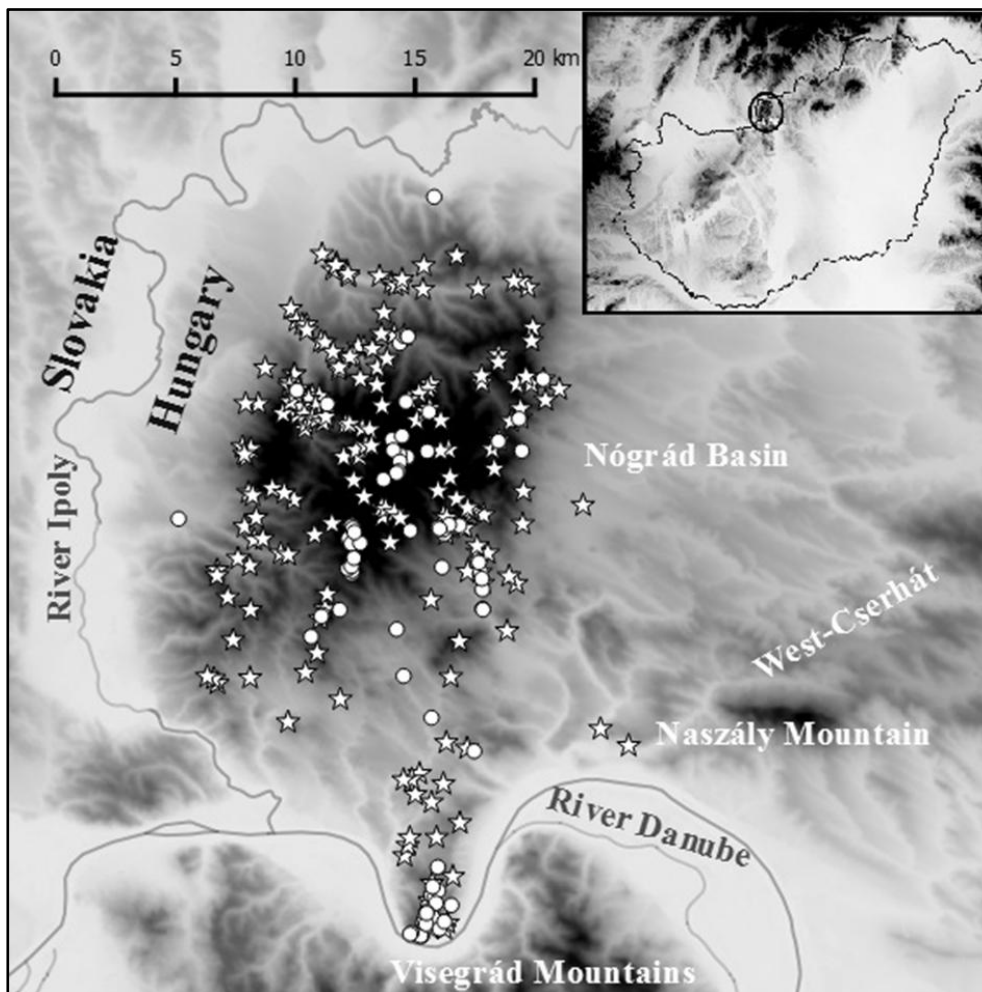


Figure 1: The study area in Hungary (inlay) and the sampling sites in Börzsöny Mountains. Stars: recently investigated localities; circles: older, approximated localities.

Material and methods

In this paper, all published and unpublished data about the Orthoptera fauna of the Börzsöny Mountains were analyzed. This includes a comprehensive inspection of the specimens stored in the Hungarian Natural History Museum. Often there was no proper location documented in the case of the old data. However, in most cases the exact habitat or at least a rough area was identified, where the record could have taken. In all possible cases, locality data were identified as accurately as possible and added to a GIS database.

An extensive study was carried out between 2012 and 2014 by the authors, when nearly the whole mountain range was covered by sampling sites. The main applied method was sweep netting complemented by visual searching and acoustic detection. In 2015 additional data of *Paracaloptenus caloptenoides* were collected. The majority of the caught animals - especially individuals of protected species - were released alive after their identification and the rest was preserved for further determination in the laboratory.

As a result, we compiled a checklist including - besides the fauna type and the frequency of the species (see below) - the name of the settlement in the vicinity of the sampling site and a code for additional information. The codes can be found in Appendix 1 in numerical order, listed after the adequate settlement with the following information: name of the sampling site, geographical coordinates, name of the collector(s), year of collection and publication - any if available.

For each species fauna type after the modified classification of RÁCZ (1998) (abbreviations: Af: African; Al: Alpine; An: Angarian; Ba: Balkanic; Ca: Caspian; Da: Dacian; Eu: European; Il: Illyrian; M: Mountainous; Ma: Manchurian; Med: Mediterranean; Moe: Moesian; N: North; Pan: Pannonian; Pc: Polycentric; Po: Pontic; Sib: Siberian, Tur: Turcesthanian) and the relative frequency (records of a given species divided by the total record value 2800) in percentage are given.

The nomenclature and system was used according to EADES et al. (2016). The ordination was executed with Past3.x (HAMMER et al. 2010).

Results and discussion

Altogether, 2744 records of 57 species were added to the formerly known 56 records of 34 species. Accordingly, 2800 records of 60 species are presented in this paper. 198 different sites were sampled during 2012-2015 and for 51 of them matching data were found in older records (coded in Appendix 1 by ordinal number/letter). Additionally, 90 approximated and 45 undetermined locations (in 16 cases, only "Börzsöny" was noted, coded by UL (Unidentified Location) in Appendix 1) were reviewed. Nevertheless, due to the unidentifiable sites a slight overlap cannot be excluded among the final 349 different localities.

Checklist for the Orthoptera fauna of the Börzsöny Mts.

Ensifera

Tettigonioidea

Tettigoniinae

Bradyponinae

Ephippiger ephippiger (Fiebig, 1784) - Po-Med; 0.43%

Diósjenő: 34/a, 35/a, 46; **Kóspallag:** 112, 119; **Nagymaros:** 179, 202, 205; **Nagyoroszi:** 212; **Szokolya:** 277, 282; **Verőce:** 321

Conocephalinae

Conocephalus fuscus (Fabricius, 1793) - Sib-Pc; 0.71%

Bernecebaráti: 5, 14, 15; **Diósjenő:** 22/a, 30, 36, 37; **Kemence:** 96; **Kóspallag:** 120; **Nagybörzsöny:** 146; **Nagymaros:** 169/b, 175, 177, 178; **Nagyoroszi:** 207; **Nógrád:** 214; **Szokolya:** 260, 261; **Perőcsény:** 227; **Zebegény:** 326

Ruspolia nitidula (Scopoli, 1786) - Af; 0.29%

Diósjenő: 17, 34, 43; **Kismaros:** 106; **Márianosztra:** 127; **Nagybörzsöny:** 146; **Nagymaros:** 178; **Zebegény:** 324

Meconematinae

Meconema thalassinum (De Geer, 1773) - Extra-Med; 0.29%

Diósjenő: 21, 22/a, 77; **Kemence:** 101; **Nagymaros:** 174; **Nagyoroszi:** 208; **Perőcsény:** 228, 248

Phaneropterinae

Barbitistes constrictus Brunner von Wattenwyl, 1878 - Ba (Moe); 0.39%

Diósjenő: 45; **Hont:** 59; **Kemence:** 93; **Nagybörzsöny:** 156; **Nagymaros:** 180, 181, 189, 196; **Szokolya:** 274/a, 301 **UL:** 340

Isophya kraussii Brunner von Wattenwyl, 1873 - Ba(II); 1.5%

Diósjenő: 21, 22, 36/a, 42/a, 45, 47, 49, 50; **Hont:** 59; **Kemence:** 92, 93, 94, 97, 101; **Kóspallag:** 113; **Nagybörzsöny:** 155, 156; **Nagymaros:** 182, 183, 184, 187, 188, 189, 196, 198, 200, 201; **Perőcsény:** 226; **Szokolya:** 274/a, 274/b, 274/e, 274/f, 274/g, 289, 291, 293, 300, 301, 307, 312; **UL:** 335, 341

Leptophyes albovittata (Kollar, 1833) - Po-Med; 5%

Bernecebaráti: 2, 3, 5, 6, 7, 10, 11, 12, 14, 15; **Diósjenő:** 17, 18, 19, 19/a, 20, 22/a, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 34/a, 36, 36/a, 37, 39, 41/c, 42/a, 45, 49, 53, 54, 56; **Hont:** 59; **Kemence:** 65, 67, 68, 70, 71, 74, 76, 77, 78, 80, 81, 83, 85, 92, 93, 94, 95, 96, 101; **Kismaros:** 106; **Kóspallag:** 115, 119, 120; **Márianosztra:** 127; **Nagybörzsöny:** 131, 133, 136, 137, 138, 143, 144, 144/a, 146, 146/a, 149, 155, 156, 158, 161; **Nagymaros:** 167, 172, 173, 174, 175, 177, 182, 187, 189, 190, 203, 205, 206; **Nagyoroszi:** 207, 208, 209, 210, 211, 212; **Nógrád:** 213, 214; **Perőcsény:** 217, 218, 226, 227, 231, 232, 233, 234, 235, 238, 244; **Szokolya:** 255, 255/a, 257, 260, 264, 264/a, 265, 266, 274, 274/b, 274/g, 276, 279, 282, 283, 284, 285, 287, 289, 295, 305; **Vámosmikola:** 315, 316, 317; **Verőce:** 318, 319; **Zebegény:** 328

Phaneroptera falcata (Poda, 1761) - Sib-Pc; 2.82%

Bernecebaráti: 2, 10, 14, 15; **Diósjenő:** 19, 22, 22/a, 22/b, 23, 24, 27, 28, 34/a, 36, 37, 39, 42/a, 43, 54; **Hont:** 59; **Kemence:** 63, 65, 72, 73, 74, 76, 77, 78, 79, 81, 82, 83; **Kismaros:** 106; **Kóspallag:** 109, 111, 115; **Letskés:** 123; **Nagybörzsöny:** 133, 134, 138, 144, 146, 146/a, 149, 151/a, 164; **Nagymaros:** 173, 174, 175, 176, 177; **Nagyoroszi:** 207; **Nógrád:** 213, 214; **Perőcsény:** 217, 225, 226, 227, 231, 234, 239; **Szokolya:** 257, 260, 264, 264/a, 265, 269, 270, 274, 274/f, 274/g, 274/h, 282; **Vámosmikola:** 315; **Verőce:** 319; **Zebegény:** 323, 326, 327

Phaneroptera nana Fieber, 1853 - Holo-Med; 0.14%
Nagymaros: 172, 178; **Perőcsény:** 220; **Zebegény:** 324

Saginae

Saga pedo (Pallas, 1771) - Po-Ca; 0.25%
Márianosztra: 128; **Nagybörzsöny:** 145/b, **Nagymaros:** 179, 190; **Perőcsény:** 220/a;
Szokolya: 298, 313

