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Checklist of water bugs (Hemiptera: Heteroptera: Nepomorpha, Gerromorpha) of Slovakia

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Abstract

The water bugs represent a significant component of the freshwater biota, play an important role in trophic webs, and may have considerable economic importance. Nevertheless, systematic research of this group has been underdeveloped in Slovakia (central Europe) for decades. This work presents a list of water bug species of Slovakia based on an exhaustive review of the literature (time span: 1808–2013) and on more than 14,000 individuals collected during extensive field campaigns (2010–2014) or obtained from insect collections. Fifty-six species belonging to 11 families of Heteroptera were recorded from a total of 767 sites. Seven species were recorded for the first time from Slovakia during our research. Among those, the first exact records of *Corixa panzeri* Fieber, 1848, *Sigara (Subsigara) distincta* (Fieber, 1848), *Notonecta (Notonecta) lutea* Müller, 1776, *Notonecta (Notonecta) maculata* Fabricius, 1794 and *Microvelia (Microvelia) buenoi* Drake, 1920 are provided here. Confusion concerning the records of two additional species, *Arctocorisa carinata carinata* (C. R. Sahlberg, 1819) and *Hesperocorixa parallela* (Fieber, 1860) is clarified. The water bugs species inventory appears to be nearly complete (~97 %) given an asymptotic richness estimate. The occurrence of other species is discussed taking into account their habitat requirements and distribution in neighbouring countries. Recommendations for future research are provided.

Key words: Diversity, species richness, inventory, *Corixa panzeri*, *Sigara distincta*, *Notonecta lutea*, *Notonecta maculata*, *Microvelia buenoi*

Introduction

The aquatic and semi-aquatic Heteroptera (water bugs) represent a significant component of the world's aquatic insect biota. Most of the approximately 4800 known species belong to the infraorders Gerromorpha and Nepomorpha, and 623 species of these were recently catalogued in the Palaearctic Region (including China) (Polhemus *et al.* 1995; Andersen 1995; Aukema *et al.* 2013). These two infraorders differ in ecology and habitat preferences. True water bugs (Nepomorpha) are nectonic (e.g., Corixidae, Micronectidae, Naucoridae, Notonectidae, Pleidae) or benthic species (e.g., Nepidae, Aphelocheiridae), with the exception of ripicolous Ochteridae and Gelastocoridae, whereas semi-aquatic bugs (Gerromorpha) are pleustonic or settled in sub-humid terrestrial habitats (e.g., Gerridae, Hebridae, Hydrometridae, Mesoveliidae, Veliidae) (Polhemus *et al.* 1992). Water bugs inhabit a wide range of aquatic habitats, play an important role in food webs and may be of considerable economic importance (e.g., Schuh & Slater 1995; Papáček 2000, 2001). Nevertheless, in Slovakia (central Europe) systematic research of water bugs has been underdeveloped for decades and the group has received far less attention than in neighbouring countries (e.g., Poland—Jaczewski & Wróblewski 1976, 1978; Wróblewski 1980; Austria—Rabitsch 2005a; Czech Republic—Kment & Smékal 2002; Hungary—Boda *et al.* 2015).

The first evidence of water bugs from the area of Slovakia dates back to the Austro-Hungarian Empire. Besides

Bartholomaeides (1808) mentioning *Notonecta* and *Nepa* in the list of insects of Levoča District, Horváth (1870, 1884, 1899) and Brancsik (1878, 1880, 1887, 1891) pioneered the knowledge of the group. Most notably, Horváth compiled a catalogue of Heteroptera published in the series “Fauna Regni Hungariae” (Horváth 1897). Subsequent decades brought more taxonomic or faunistic investigations with the major contributions of Balthasar (1936, 1942), Tamanini (1949), Soós (1959) and Wroblewski (1960). For detailed information on the history of Heteroptera research in the territory of Slovakia see Horváth (1897) and Stehlík & Vavřínová (1991). Hoberlandt (1977) summarized published data in a checklist of 44 water bug species from Slovakia. Late 20th century freshwater research was mainly ecologically oriented and water bugs were recorded only sporadically (e.g., Bulánková *et al.* 1994, Bulánková 1995, Elexová 1998a). Unfortunately, the latest checklist of aquatic and semi-aquatic Heteroptera (Bulánková 2003) was based on only ~30% of published sources available and covers only 28 species and 2 genera without specifying species. Also, the Palaearctic catalogue of Heteroptera (Andersen 1995, Polhemus *et al.* 1995) includes information on the Slovak water bugs, but in several cases (especially in Notonectidae) the records from Slovakia are based on misinterpretation of the records from the former Czechoslovakia and in fact pertained to the Czech Republic; therefore, this catalogue also is insufficient as a checklist of Slovak water bugs. Thus, Hoberlandt’s (1977) contribution remains the most comprehensive list of water bug species from Slovakia. Works focused on water bugs are still rare and rather local or include brief information on newly recorded species (e.g., Bryja & Kment 2004, 2007; Faková 2005; Manko 2011; Kment *et al.* 2013; Reduciendo Klementová & Svitok 2014; Novikmec *et al.* 2015).