Tettigoniinae

Decticus verrucivorus (Linnaeus, 1758) - An; 1.03%
Bernecebaráti: 1, 3, 4, 12; **Diósjenő:** 19/a, 28, 55; **Nagybörzsöny:** 144/b, 145; **Kemence:** 65, 76; **Nagymaros:** 169/a, 173, 174, 178, 181; **Nagyoroszi:** 208, 211; **Perőcsény:** 233; **Szokolya:** 255/a, 257, 261, 265, 266, 267, 274, 274/a, 311; **Zebegény:** 327

Bicolorana bicolor (Philipi, 1830) - An; 2.72%
Bernecebaráti: 1, 10, 14; **Diósjenő:** 19, 19/a, 22/a, 23, 24, 26, 34, 36, 36/a, 41/c, 42/a, 46, 49, 51, 55; **Kemence:** 63, 64, 65, 72, 78, 87, 95, 101; **Kóspallag:** 109, 115, 117; **Nagybörzsöny:** 131, 133, 143, 144, 144/a, 152, 155, 157, 159, 162; **Nagyoroszi:** 208; **Nagymaros:** 173, 174, 182, 185, 187; **Nógrád:** 213, 214; **Perőcsény:** 217, 221, 224, 234, 235, 236, 237, 238, 244, 247, 250; **Szokolya:** 255, 255/a, 260, 266, 268, 269, 272, 274/b, 274/d, 274/g, 274/h, 274/i, 282, 283, 287, 309; **Zebegény:** 323 **UL:** 335

Metrioptera brachyptera (Linnaeus, 1761) - Sib-Pc-M; 0.04%
Szokolya: 274/d

Roeseliana roeselii (Hagenbach, 1822) - Po-Ca; 2.6%
Bernecebaráti: 2, 5, 8, 9, 10, 13, 14, 15, 16; **Diósjenő:** 18, 19, 20, 21, 22, 26, 30, 31, 32, 34, 36, 36/a, 37, 38, 40, 41, 41/c, 42, 42/a, 43, 49, 84; **Kismaros:** 106; **Márianosztra:** 127; **Nagybörzsöny:** 132, 140, 143, 144/b, 146, 146/a, 153, 155, 161; **Nagymaros:** 169, 169/b, 172, 173, 175, 177, 178; **Nagyoroszi:** 207, 209, 211; **Perőcsény:** 227, 228, 229, 230, 231, 232; **Szokolya:** 255, 256, 259, 260, 261, 264, 264/a, 265, 273, 270, 272, 274, 274/g, 274/i; **Zebegény:** 327

Pholidoptera aptera (Fabricius, 1793) - Extra-Med-M; 1.18%
Diósjenő: 35/a, 36/a, 42/a, 45, 48; **Kemence:** 94, 96, 101; **Kóspallag:** 113, 116; **Nagybörzsöny:** 156, 157; **Nagymaros:** 169/a, 181, 186, 187, 189; **Nógrád:** 44; **Szokolya:** 263, 274, 274/a, 274/c, 274/f, 277, 280, 285, 288, 289, 292, 296, 300; **Zebegény:** 328; **UL:** 341

Pholidoptera fallax (Fischer, 1853) - Po-Med; 1.29%
Bernecebaráti: 2, 10; **Diósjenő:** 19/a, 20, 27, 41, 41/c, 41/d, 42/a, 53; **Ipolytölgyes:** 61; **Kemence:** 65, 72, 101; **Nagybörzsöny:** 156, 159; **Nagymaros:** 189; **Perőcsény:** 229, 231, 234, 239; **Szokolya:** 260, 264, 264/a, 267, 272, 273, 274, 274/b, 274/d, 274/e, 274/g, 277, 278, 280, 285

Pholidoptera griseoptera (De Geer, 1773) - Po-Ca; 3.86%
Bernecebaráti: 1, 2, 8, 9, 11, 13, 15; **Diósjenő:** 17, 18, 19, 19/a, 21, 22/a, 26, 35/a, 36/a, 38, 39, 40, 41/b, 42/a, 44, 45, 46, 47, 49, 53, 55; **Hont:** 59; **Ipolytölgyes:** 61; **Kemence:** 65, 66, 93, 96, 98, 100, 101; **Kismaros:** 106; **Kóspallag:** 108, 111, 112, 113, 114, 116, 121, 118; **Nagybörzsöny:** 143, 145/b, 146, 155, 156, 160; **Nagymaros:** 169/a, 169/b, 172, 175, 177, 178, 184, 187, 189, 191, 193, 195, 199, 201, 205; **Nagyoroszi:** 209, 210; **Nógrád:** 213; **Perőcsény:** 227, 228, 238; **Szokolya:** 258, 259, 260, 263, 264, 274/c, 274/f, 274/g, 274/h, 276, 277, 278, 279, 280, 284, 285, 287, 288, 289, 290, 291, 294, 300, 305, 306, 309, 310; **Verőce:** 318, 319, 321; **Zebegény:** 324, 326, 328 **UL:** 335, 336;

Platycleis affinis Fieber, 1853 - Po-Ca; 0.04%

Diósjenő: 34/a

Platycleis grisea (Fabricius, 1781) - Po-Ca; 4.29%

Bernecebaráti: 4, 6, 7, 11, 12; **Diósjenő:** 23, 25, 27, 29, 34/a, 35/a, 41, 44, 45, 46; **Ipolydamásd:** 60; **Kemence:** 62, 64, 65, 66, 67, 68, 69, 70, 71, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 86, 87, 89, 90, 91, 94; **Letkés:** 122, 123; **Márianosztra:** 127/a, 128; **Nagybörzsöny:** 131, 132, 133, 134, 136, 138, 139, 141, 142, 144, 144/a, 144/b, 145, 145/a, 145/b, 145/c, 147, 148, 149, 150, 151/a; **Nagymaros:** 165, 166, 171, 173, 173/a, 176, 190, 192, 203, 204; **Nagyoroszi:** 208, 210, 212; **Nógrád:** 214; **Perőcsény:** 215, 216, 217, 218, 219, 220, 222, 223, 224, 225, 226, 233, 234, 236, 238, 239, 240, 241, 242, 243, 244, 246, 247, 248, 249, 250; **Szokolya:** 265, 266, 267, 268, 269, 274, 274/h, 274/j; **Vámosmikola:** 314, 315, 316; **Zebegény:** 323, 330, 331

Rhacocleis germanica (Herrich-Schäffer, 1840) - Po-Med; 1.36%

Bernecebaráti: 1, 3, 4, 6, 7, 11, 12; **Diósjenő:** 24, 25, 33, 35/a, 44; **Kemence:** 66, 68, 69, 71, 82, 85; **Kismaros:** 106; **Nagymaros:** 166, 167, 168, 171, 176, 194, 195, 197, 203, 206; **Nagyoroszi:** 208, 210; **Perőcsény:** 215, 239, 241; **Szokolya:** 276; **Verőce:** 318, 319; **Zebegény:** 323

Pachytrachis gracilis (Brunner von Wattenwyl, 1861) - Po-Med; 1.57%

Bernecebaráti: 1, 3, 13, 14; **Diósjenő:** 18, 22/a, 24, 26, 27, 30, 36/a, 45; **Kemence:** 65, 67, 68, 73, 74, 89, 90, 91, 93, 94, 101; **Kóspallag:** 114; **Nagybörzsöny:** 151/a, 156, 160; **Nagyoroszi:** 208, 212; **Nógrád:** 214; **Perőcsény:** 232, 233, 234, 238; **Szokolya:** 255/a, 274, 275, 276, 280, 282, 285, 302, 309; **Verőce:** 321; **UL:** 341

Tessellana veyseli (Koçak, 1984) - Po-Ca; 0.36%

Diósjenő: 23, 25, 35/a; **Kemence:** 77, 91; **Kismaros:** 106; **Nagybörzsöny:** 148; **Perőcsény:** 222; **Szokolya:** 257; **Zebegény:** 333

Tettigonia cantans (Füssli, 1775) - Sib; 3.04%

Bernecebaráti: 8, 9, 10, 11, 12, 14, 15, 16, 43; **Diósjenő:** 17, 18, 19, 21, 22, 22/a, 30, 31, 34, 34/a, 36, 37, 38, 41, 42, 42/a, 44, 55, 56; **Ipolytölgyes:** 61; **Kemence:** 63, 68, 69, 72, 74, 43, 75, 84; **Kóspallag:** 117; **Nagybörzsöny:** 138, 139, 144/a, 146, 149, 152, 159, 161, 162; **Nagyoroszi:** 207, 209, 210, 211, 212; **Perőcsény:** 217, 219, 226, 227, 228, 231, 232, 233, 235, 241; **Szokolya:** 258, 259, 261, 262, 263, 269, 270, 271, 272, 274, 274/d, 274/g, 274/h, 275, 277, 280, 282, 285, 296, 297, 299, 306; **UL:** 340

Tettigonia viridissima Linnaeus, 1758 - Sb-Pc; 0.89%

Bernecebaráti: 5, 13; **Diósjenő:** 19, 21, 26, 32, 34/a, 36/a, 45, 47; **Kemence:** 79, 94, 101; **Nagybörzsöny:** 155; **Nagymaros:** 173, 176, 178, 189, 201; **Nógrád:** 214; **Szokolya:** 258, 259, 266, 294; **Zebegény:** 325

Grylloidea

Gryllidae

Gryllinae

Gryllus campestris Linnaeus, 1758 - Af; 0.96%

Bernecebaráti: 12; **Diósjenő:** 31, 34/a, 36/a; **Kemence:** 67, 84, 91; **Kóspallag:** 110, 121; **Márianosztra:** 130; **Nagybörzsöny:** 144/c, 145/b; **Nagymaros:** 167, 171, 172, 178, 187, 201; **Nógrád:** 214; **Perőcsény:** 235; **Szokolya:** 258; **Verőce:** 318, 319; **Zebegény:** 323, 324, 326, 327

Oecanthinae

Oecanthus pellucens (Scopoli, 1763) - Po-Med; 2.53%

Bernecebaráti: 4, 5, 7, 11; **Diósjenő:** 23, 24, 25, 27, 29, 35, 50; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 66, 67, 68, 71, 72, 73, 74, 75, 77, 78, 80, 81, 82, 83, 85, 90; **Kismaros:** 107; **Letskés:** 124; **Nagybörzsöny:** 132, 133, 134, 135, 136, 137, 138, 139, 145, 148, 151/a; **Nagymaros:** 165, 166, 169, 171, 173, 174, 175, 176, 191, 206; **Nógrád:** 214; **Perőcsény:** 220, 222, 223, 224, 225, 228, 233, 239, 243, 247; **Szokolya:** 257, 269, 282, 295; **Verőce:** 318, 319; **Zebegény:** 324, 327

Caelifera

Tetrigoidea

Tetrigidae

Tetrix kraussi Saulcy, 1888 - Sib-Pc; 0.25%

Bernecebaráti: 7, 16; **Kóspallag:** 118; **Nagymaros:** 196, 205, 206; **Nagyoroszi:** 208

Tetrix subulata (Linnaeus 1758) - Eu-Pc; 0.21%

Hont: 59; **Kóspallag:** 118; **Szob:** 253; **Szokolya:** 263; **Verőce:** 320, 322

Tetrix tenuicornis Sahlberg, 1893 - Sib-Pc; 0.25%

Diósjenő: 22/c, 36/a; **Kemence:** 77, 94, 105; **Kóspallag:** 118; **Szokolya:** 257; **Zebegény:** 331

Acridoidea

Acrididae

Calliptaminae

Calliptamus italicus (Linnaeus, 1758) - An; 5.64%

Bernecebaráti: 1, 3, 4, 6, 11, 12, 13; **Diósjenő:** 20, 23, 24, 25, 26, 27, 29, 30, 34, 34/a; 35, 35/a, 44, 46, 55; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 62, 65, 66, 67, 68, 69, 70, 71, 212, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 94; **Kismaros:** 106; **Letskés:** 122, 123, 124; **Márianosztra:** 126, 127, 128, 129; **Nagybörzsöny:** 131, 132, 133, 134, 135, 136, 137, 138, 139, 141, 142, 144, 144/a, 144/b, 145, 145/a, 145/b, 147, 148, 150, 151/a, 154; **Nagymaros:** 165, 166, 167, 168, 169, 169/b, 170, 171, 172, 173, 174, 176, 177, 178, 191, 192, 194, 203, 204; **Nagyoroszi:** 208, 209; **Nógrád:** 213, 214; **Perőcsény:** 215, 216, 217, 218, 219, 220, 222, 223, 225, 226, 228, 229, 233, 234, 235, 236, 237, 240, 242, 244, 245, 246, 247, 248, 249, 250; **Szokolya:** 255, 257, 258, 259, 261, 266, 267, 268, 269, 273, 274, 275, 276, 295; **Vámosmikola:** 314, 315, 316; **Verőce:** 318, 319; **Zebegény:** 323, 324, 325, 326, 327, 331; **UL:** 336

Paracaloptenus caloptenoides (Brunner von Wattenwyl, 1861) - Ba; 1.36%

Diósjenő: 23, 23/a, 24, 24/a, 24/b, 25, 25/a, 26, 26/a, 57; **Kemence:** 76, 76/a, 82, 83, 83/a, 102; **Nagybörzsöny:** 133, 133/a, 163; **Nagyoroszi:** 208, 210; **Perőcsény:** 216, 216/a, 219, 219/a, 233, 233/a, 239, 239/a, 251, 252; **Szokolya:** 275, 275/a, 282, 286 **UL:** 336, 345

Catantopinae

Miramella alpina (Kollar, 1833) - Al; 0.04%

UL: 343

Pezotettix giornae (Rossi, 1794) - Po-Med; 0.21%

Nagymaros: 167, 170; **Zebegény:** 323, 324, 325, 326

Gomphocerinae

Arcyptera fusca (Pallas, 1773) - An; 0.39%

Diósjenő: 41/a, 41/c, 42/a; **Kemence:** 104; **Szokolya:** 274/a; 287, 289, 304, 306; **UL:** 335, 346

Chorthippus apricarius (Linnaeus, 1758) - An; 1.46%

Bernecebaráti: 9, 14; **Diósjenő:** 22, 26, 28, 29, 34, 41, 41/c, 53, 54; **Kemence:** 71, 86; **Nagybörzsöny:** 143, 144, 144/b, 146/a; **Nagymaros:** 170, 172, 173, 174, 203; **Nagyoroszi:** 212; **Nógrád:** 213; **Perőcsény:** 217, 234, 235, 238; **Szokolya:** 255, 255/a, 258, 264, 264/a, 265, 271, 272, 274, 274/f, 274/g, 305; **Zebegény:** 325

Chorthippus biguttulus (Thunberg, 1815) - Po-Ca; 5.82%

Bernecebaráti: 1, 3, 4, 6, 7, 11, 12, 13, 16; **Diósjenő:** 23, 24, 25, 27, 30, 31, 32, 33, 34, 35, 41, 44, 46, 51, 53, 55; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 85, 86, 87, 88, 89, 90, 91; **Kóspallag:** 111, 115, 121; **Letkés:** 122, 123; **Márianosztra:** 126, 127, 128, 129, 130; **Nagybörzsöny:** 131, 132, 133, 134, 135, 136, 138, 141, 142, 144, 144/a, 144/b, 145/a, 145/b, 146, 147, 148, 150, 151, 151/a, 153, 157, 159, 162; **Nógrád:** 213; **Nagymaros:** 165, 166, 167, 168, 169, 170, 171, 175, 176, 179, 191, 192, 193, 194, 197, 199, 204; **Nagyoroszi:** 208, 210, 212; **Perőcsény:** 215, 216, 218, 219, 220, 221, 222, 223, 224, 225, 226, 228, 230, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249; **Szokolya:** 260, 267, 268, 269, 270, 271, 273, 274/f, 274/i, 250, 276, 285, 286, 295, 303, 306; **Vámosmikola:** 314, 315, 316, 317; **Verőce:** 321; **Zebegény:** 327, 331; **UL:** 335, 338

Chorthippus brunneus (Thunberg, 1815) - An; 4.68%

Bernecebaráti: 1, 3, 4, 13, 16; **Diósjenő:** 19, 21, 22/a, 24, 28, 29, 32, 38, 40, 41, 42, 42/a, 46, 49, 56; **Ipolydamásd:** 60; **Kemence:** 62, 63, 64, 65, 68, 72, 77, 78, 82, 84, 86, 87, 88, 89, 90, 98, 99, 100; **Kóspallag:** 111, 118; **Letkés:** 122, 123, 124; **Márianosztra:** 125, 126, 127, 129, 130; **Nagybörzsöny:** 133, 134, 135, 137, 139, 142, 144, 144/a, 144/b, 144/c, 146/a, 149, 151/a, 155, 156, 158, 159, 160, 162; **Nagymaros:** 167, 168, 169/a, 169/b, 170, 174, 177, 187, 191, 197, 204; **Nagyoroszi:** 208, 211; **Perőcsény:** 217, 225, 227, 228, 145, 229, 235, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250; **Szokolya:** 254, 255, 255/a, 256, 257, 258, 260, 270, 271, 273, 231, 232, 274, 274/b, 274/f, 274/g, 276, 282, 285, 300, 305, 309; **Vámosmikola:** 315; **Verőce:** 319, 321; **Zebegény:** 323, 326, 327, 328, 331;

Chorthippus dorsatus (Zetterstedt, 1821) - Sib-Pc; 3.53%

Bernecebaráti: 1, 2, 4, 5, 8, 9, 10, 12, 14, 16, 43; **Diósjenő:** 19, 19/a, 21, 22, 25, 28, 30, 31, 32, 34, 36, 37, 39, 40, 41, 42, 49, 56; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 62, 65, 72, 84; **Kismaros:** 106; **Kóspallag:** 109, 111, 121; **Letkés:** 122, 124; **Márianosztra:** 129; **Nagybörzsöny:** 140, 144, 146, 146/a, 149, 153; **Nagymaros:** 169, 170, 172, 173, 173/b, 174, 175, 177, 178; **Nagyoroszi:** 211; **Nógrád:** 214; **Perőcsény:** 222, 228, 229, 230, 231, 233, 236, 237, 238, 239, 244; **Szokolya:** 255, 256, 257, 260, 261, 262, 264, 270, 271, 272, 273, 274/g, 274/i, 276, 278, 282, 309; **Vámosmikola:** 317; **Verőce:** 318, 319, 321; **Zebegény:** 323, 324, 325, 326, 327, 329, 331; **UL:** 335

Chorthippus mollis (Charpentier, 1825) - An; 2.64%

Bernecebaráti: **Diósjenő:** 25, 27, 39, 41, 42, 46, 56; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 62, 63, 64, 79, 80, 87, 89, 90; **Letkés:** 122, 124; **Márianosztra:** 125, 126, 127, 128, 129, 130; **Nagybörzsöny:** 134, 135, 142, 144/b, 145, 145/c, 146, 147, 149, 150, 151, 154; **Nagymaros:** 166, 167, 168, 173, 173/a, 174, 177, 203; **Nógrád:** 213; **Perőcsény:** 215, 219, 233, 235, 236, 237, 238, 239, 240, 242, 243, 244, 245, 246, 247, 248, 249, 250; **Szokolya:** 258, 273; **Vámosmikola:** 315, 317; **Verőce:** 318, 321; **Zebegény:** 323, 325, 326, 327

Chorthippus oschei Helversen, 1986 - Po-Pan; 0.71%

Bernecebaráti: 16; **Diósjenő:** 19, 22/a, 32, 41, 42/a, 53; **Kemence:** 64; **Márianosztra:** 127; **Nagybörzsöny:** 153; **Nagyoroszi:** 209; **Perőcsény:** 230, 231; **Szokolya:** 255, 256, 257, 258, 274; **Verőce:** 321; **Zebegény:** 327

Chrysochraon dispar (Germar, 1834) - An; 2.5%

Bernecebaráti: 2, 5, 8, 13, 14, 15; **Diósjenő:** 17, 18, 19, 19/a, 22/a, 27, 28, 31, 32, 36/a, 37, 38, 41, 41/a, 41/b, 41/c, 42/a, 43, 49; **Hont:** 59; **Kóspallag:** 117; **Nagybörzsöny:** 143, 144/b,

149, 153, 155, 156, 161; **Nagymaros:** 169/a, 175, 178, 181, 182, 187, 189, 190; **Nagyoroszi:** 207, 209, 211; **Perőcsény:** 227, 229, 230; **Szokolya:** 260, 263, 264, 265, 274/c, 274/g, 276, 278, 284, 287, 289, 291, 295, 300, 309; **Zebegény:** 326, 328, 331; **UL:** 335, 344, 347

Euchorthippus declivus (Brisout de Barneville, 1849) - N-Med; 4.57%

Bernecebaráti: 1, 4, 12, 13, 14, 16; **Diósjenő:** 19, 20, 23, 24, 25, 26, 27, 29, 30, 34, 34/a, 36, 41, 42, 42/a, 44, 46, 55; **Ipolydamásd:** 60; **Kemence:** 63, 64, 65, 67, 68, 70, 73, 74, 76, 77, 79, 81, 86, 87, 89, 90, 91, 100; **Kismaros:** 106; **Kóspallag:** 115, 121; **Letskés:** 122, 124; **Márianosztra:** 125, 127, 129; **Nagybörzsöny:** 131, 133, 134, 137, 138, 141, 142, 144, 144/a, 144/b, 146, 146/a, 147, 151, 155, 158; **Nagymaros:** 169/b, 171, 173, 173/a, 173/b, 176, 177; **Nagyoroszi:** 209, 210, 211, 212; **Nógrád:** 213; **Perőcsény:** 215, 217, 218, 220, 221, 223, 224, 226, 227, 230, 233, 234, 235, 236, 237, 238, 244, 247, 248, 250; **Szokolya:** 255, 256, 257, 258, 260, 266, 267, 268, 269, 271, 272, 274, 274/f, 274/g, 283; **Vámosmikola:** 314, 316, 317; **Verőce:** 318, 319, 321; **Zebegény:** 323, 324, 325, 326, 327, 331, 332, 333

Euchorthippus pulvinatus (Fischer de Waldheim, 1846) - Po-Ca-Tur; 0.36%

Bernecebaráti: 4 **Kemence:** 73, 74; **Nagybörzsöny:** 144; **Nógrád:** 213; **Perőcsény:** 224, 233, 234, 236; **Szokolya:** 267

Euthystira brachyptera (Ocskay, 1826) - An; 5%

Bernecebaráti: 1, 2, 10, 11, 12, 13, 14, 15, 16; **Diósjenő:** 17, 18, 19, 20, 21, 22, 22/a, 23, 24, 25, 26, 27, 28, 29, 32, 34, 36, 36/a, 37, 38, 39, 41, 41/a, 41/b, 41/c, 42, 42/a, 43, 45, 47, 49, 53, 54, 55; **Kemence:** 62, 65, 72, 73, 77, 80, 81, 82, 86, 95, 96, 101; **Kismaros:** 106; **Kóspallag:** 109, 111, 115, 117, 121, 119; **Nagybörzsöny:** 133, 135, 137, 143, 144, 144/b, 146/a, 153, 155, 158, 160; **Nagymaros:** 169/a, 173, 173/b, 174, 175, 177, 178, 187, 195, 203, 205; **Nagyoroszi:** 207, 208, 209, 210, 211, 212; **Nógrád:** 213, 214, 44; **Perőcsény:** 217, 218, 219, 223, 229, 231, 232, 233, 234, 235, 244, 247, 250; **Szokolya:** 255, 258, 260, 261, 264, 264/a, 265, 266, 267, 269, 273, 274, 274/b, 274/d, 274/e, 274/f, 274/g, 278, 284, 287, 288, 289, 290, 291, 300, 305, 309; **Zebegény:** 323, 328; **UL:** 335, 336, 347, 348

Gomphocerippus rufus (Linnaeus, 1758) - An; 4.1%

Bernecebaráti: 7, 11, 12, 13, 16; **Diósjenő:** 19, 19/a, 20, 21, 22/b, 23, 24, 25, 26, 27, 29, 31, 33, 34, 35, 38, 40, 42/a, 43, 48, 49; **Kemence:** 62, 66, 70, 72, 73, 75, 76, 78, 82, 83, 86, 87, 88, 89, 90, 91, 103; **Kismaros:** 106; **Kóspallag:** 111, 114, 115, 116; **Márianosztra:** 127, 130; **Nagybörzsöny:** 140, 144/a, 144/b, 145/b, 146, 147, 149, 150, 151/a, 157; **Nagymaros:** 165, 166, 167, 168, 171, 176, 191, 193, 199, 204; **Nagyoroszi:** 208; **Nógrád:** 213; **Perőcsény:** 215, 216, 221, 222, 223, 229, 231, 232, 238, 237, 239, 242, 244, 245, 246, 247; **Szokolya:** 256, 258, 268, 270, 272, 274/h, 275, 276, 282, 284, 285, 288, 295; **Vámosmikola:** 316, 317; **Verőce:** 318, 319, 321; **Zebegény:** 323, 324, 325, 326, 327, 328, 331; **UL:** 335

Mymeleotettix antennatus (Fieber, 1853) - An; 0.04%

Zebegény: 331

Myrmeleotettix maculatus (Thunberg, 1815) - An; 0.04%

Nagymaros: 173/a

Omocestus haemorrhoidalis (Charpentier, 1825) - An; 0.46%

Diósjenő: 42/a, 46, 55, 56; **Nagymaros:** 173/a, 173/b; **Nógrád:** 214; **Perőcsény:** 218; **Szokolya:** 274/b, 274/h, 303, 305, 332

Omocestus rufipes (Zetterstedt, 1821) - An; 0.89%

Bernecebaráti: 3, 14; **Diósjenő:** 24, 43, 51, 56; **Kemence:** 73, 103; **Kóspallag:** 109; **Nagybörzsöny:** 144, 144/b; **Nagymaros:** 169/b, 181, 192; **Nógrád:** 214; **Szokolya:** 257, 260, 261, 262, 273, 274/h, 276, 280; **Zebegény:** 331; **UL:** 335

Pseudochorthippus parallelus (Zetterstedt, 1821) - An; 4.43%

Bernecebaráti: 1, 2, 5, 8, 9, 10, 13, 14, 15, 16, 43; **Diósjenő:** 17, 18, 19, 19/a, 20, 21, 22, 22/a, 26, 28, 29, 30, 31, 32, 34, 34/a, 36, 36/a, 37, 38, 40, 41, 41/b, 41/c, 42/a, 44, 49, 51, 52, 53, 54, 55, 56; **Hont:** 59; **Kemence:** 65, 72, 84; **Kismaros:** 106; **Kóspallag:** 109, 111, 116, 117, 118; **Márianosztra:** 127; **Nagybörzsöny:** 140, 142, 143, 144, 146, 146/a, 149, 153, 155, 161, 162; **Nagymaros:** 169, 169/a, 169/b, 172, 173, 175, 177, 178; **Nagyoroszi:** 207, 209, 210, 211; **Nógrád:** 214; **Perőcsény:** 217, 227, 228, 229, 230, 231, 232; **Szokolya:** 255, 255/a, 256, 257, 258, 259, 260, 261, 262, 264, 264/a, 265, 266, 268, 270, 271, 272, 273, 274, 274/b, 274/d, 274/f, 274/g, 282, 283, 288, 291, 295, 305; **Vámosmikola:** 317; **Verőce:** 319; **Zebegény:** 324, 325, 326, 327, 331, 333; **UL:** 335

Stenobothrus crassipes (Charpentier, 1825) - Po-Med; 1.18%

Diósjenő: 56; **Ipolydamásd:** 60; **Ipolytölgyes:** 61; **Kemence:** 103; **Kóspallag:** 110; **Letskés:** 124; **Márianosztra:** 125, 128, 129, 130; **Nagybörzsöny:** 144, 144/a, 144/b, 145, 145/a, 145/b, 151, 151/a, 154; **Nagymaros:** 173, 173/a, 174; **Nógrád:** 214; **Szokolya:** 255/a, 281, 283, 309; **Verőce:** 318, 319, 321; **Zebegény:** 331, 332; **UL:** 335

Stenobothrus eurasius Zubovski, 1898 - An; 0.04%

UL: 349

Stenobothrus lineatus (Panzer, 1796) - An; 5.68%

Bernecebaráti: 1, 3, 5, 6, 10, 11, 12, 13, 14, 16; **Diósjenő:** 19, 21, 22, 22/a, 24, 26, 29, 33, 34/a, 36, 36/a, 38, 39, 40, 41/c, 42, 42/a, 46, 49, 53, 55, 56; **Ipolydamásd:** 60; **Kemence:** 63, 64, 65, 67, 68, 69, 71, 72, 73, 74, 75, 76, 78, 79, 80, 81, 84, 85, 82, 87, 88, 89, 90, 95; **Kismaros:** 106; **Kóspallag:** 115, 117; **Márianosztra:** 127/a, 128, 129, 130; **Nagybörzsöny:** 131, 133, 134, 135, 137, 138, 141, 142, 143, 144, 144/a, 144/b, 145, 145/b, 145/c, 146, 147, 151, 151/a, 154; **Nagymaros:** 166, 169/a, 170, 173, 173/a, 174, 175, 176, 187, 190, 193, 195, 203, 206; **Nagyoroszi:** 208, 210, 211, 212; **Nógrád:** 213, 214; **Perőcsény:** 215, 216, 217, 218, 220, 221, 223, 225, 226, 228, 233, 234, 235, 236, 237, 238, 239, 244, 246, 247, 250; **Szokolya:** 255, 256, 260, 266, 267, 268, 269, 270, 272, 274, 274/b, 274/d, 274/f, 274/g, 274/h, 275, 276, 283, 285, 286, 287, 303, 305, 308, 309, 311; **Vámosmikola:** 314, 316, 317; **Verőce:** 318; **Zebegény:** 325, 327; **UL:** 335, 336

Stenobothrus nigromaculatus (Herrich-Schäffer, 1840) - An; 0.04%

Nagymaros: 173/b

Stenobothrus stigmaticus (Rambur, 1838) - Po-Ca; 0.11%

Nagybörzsöny: 162; **Nagymaros:** 173/a, 173/b

Oedipodinae

Aiolopus thalassinus (Fabricius, 1781) - Af; 0.07%

Nagymaros: 175 **Verőce:** 321

Oedalus decorus (Germar, 1826) - Pc; 0.11%

Nagybörzsöny: 131, 138; **Zebegény:** 327

Oedipoda caerulescens (Linnaeus, 1758) - Pc; 3.39%

Bernecebaráti: 1, 4, 6, 11, 12; **Diósjenő:** 33, 34, 35, 35/a, 45, 44, 46, 55; **Ipolytölgyes:** 61; **Kemence:** 62, 63, 64, 68, 69, 70, 71, 73, 74, 75, 76, 77, 78, 79, 80, 85, 89, 90, 91; **Letskés:** 122, 123, 124; **Márianosztra:** 126, 127/a, 128; **Nagybörzsöny:** 133, 134, 136, 138, 144, 144/a, 144/b, 145, 145/a, 145/c, 148, 150, 151, 151/a, 153, 155; **Nagymaros:** 165, 166, 167, 168, 171, 173, 176, 192, 194, 203, 204; **Nagyoroszi:** 210, 212; **Perőcsény:** 215, 216, 217, 218, 224, 225, 235, 236, 237, 240, 241, 242, 243, 246, 247; **Szokolya:** 266, 268, 275, 276, 280, 295; **Vámosmikola:** 314, 315, 316; **Verőce:** 318; **Zebegény:** 323, 327; **UL:** 343

Psophus stridulus (Linnaeus, 1758) - An; 0.21%
Diósjenő: 58; **Szokolya:** 274/c, 274/h, 274/i **UL:** 338, 341

Stethophyma grossum (Linnaeus, 1758) - Ma; 0,04%
Zebegény: 334

Species richness and composition

At the present level of knowledge, the species richness of Börzsöny is with 60 species slightly lower than the most other well documented mountain ranges in the North Hungarian Mts. (altogether 103 recorded species): in Bükk Mountains 74 species (NAGY & RÁCZ 1996), in Zemplén-Slanské Mts. - including the Slovakian part - 68 species (NAGY et al. 1998), in Aggtelek Karst 79 species (NAGY et al. 1999, NAGY 2008, SZANYI et al. 2013), in Cserhát Hills 67 species (SZÖVÉNYI et al. 2013), in Naszály Mt. 46 species (SZÖVÉNYI et al. 2010) and in Visegrád Mts. 58 species (NAGY 1987) were recorded. Börzsöny's Orthoptera fauna is mostly similar to the latter three, which are situated close together (Figure 2). The least similarities exist to Zemplén-Slanské Mountains and Aggtelek Karst, which can be found geographically the furthest.

It is important to consider the reliability of some old data. *Miramella alpina* is mentioned with one record in HARZ (1975) without any locality given, only "Börzsöny" (sic!). According to the latest samplings and NAGY et al. (2010) it could be most probably an incorrect data due to presumably a labeling mistake. *Stenobothrus eurasius* (also in HARZ 1975, without any location) is a protected, and really rare species in Hungary. Although it really occurs in some parts of the North Hungarian Mts. (Bükk Mts., Zemplén Mts. and Aggtelek Karst), the existence of a single old data from Börzsöny Mts. without any detailed location - its absence in later records here, and even in the neighbouring areas - indicates, that it could rather be a false record as well. Considering the presence of the suitable habitats here, the possibility of its real occurrence (at least in the past) cannot be excluded, but the authors were not able to confirm it until now.

There are some other species, which are represented by only a single or a few old records. *Myrmeleotettix antennatus* is considered to be an indicator species of dry opened sand steppes in Hungary (NAGY et al. 2003). However, its former occurrence (1 record), in the southern part - where sandy banks of River Danube and other flat meadows could be found in the past - is conceivable. The single record of *Stethophyma grossum* is also originated from this area. However, regarding to its natural habitat, that specimen could also be collected in one of the valleys, which are partially covered by sedge and other swampy grassland vegetation. Other species characteristic to the Pannonian lowlands and hills (e.g. *Aiolopus thalassinus*, *Oedalus decorus*, *Platycleis affinis*, *Ruspolia nitidula*, *Stenobothrus crassipes*, *Tessellana veyseli*) can be found sporadically in the lower regions, but - as the latest samplings show - often with high abundances and most frequently in the south part of the mountains. It also indicates similarly to the floristic pattern (see The study area), that South-Börzsöny differs strongly from the other parts of the mountain range.

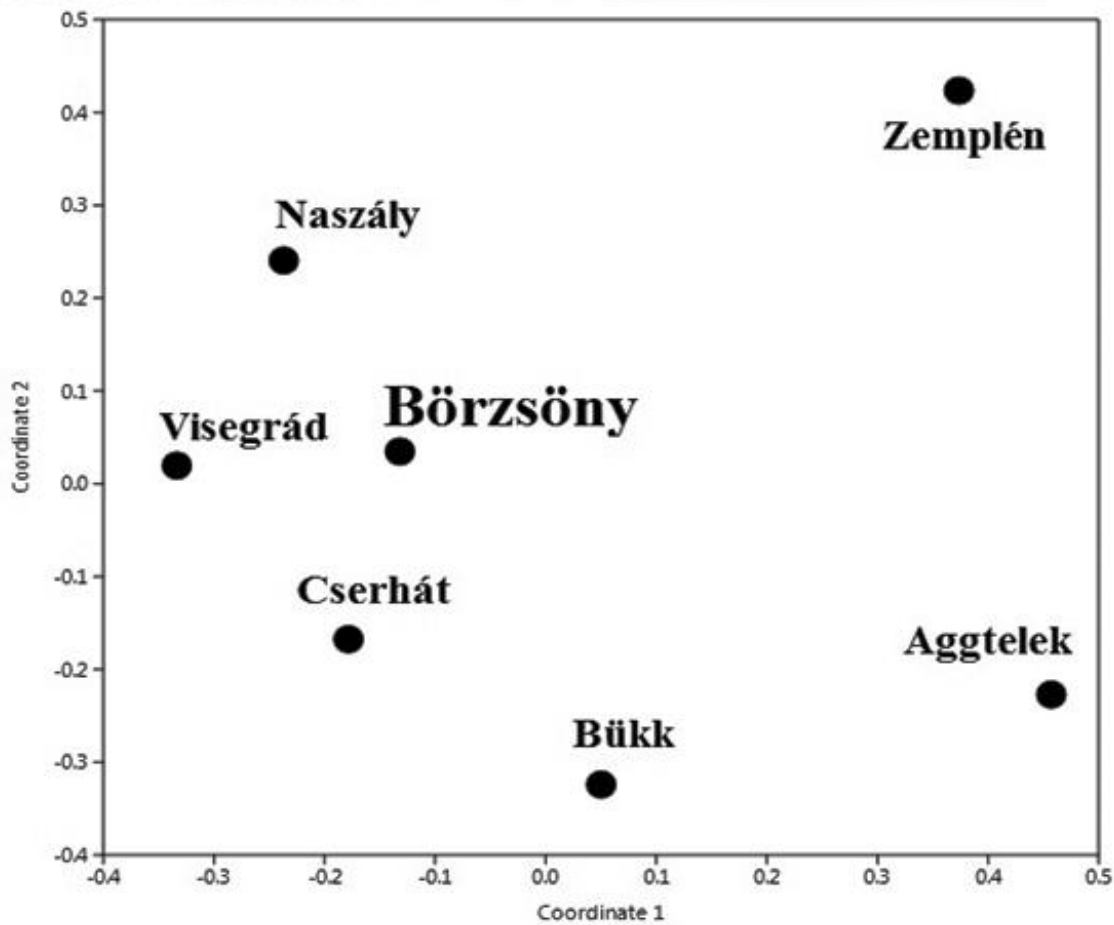
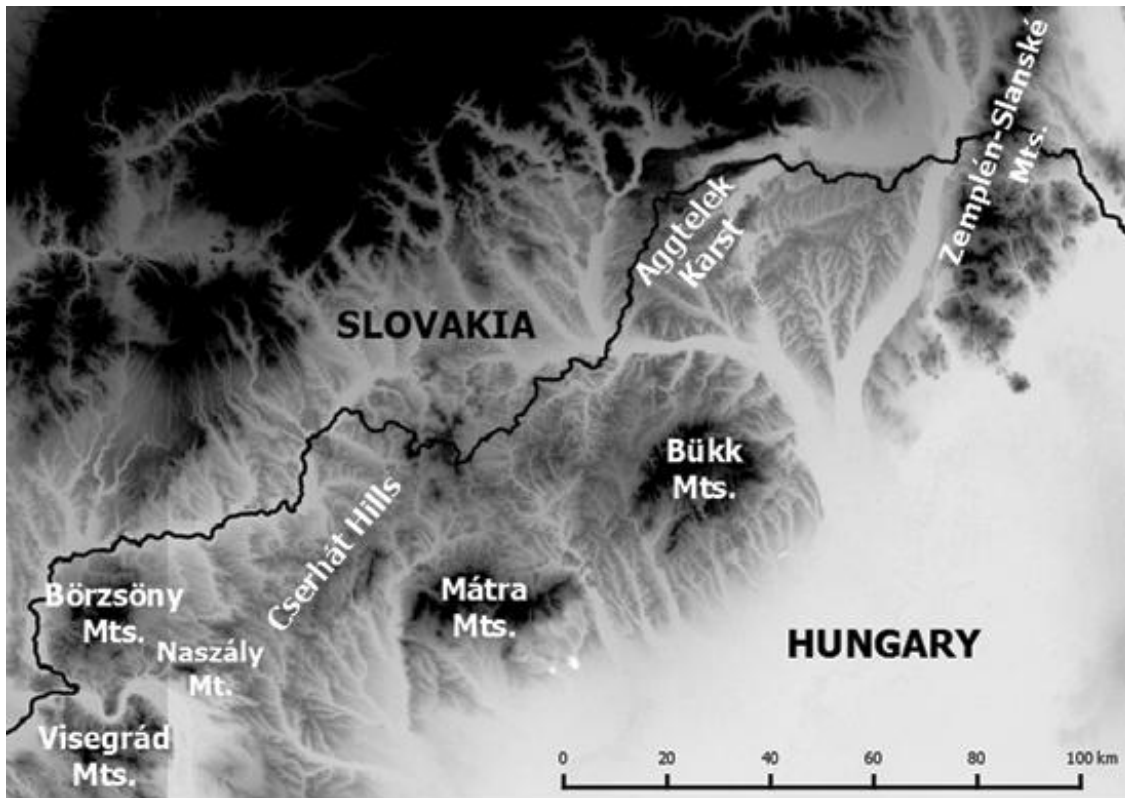


Figure 2: The main parts of the North Hungarian Mountains and their ordination based on the Orthoptera species composition (NMDS, Mátra Mts. is not included in the analysis because of the lack of published orthopterological data).

For instance, *Pezotettix giornae* (new records), *Myrmeleotettix antennatus*, *Myrmeleotettix maculatus*, *Stenobothrus nigromaculatus*, *Stenobothrus stigmaticus* (old records) and *Aiolopus thalassinus* (old and new records) were exclusively found in this area. *Oedalus decorus*, *Rhacocleis germanica* and *Stenobothrus crassipes* were three times more frequent here, than in the other parts of the mountain range. It is relevant to mention, that the surroundings of Börzsöny, including the river shores and the inner small basins were scarcely explored. Therefore, other lowland species can likely be detected during future investigations.

On the other hand, it is surprising, that only one regionally mountainous species was recorded during the latest samplings. Nevertheless, *Tettigonia cantans* was very frequent (3.04%) in the forested parts of the mountains. Almost all of the few records of *Arcyptera fusca*, *Psophus stridulus* and *Metrioptera brachyptera*, which are known to be restricted to the higher mountains in Hungary, are older than 40 years. Only one record of *Arcyptera fusca* is from 2000. They mainly occur in the middle and eastern parts of the North Hungarian Mts., similarly to the mountainous species *Pholidoptera transsylvanica* (Fischer, 1853), *Podisma pedestris* (Linnaeus, 1758), *Pseudopodisma nagyii* Galvagni et Fontana, 1996 and *Stauroderus scalaris* (Fischer de Waldheim, 1846), which are missing from the western part of this mountain range. *Arcyptera fusca* and *Psophus stridulus* were reported from the Visegrád Mts., but both are considered to be extinct there. Nevertheless, it is well imaginable that both species occur in small populations in the Börzsöny Mts., because the mountain range has many seemingly suitable habitats on relatively high altitudes. Further investigations are necessary to clear this question.

The Orthoptera species known from the Börzsöny Mts. can be classified into 4 groups of fauna types (*Miramella alpina* and *Stenobothrus eurasius* are excluded due to data unreliability): Siberian (An, Sib, Sib-Pc, Sib-Pc-M), Southern (Af, Extra-Med, Holo-Med, N-Med, Po-Ca, Po-Ca-Tur, Po-Med), Polycentric (Eu-Pc, Pc) and Balkan-Dacian (Ba, Ba (II), Ba (Moe)). As the majority of the species, the most common ones belong to the Siberian (e.g. *Stenobothrus lineatus*, *Calliptamus italicus*, *Euthystira brachyptera*, *Pseudochorthippus parallelus*) and Southern (e.g. *Chorthippus biguttulus*, *Leptophyes albovittata*, *Euchorthippus declivus*, *Platycleis grisea*) groups as well. Nevertheless, the species of the Siberian group are quite more frequent (Table 1). This pattern slightly differs from the composition of the Orthoptera fauna of Hungary (see in RÁCZ 1998 modified), in which the Southern group is slightly more frequent.

Table 1: Species number, proportion and weighted proportion of the fauna types found in Börzsöny Mountains.

	Number of species	Proportion of fauna type (%)	Proportion weighted by relative frequency (%)
Siberian	27	46.6	53.5
Southern	25	43.1	39.5
Polycentric	3	5.2	3.7
Balkan-Dacian	3	5.2	3.3

The (North-)West Carpathians forms a geographical barrier for several Orthoptera species. *Pezotettix giornae* occurs at a few sites in the Southern Börzsöny and *Rhacocleis germanica* is - as in Cserhát Hills (SZÖVÉNYI et al. 2013) - relatively common in the study area. In south Slovakia nevertheless, they are extremely rare (KOČÁREK 1999, HOLUŠA & KOČÁREK 2008). *Ruspolia nitidula* and *Phaneroptera nana* were detected at a few sites, and only during the last intensive study period. It may also corroborate the latest observations of their northwest expansion in the Northern Carpathians in the last decades (e.g. HOLUŠA et al. 2007, KOČÁREK et al. 2008). Börzsöny Mts. offers suitable habitats for some other thermophilus species as well (see heat demand data in KENYERES 2008), which are at or near the border of their northern or northwestern distribution, but common in the Hungarian Plain. *Platycleis affinis* was found at one site, *Aiolopus thalassinus*, *Oedalus decorus*, *Tessellana veyseli* also occurred in a very few localities, whilst *Pachytrachis gracilis* similarly to *Rhacocleis germanica* are relatively frequent. It is unfortunate, that the mountainous species - except *Tettigonia cantans* - were missing from the new records. However, it is interesting, that many species characteristic to lowlands in Hungary, were found only lately in the mountain range.

In the case of the mountainous species, it is important to mention, that most of their old records are known from hayfields. Hayfields were previously mowed by hand for centuries. Due to the land use change, most of them were gradually abandoned, and after decades of abandonment nowadays intensively mowed by machines. These developments probably also facilitated the loss of some mountainous species.

Species of high nature conservation value

Paracaloptenus caloptenoides can be found in the annexes II and IV of Habitats' Directive (COUNCIL OF EUROPE 1992). In Hungary it is one of the four strictly protected orthopteran insects. Its first record in Börzsöny Mts. is from 1949, but similarly to a considerable part of the other older data, it does not have an exact locality, and until now it was not published. During the last few years, the species could be discovered for almost twenty different locations in the study area (Fig. 3). It inhabits mainly dry, opened stony grasslands. However, it was found in secondary habitats, as an old abandoned quarry and some clearings as well. This species shows a very sparse distribution pattern in the Börzsöny Mts., in the northernmost part of its area, the Carpathian Basin. The majority of its published occurrences in Hungary are known from the North Hungarian Mountains. Until now, most of the localities were published from Aggtelek Karst ($N_{\text{records}} = 12$, NAGY et al. 1999, NAGY 2008 and SZANYI et al. 2013), Bükk Mts. ($N_{\text{records}} = 3$, NAGY & RÁCZ 1996) and recently from Cserhát Hills ($N_{\text{records}} = 1$, SZÖVÉNYI et al. 2013) and Mátra Mountains ($N_{\text{records}} = 1$, CSÓKA et al. 2010). It is known from Visegrád Mts. (NAGY 1987) and it was recorded from Bakony Mts. in Transdanubia, where it is probably extincted (KENYERES 2008). It was discovered in Slovakia (GAVLAS 2004), and rediscovered in Austria (ZUNA-KRATKY et al. 2009).

Saga pedo can also be found in the annexes II and IV of Habitats' Directive (COUNCIL OF EUROPE 1992). It is - just as *Arcyptera fusca* - one of the protected

species in Hungary. Only a few records are known from Börzsöny Mts. (Fig. 3), and in the case of *A. fusca*, the recent presence is questionable. *S. pedo* occurs in several localities in Hungary (KOLICS et al. 2008), but due to its hidden way of living and effective camouflage, the data are scattered. In Börzsöny Mts. it was found on dry, steppic slopes. *A. fusca* occurs mainly in the higher parts of the North Hungarian Mountains. It was detected in mesic mountain meadows and semi-dry steppic slopes in the Central Börzsöny Mountains at higher elevations.

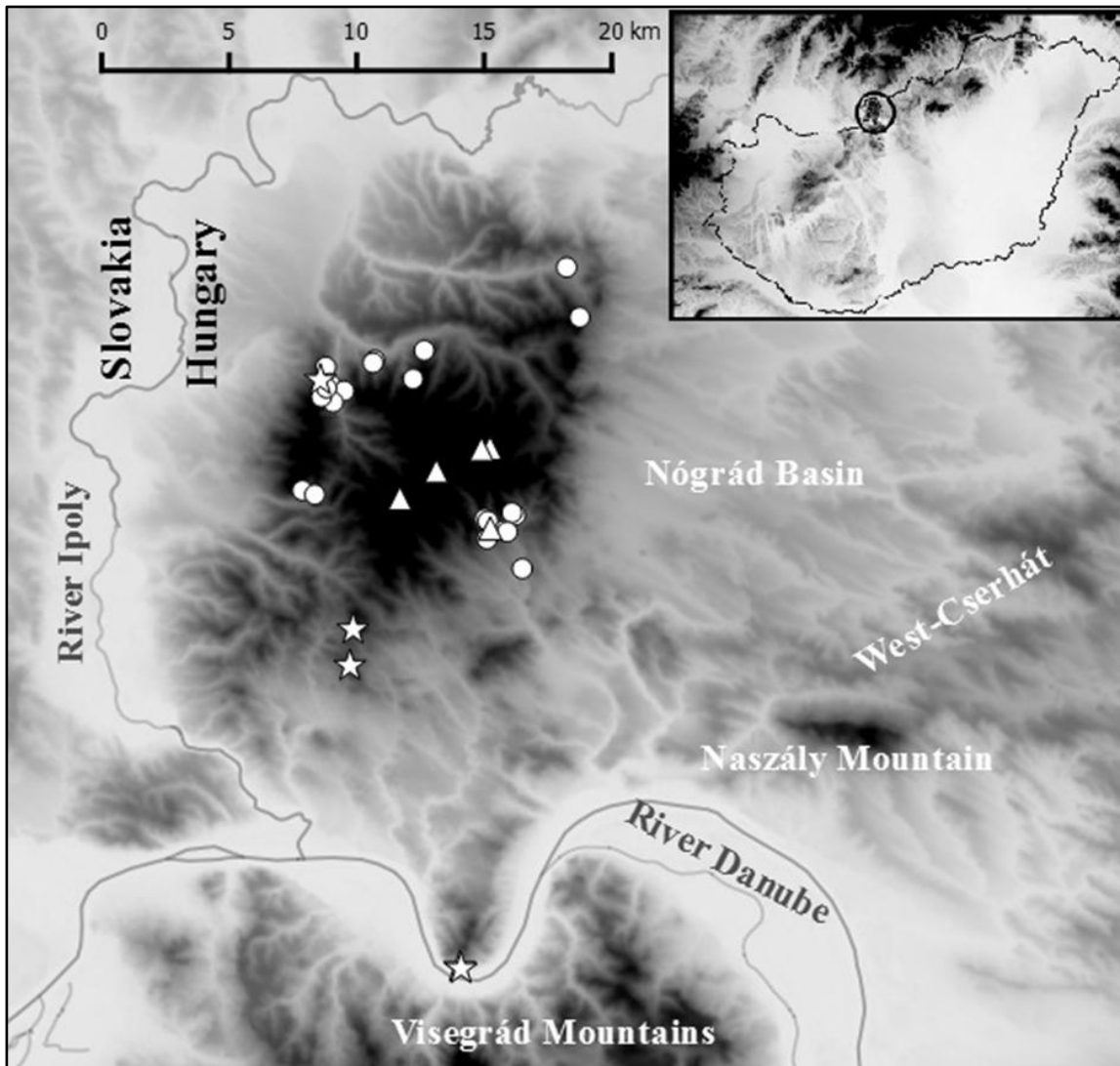


Figure 3: Sampling sites of *Paracaloptenus caloptenoides* (circles), *Saga pedo* (stars) and *Arcyptera fusca* (triangles) in Börzsöny Mountains.

According to the latest field investigations, at least 50 Orthoptera species can be found in the Börzsöny Mountains at the present time. The evaluation of the available old data revealed records of ten additional species. From these - due to data unreliability - two species (*Miramella alpina* and *Stenobothrus eurasius*) can be certainly excluded. In the case of two mountainous species (*Metrioptera brachyptera* and *Psophus stridulus*) the local extinction has unfortunately a high probability. The situation could be the same for *Arcyptera fusca*, however its last record from 2000 indicates the need of further, detailed investigation. The records of the remaining 5 species (*Myrmeleotettix antennatus*, *Myrmeleotettix*

maculatus, *Stenobothrus nigromaculatus*, *Stenobothrus stigmaticus* and *Stethophyma grossum*) are all from the southern part of the study area. There is conceivable, that - excluding *M. antennatus* - they still occur in this area. As the peripheral areas - including the riverbanks - were not investigated, there is no information about further species living there. It is conceivable, that some of them migrate to higher areas time by time and establish temporary populations.

Considering the nature conservation value, *Paracaloptenus caloptenoides* has the highest priority. It is a strictly protected species in Hungary, and due to our samplings (records for nearly twenty localities) the Börzsöny Mts. seems to be one of the strongholds of the species in the country. *Saga pedo* and *Arcyptera fusca* - also protected in Hungary - have high nature conservation value as well, but the current existence of the latter is unfortunately questionable. There are further species, which can be considered to be locally zoogeographically valuable. *Aiolopus thalassinus*, *Oedalus decorus*, *Pachytrachis gracilis*, *Phaneroptera nana*, *Pezotettix giornae*, *Rhacocleis germanica*, *Ruspolia nitidula* and *Tessellana veyseli* can be highlighted from this point of view. It is also important to mention, that some exceptional meadows, hayfields and dry grassy slopes harbour species-rich Orthoptera assemblages. On the Nagy-Hideg-hegy (code 274) and the Nagy-Sas-hegy (code 144) for example, 17 species, respectively were sampled during the latest field investigations. Older records reveal for the first site 10 and for the second site 6 additional species. Therefore, the maintenance and the conservation of these habitats - besides the ones, where a strictly protected or a protected species lives - should also receive a high priority for the local nature conservation endeavours.

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Authors:

Arnold Erdélyi, Gergely Szövényi
Department of Systematic Zoology and Ecology
Eötvös Loránd University
Pázmány P. sétány 1/c
H-1117 Budapest, Hungary
E-Mail: arnoldoooo@gmail.com

Barnabás Nagy, Gellért Puskás
Department of Zoology
Hungarian Natural History Museum
Baross u. 13.
H-1088 Budapest, Hungary

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Appendix

Data of locations, collectors and collecting time are listed here: **1.** locality name; **2.** geographical coordinates (as N lat, E lon); **3.** collector (E: Erdélyi Arnold, N: Nagy Barnabás, P: Puskás Gellért, S: Szövényi Gergely and B: Bajári Erzsébet, En: Endrődy Younga Sebestyén, G: Gergely (?), H: Hangay György, M: Móczár László, So: Sólymosné (?), St: Steinmann Henrik, Sz: Székessy Vilmos, Ú: Újhelyi Sándor, V: Vojnits András); **4.** year of collection; **5.** publication - any if available and separated by ';'.
 ;'

Bernecebaráti: **1:** Szira-hegy; 48.03, 18.91; E-P-S; 2012 / **2:** Nagy-völgy, S of Pösölő-kő; 48.02, 18.92; E-P-S; 2012 / **3:** hilltop over Pösölő-kő; 48.02, 18.92; E-P-S; 2012 / **4:** Pösölő-kő; 48.02, 18.92; E-P-S; 2012 / **5:** Nagy-völgy, N foot of Kakukk-bérc; 48.02, 18.93; E-P-S; 2012 / **6:** Nagy-völgy, S foot of Veres-hegy; 48.02, 18.93; E-P-S; 2012 / **7:** S of Fenyves; 48.02, 18.94; E-P-S; 2012 / **8:** Nagy-völgy, Bodzafás-kút; 48.01, 18.95; E-P-S; 2012 / **9:** E side of Bikk; 48.01, 18.95; E-P-S; 2012 / **10:** Nagy-völgy, Bodzafás-dűlő; 48.01, 18.96; E-P-S; 2012 / **11:** NW of Solymár-forrás; 48.01, 18.96; E-P-S; 2012 / **12:** Kis-Kalakocs-orom; 48.02, 18.97; E-P-S; 2012 / **13:** Pulya-rét; 48.02, 18.99, E-P-S; 2012 / **14:** Irtások; 48.01, 18.99; E-S; 2012 / **15:** Nagy-völgy, N foot of Kecse-ér-oldal; 48.01, 18.97; E-S; 2012 / **16:** Külső-Tólak; 48.00; 18.95; S; 2012 / **Diósjenő:** **17:** Cseresznyési-rakodó; 47.92, 18.99; E; 2012 / **18:** Saj-kút-bérc; 47.93, 18.97; E; 2012 / **19:** Foltán-kereszt; 47.93, 18.97; E; 2012 / **19/a:** N; 1972 / **20:** Hárs-rét; 47.94, 18.96; E; 2012 / **21:** Verebes-kaszáló; 47.94, 18.99; E; 2012 / **22:** Nagy Gál-rét; 47.95, 18.99; E; 2012 / **22/a:** N; 1992 / **22/b:** B; 1958; Rácz, I. (1992) and Rácz, I. et. al. (2005) / **22/c:** Só; 1958 / **23:** SW of Saj-kút; 47.92, 18.97; E; 2012 / **23/a:** E; 2015 / **24:** Hárs-gerinc, close to Szent-Györgyi Albert-forrás; 47.92, 18.96; E; 2012 / **24/a:** E; 2015 / **24/b:** S rocky patch of Hársas-gerinc; E; 2015 / **25:** SE of Saj-kút-bérc 1; 47.92, 18.98; E; 2012 / **25/a:** E; 2015 / **26:** SE of Saj-kút-bérc 2; 47.93, 18.98; E; 2012 / **26/a:** E; 2015 / **27:** SE of Saj-kút-bérc 3; 47.93, 18.98; E; 2012 /

28: Kámori-völgy; 47.97, 19.04; E; 2012 / **29:** Gyertyános; 47.96, 19.03; E; 2012 / **30:** Csicsókás; 47.97, 19.03; E; 2012 / **31:** SE of Csepegő-kő; 47.97, 19.02; E; 2012 / **32:** Jász-bükki-rét; 47.97, 19.01; E; 2012 / **33:** Kurta-bérci-barlang; 47.97, 19.02; E; 2012 / **34:** Závóz; 47.96, 19.01; E; 2012 / **34/a:** S-P; 2010 / **35:** Kőszirt; 47.96, 19.01; E; 2012 / **35/a:** S-P; 2010 / **36:** Kun-rét; 47.96, 19.02; E; 2012 / **36/a:** S-P; 2010 / **37:** S of Jász-delelő; 47.98, 19.01; E; 2012 / **38:** Kemence-völgy, S of Borostyán-gödör; 47.97, 18.99; E; 2012 / **39:** Pogányvári-kaszáló; 47.96, 18.97; E; 2012 / **40:** Kis-Gál-rét; 47.95, 19.00; E; 2012 / **41:** Nyír-rét; 47.95, 18.97; E; 2012 / **41/a:** N; 1966 / **41/b:** N; 1992 / **41/c:** N; 2000 / **41/d:** 1944; Rácz, I (1992) / **42:** Alsó-Hinta-rét; 47.95, 18.97; E; 2012 / **42/a:** N; 1992 / **43:** Borostyán-gödör; 47.98, 18.99; S; 2012 / **44:** Rákos-hegy; 47.56, 19.00; S-P; 2010 / **45:** Kurta-bérc; S-P; 2010 / **46:** S slope of Nagy-Mána; S; 2002 / **47:** Under Kőszirt; N; 1987 / **48:** Close to Csehvár; N; 1992 / **49:** hayfield, close to Nagy-Gál-rét; N; 1992 / **50:** E side of Csóványos; N; 1974 / **51:** Csóványos; N; 1972 / **52:** top of Csóványos; N; 2000 / **53:** grassy patch around the ridge of Csóványos; N; 1993 / **54:** Felső-Hinta-rét; N; 2000 / **55:** Hangyás-bérc; N; 1993 / **56:** Királyháza; Ú; 1954 / **57:** Őzikelak, S of saj-kút peak; E; 2015 / **58:** G; 1938; Rácz, I. et. al. (2005) / **Hont:** **59:** entrance of Honti-szakadék; N; 1983 / **Ipolydamásd:** **60:** Galla-tisztás; 47.87, 18.83; S; 2012 / **Ipolytölgyes:** **61:** Kis-Koppány; 47.90, 18.84; E; 2012 / **Kemence:** **62:** NE side of Sasfészek-bérc; 47.962425, 18.956584; E; 2012 / **63:** SW of Nagy-Mána; 47.97, 18.96; E; 2012 / **64:** Nagy-Mána; 47.97, 18.96; E; 2012 / **65:** Gomb-hegy; 48.01, 18.89; E-S; 2012 / **66:** NW of Kőrözsa; 48.01, 18.89; E-S; 2012 / **67:** N of Kőrözsa; 48.00, 18.90; E-S; 2012 / **68:** N of Sózó; 48.00, 18.90; E-S; 2012 / **69:** Malom-kő; 48.00, 18.90; E-S; 2012 / **70:** Barát-kő; 47.99, 18.91; E-S; 2012 / **71:** Asztal-kő; 47.99, 18.91; E-S; 2012 / **72:** Varjas-árok; 47.99, 18.95; S; 2012 / **73:** NW side of Varjas-árok; 47.99, 18.94; S; 2012 / **74:** Cicőke; 47.99, 18.96; S; 2012 / **75:** Tüdős-bérc; 47.98; 18.94; S; 2012 / **76:** Fatál-völgy; 47.98, 18.94; S; 2012 / **76/a:** Fatál-völgy; 47.98, 18.94; E; 2015 / **77:** Pléska-oldal; 47.98, 18.93; S; 2012 / **78:** NE side of Dorottyin; 47.99232, 18.93196; S; 2012 / **79:** S slope of Dorottyin; 47.99276, 18.92896; S; 2012 / **80:** S slope of Dorottyin, close to Cukorháza; 47.99, 18.92; S; 2012 / **81:** S slope of Dorottyin, close to the joint of Nagy-Csörcsöle-völgy; Kemence; 47.99, 18.92; S; 2012 / **82:** NE slope of Miklós-bérc; 47.99, 18.91; S; 2012 / **83:** N side of Miklós-bérc; 47.98, 18.92; S; 2012 / **83/a:** N side of Miklós-bérc; 47.99, 18.91; E; 2015 / **84:** Kemence-patak-völgy, S foot of Csipcsina; 47.99, 18.94; S; 2012 / **85:** W side of Dorottyin, close to Sebes-kő; 47.99, 18.91; S; 2012 / **86:** S foot of Tűzköves-bérc; 47.98, 18.97; S; 2012 / **87:** SW foot of Tűzköves-bérc; 47.97, 18.96; S; 2012 / **88:** NE side of Rakottyás-bérc; 47.97, 18.96; S; 2012 / **89:** hilltop of Rakottyás-bérc; 47.97, 18.95; S; 2012 / **90:** SW side of Ördög-oldal; 47.97, 18.94; S; 2012 / **91:** Rakottyás-bérc; S; 2002 / **92:** along Kemence-patak, under Cicőke 1; N; 1987 / **93:** along Kemence-patak, under Cicőke 2; N; 1987 / **94:** S slope of Cicőke; N; 1987 / **95:** S slope of Cicőke; Kemence; N; 1987 / **96:** foothills of Cicőke; N; 1987 / **97:** top of Magosfa; N; 1968 / **98:** W ridge of Csóványos; N; 1993 / **99:** NW ridge of Csóványos; N; 2000 / **100:** Sasfészek-bérc; N; 1993 / **101:** Godóvár; N; 1983 / **102:** Barsi-bükk, Kovács Marci-völgy; E; 2015 / **103:** Kemence-völgy; 1958; B; Rácz, I. et. al. (2005) / **104:** H; 1957; neotype in Harz (1975) / **105:** Kemence-patak valley; B; 1958 / **Kismaros:** **106:** Nagy-Kelemen-hegy; 47.84, 18.96; E; 2014 / **107:** S foot of Kelemen-hegy; N; 1957 / **Kóspallag:** **108:** Pusztatorony; N; 1957 / **109:** N of Kóspallag; N; 1992 / **110:** E bank of Korompatak; N; 1957 / **111:** Between Kóspallag and Nagyirtáspuszta; N; 1992 / **112:** N of Kóspallag, along the road; N; 1957 / **113:** Kisinóc, Hálás-bérc; N; 1962 / **114:** above Kisinóc 1; N; 1979 / **115:** above Kisinóc 2; N; 1979 / **116:** above Kisinóc 3; N; 1979 / **117:** above Kisinóc 4; N; 1979 / **118:** Kisinóc; M; 1958 / **119:** Kisinóc; M; 1958; Rácz, I (1992) / **120:** Kisinóc; 1920; Rácz, I (1992) / **121:** between Kóspallag and Nagy-Sas-hegy, N, 1993 / **Letkés:** **122:** Nagy-Galla; 47.87, 18.83; S; 2012 / **123:** Közép-Galla; 47.88, 18.82; S; 2012 / **124:** Széles-hegy; 47.89, 18.84; S; 2012 / **Márianosztra:** **125:** Panyi-parlag; 47.861391, 18.895756; E; 2012 / **126:** hilltop of Csák-hegy; 47.86, 18.87; E; 2012 / **127:** Sarok-rét; 47.87, 18.88; E; 2012 / **127/a:** Sarok-rét; N; 1993 / **128:** Kopasz-hegy; 47.88, 18.89; E; 2012 / **129:** E foot of Nagy-Galla, close to László-forrás; 47.87, 18.85; S; 2012 / **130:** Lengyel-rétek; N; 1993 / **Nagybörzsöny:** **131:** S side of Községi Erdő; 47.94, 18.86; E; 2012 / **132:** S of Községi Erdő; 47.94, 18.86; E; 2012 / **133:** Száraz-bérc; 47.94, 18.87; E; 2012 / **133/a:** Száraz-bérc; 47.94, 18.87; E; 2015 / **134:** W side of Bor-oldal; 47.93, 18.85; E; 2012 / **135:** Bor-oldal, Rustok; 47.93, 18.86; E; 2012 / **136:** SW of Hegyes-hegy-om; 47.92, 18.86; E; 2012 / **137:** S of Hegyes-hegy-om; 47.92, 18.86; E; 2012

/ **138**: Hosszú-völgy, S of Palz-árok; 47.92, 18.87; E; 2012 / **139**: N of Kisirtáspuszta; 47.92, 18.88; E; 2012 / **140**: Kupec-rét; 47.94, 18.88; E; 2012 / **141**: Zalog-bérc; 47.92, 18.89; E; 2012 / **142**: S of Fagyosasszony; 47.93, 18.90; E; 2012 / **143**: Fokhagymás; 47.93, 18.91; E; 2012 / **144**: Nagy-Sas-hegy; 47.90, 18.89; E; 2012 / **144/a**: N; 1992 / **144/b**: N; 1993 / **144/c**: N; 2003 / **145**: Só-hegy; 47.89, 18.89; E; 2012 / **145/a**: N; 1992 / **145/b**: N; 1993; Kenyeres et al., (2002) / **145/c**: N; 2003 / **146**: Érsek-tisztás; 47.90, 18.90; E; 2012 / **146/a**: N; 1992 / **147**: SE side of Eckleiter ; 47.92, 18.85; E; 2012 / **148**: NW side of Eckleiter; 47.92, 18.85; E; 2012 / **149**: Bizmet-rét; 47.92, 18.84; E; 2012 / **150**: Gömbölyű-kő; 47.91, 18.84; E; 2012 / **151**: Nagy-Koppány; 47.90, 18.85; E; 2012 / **151/a**: N; 2011 / **152**: Szent István church's garden; N; 1983 / **153**: on the ridge between Nagy-Sas-hegy and Só-hegy; N; 1992 / **154**: between Nagy-Sas-hegy and Só-hegy; N; 2003 / **155**: Nagyinóc; N; 1992 / **156**: peak of Nagyinóc; N; 1962 / **157**: below Nagyinóc 1; N; 1979 / **158**: below Nagyinóc 2; N; 1979 / **159**: below the southern top of Nagyinóc; N; 1979 / **160**: S edge of the plateau of Nagyinóc; N; 1979 / **161**: top of Nagyinóc; N; 1979 / **162**: among the ridge of Nagyinóc; N; 1979 / **163**: Templom-bérc; 47.94, 18.88; E; 2015 / **164**: Hosszú-völgy; 1975; Rácz, I. (1986a) / **Nagymaros**: **165**: S slope of Rigó-hegy; 47.77, 18.94; E; 2014 / **166**: SE slope of Rigó-hegy; 47.77, 18.94; E; 2014 / **167**: E of Ördög-gerinc; 47.77, 18.93; E; 2014 / **168**: Rigó-hegy; 47.77, 18.93; E; 2014 / **169**: Ürmös-rét; 47.78, 18.93; E; 2014 / **169/a**: N; 1969 / **169/b**: N; 1992 / **170**: Világos-tér; 47.79, 18.93; E; 2014 / **171**: Templom-völgy; 47.79, 18.95; E; 2014 / **172**: Ózike-forrás; 47.82, 18.94; E; 2014 / **173**: Törökmező; 47.83, 18.95; E; 2014 / **173/a**: Ú; 1954 / **173/b**: Ú; 1954 / **174**: Szent Gál Föld; 47.84, 18.95; E; 2014 / **175**: S of Törökmezői-hévíz; 47.83, 18.93; E; 2014 / **176**: S of Köböl-völgy; 47.81, 18.95; E; 2014 / **177**: N of Hangyás-árok; 47.83, 18.93; E; 2014 / **178**: NE of Özfej; 47.83, 18.93; E; 2014 / **179**: Ördög-hegy; S; 1999 / **180**: between Szent Mihály-hegy and Hegyes-tető; N; 1973 / **181**: Hegyes-tető; N; 1961 / **182**: Hegyes-tető; N; 1978 / **183**: Hegyes-tető; N; 1965 / **184**: S side of Hegyes-tető; N; 1973 / **185**: ridge above Templom-völgy, close to Hegyes-tető; N; 1990 / **186**: W side of Templom-völgy; N; 1990 / **187**: Csemetekert, N of Hegyestető; N; 1969 / **188**: Ördög-hegy 1; N; 1961 / **189**: Ördög-hegy 2; N; 1963 / **190**: SE ridge of Ördög-hegy; N; 1970; Kenyeres et al., (2002) / **191**: E side of Ördög-hegy; N; 1992 / **192**: S ridge of Ördög-hegy; N; 1992 / **193**: Ördög-hegy; N; 1998 / **194**: SE side of Ördög-hegy; N; 1998 / **195**: between Szent Mihály-hegy and Nagymaros; N; 1969 / **196**: Szent Mihály-hegy 1; N; 1965 / **197**: Szent Mihály-hegy 2; N; 1992 / **198**: S slope of Szent Mihály-hegy 1; N; 1973 / **199**: S slope of Szent Mihály-hegy 2; N; 1998 / **200**: Szent Mihály-hegy; N; 1965 / **201**: Fehér-hegy; N; 1980 / **202**: W side of Rigó-hegy; N; 1973 / **203**: Rigó-hegy; N; 1984 / **204**: S side of Szent György-hegy; N; 1992 / **205**: S ridge of Remete-bérc; N; 1978 / **206**: foot of the S ridge of Remete-bérc; N; 1978 / **Nagyoroszi**: **207**: Jász-delelő; 47.98, 19.01; E; 2012 / **208**: abandoned mine, Csillag-vágási-bánya; 47.99, 19.03; E-S; 2012 / **209**: Juhász-rét; 48.01, 19.03; E-S; 2012 / **210**: Borókás-rét; 48.01, 19.02; E-S; 2012 / **211**: Öreg-vágási-rét; 48.01, 19.02; E-S; 2012 / **212**: Kőember; 47.99, 19.03; S; 2012 / **Nógrád**: **213**: Öreg-szőlők; 47.92, 19.01; E; 2012 / **214**: Zsellér-rétek; 47.55, 19.02; S-P; 2010 / **Perőcsény**: **215**: Aklok; 47.99, 18.88; E; 2012 / **216**: N-NE slope of Ökör-orom; 47.99, 18.89; E; 2012 / **216/a**: E; 2015 / **217**: N of Jancsi-hegy; 47.98, 18.89; E; 2012 / **218**: Jancsi-hegy; 47.98, 18.89; E; 2012 / **219**: E of Jancsi-hegy; 47.98, 18.89; E; 2012 / **219/a**: E; 2015 / **220**: SE of Jancsi-hegy; 47.98, 18.89; E; 2012 / **220/a**: below the top of Jancsi-hegy; S; 2010; **221**: SE of Jancsi-hegy, N of Szarvas-kő; 47.98, 18.89; E; 2012 / **222**: Szarvas-kő; 47.97, 18.89; E; 2012 / **223**: Kilátó-bérc; 47.96, 18.89; E; 2012 / **224**: Kaszálók; 47.97, 18.89; E; 2012 / **225**: Vad-tető; 47.97, 18.89; E; 2012 / **226**: Holló-kő; 47.97, 18.88; E; 2012 / **227**: Büzmöd-rét; 47.98, 18.87; E; 2012 / **228**: Kis-Sebestyén-rét; 47.98, 18.86; E; 2012 / **229**: Szabó-kaszálók; 47.94, 18.92; E; 2012 / **230**: Kuruci-Nagy-rét; 47.95, 18.91; E; 2012 / **231**: Tűzkiyulladt; 47.95, 18.92; E; 2012 / **232**: Mogyorós-gerinc, Etető lápa; 47.95, 18.92; E; 2012 / **233**: Nagy-kőszikla; 47.98, 18.90; S; 2012 / **233/a**: E; 2015 / **234**: Godó-rét; 47.98, 18.90; S; 2012 / **235**: W of Miklós-tető; 47.97, 18.91; S; 2012 / **236**: Keszeháci-lápa; 47.97, 18.91; S; 2012 / **237**: N of Kecské-kő; 47.98, 18.90; S; 2012 / **238**: SE of Kecské-kő; 47.97, 18.90; S; 2012 / **239**: foothills of Szarvas-kő; 47.97; 18.89; S; 2012 / **239/a**: E; 2015 / **240**: foothills of Vad-tető; Perőcsény; 47.97; 18.89; S; 2012 / **241**: W side of Drinó-völgy, close to Fekete-völgy; 47.97, 18.90; S; 2012 / **242**: W side of Drinó-völgy; 47.97, 18.90; S; 2012 / **243**: SW side of Keszeháci-lápa; 47.97, 18.90; S; 2012 / **244**: NW side of Keszeháci-lápa; 47.97, 18.91; S; 2012 / **245**: W side of Szívfájó-bérc, close to Szoros-lápa; 47.96, 18.92; S; 2012 / **246**: W side of

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(2005) / **311**: Királyrét; 1962; Rácz, I (1992) / **312**: Királyrét; 1962 / **313**: Királyrét; 1967; Kaltenbach, A. (1967) / **Vámosmikola**: **314**: Taricska-bérc; 47.96, 18.86; E; 2012 / **315**: Henkó-lápa; 47.96, 18.86; E; 2012 / **316**: Róka-völgyi-árok; 47.96, 18.86; E; 2012 / **317**: Török-Bükk-bérc; 47.96, 18.86; E; 2012 / **Verőce**: **318**: Lőcs-oldal; 47.83, 19.05; E; 2014 / **319**: W of Borbély-hegy; 47.84, 19.04; E; 2014 / **320**: Ú; 1960 / **321**: St; 1957; Rácz, I (1992) and Rácz, I. et. al. (2005) / **322**: Magyarakút; En; 1957 / **Zebegény**: **323**: Cerinka; 47.80, 18.92; E; 2014 / **324**: Gründl-rét; 47.80, 18.92; E; 2014 / **325**: NW of Kis-Kerek-hegy; 47.81, 18.93; E; 2014 / **326**: János-bükk; 47.80, 18.94; E; 2014 / **327**: Varjú vár; 47.82, 18.93; E; 2014 / **328**: Csizmadia-völgy; N; 1969 / **329**: Ú; 1943 / **330**: Ú; 1944; Rácz, I (1992) / **331**: Ú; 1944 / **332**: Ú; 1952 / **333**: Ú; 1954 / **334**: Ú; 1943 / **Unidentified locality (UL)**: **335**: Ú; 1949 / **336**: Ú; 1949 / **337**: Ú; 1949 / **338**: 1921; Rácz, I. et. al. (2005) / **339**: N; Nagy, B. (1987) / **340**: Harz (1969) / **341**: V; 1962; Harz (1975) / **342**: V; 1961; Harz (1975) / **343**: Harz (1975) / **344**: V; 1962; Harz (1975) / **345**: Harz (1975) / **346**: V; 1962; neotype, Harz (1975) / **347**: V; 1963; Harz (1975) / **348**: V; 1967; Harz (1975) / **349**: Harz (1975) /

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Autor(en)/Author(s): Erdélyi A., Nagy Barnabas, Puskas G., Szövényi Gergely

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