In order to fill an important gap in the knowledge of aquatic insects, we performed extensive surveys of water bug distributions in Slovakia. To do this we processed the material from museum, departmental and private collections as well as material from our own large-scale sampling conducted from 2010 to 2014. These data were supplemented by a complete literature review of all available publications with the aim to establish the first comprehensive checklist of aquatic and semi-aquatic Heteroptera of Slovakia.

Study area

Slovakia (16°50′–22°34′E, 47°44′–49°37′N) includes both mountainous and lowland landscapes, resulting in high elevational variability (94–2654 m a.s.l.). The mean annual temperature and total annual precipitation ranges from ~ 0.3 to 11.4°C and 500 to 1400 mm, respectively. However, considerable regional climatic differences exist. The Pannonian lowland, the warmest part of the area, typically has mean annual temperatures of > 9°C and relatively low total annual precipitation (< 600 mm). In contrast, mean annual temperatures in the coldest parts of the Carpathian Mountains are < 5°C and precipitation totals are > 1000 mm. The largest part of the country belongs to the Black Sea drainage area (Danube River basin), whereas the minority is drained to the Baltic Sea (Vistula River basin) (Miklós 2002). Aquatic habitats included in the study range from temporary pools through permanent ponds, ditches and small streams to rivers and lakes.

Material and methods

The study is based on a dataset compiled from three sources of information:

1) Published data. Records of occurrence of aquatic and semi-aquatic Heteroptera in Slovakia were collected in a comprehensive literature survey of all available archive sources. As a result, data from 54 articles and 5 monographic studies covering the period 1808–2013 are included in the dataset (Fig. 1). The surveyed papers are marked with asterisks (*) in the References section.

2) Museum and private collections. We studied unpublished material in seven museum collections (National Museum in Prague, Czech Republic (CZ); Moravian Museum in Brno, CZ; Natural History Museum in Bratislava, Slovakia (SK); Central Slovakia Museum in Banská Bystrica, SK; Homeland Museum Hlohovec, SK; Vihorlat Museum Humenné, SK and The Western Slovakia Museum in Trnava, SK), one departmental collection (Dept. of Biology and General Ecology, Technical University in Zvolen, SK) and eight private collections (Peter Bitušik, Eva Bulánková, Jozef Cunev, Vladimír Hemala, Peter Manko, Jozef Oboňa, Filip Rovný and Matúš Šoltís). All material was determined to the lowest possible taxonomic level using determination keys by Savage (1999), Rabitsch (2005b) and Tempelman & van Haaren (2009).

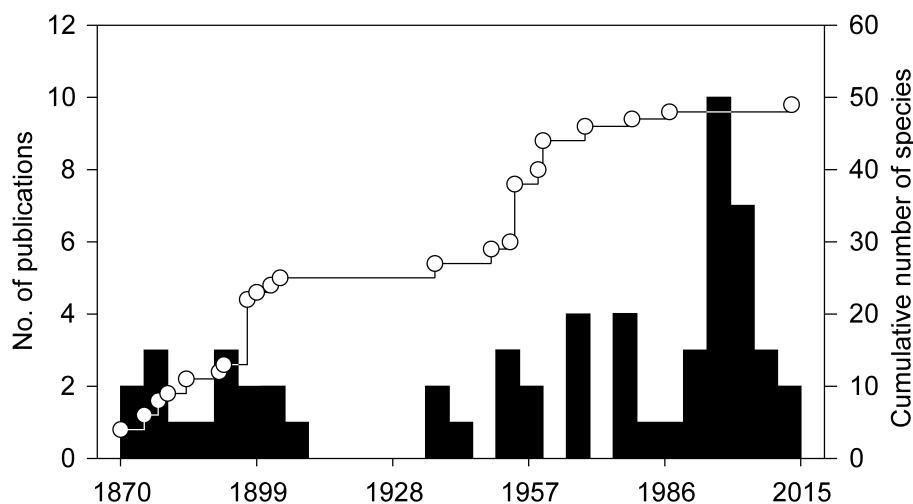


FIGURE 1. Histogram showing number of surveyed studies on water bugs in Slovakia and cumulative number of species. Note that the work of Bartholomaeides (1808) mentioning two genera (*Notonecta* and *Nepa*) is not included.

3) Extensive field survey. During 2010 to 2014, we conducted a large-scale sampling campaign across all of Slovakia. Samples were taken in various habitats using several sampling methods, including sweeping of aquatic plants above and below water, and quantitative and qualitative benthic sampling. Collected material was preserved in 70% ethanol and transferred to the laboratory for determination. Voucher material is housed in the collection of the Department of Biology and General Ecology, Technical University in Zvolen, Slovakia.

Records from those sources were included in the dataset only if the specimen was identified to the species level. Geographical coordinates and basic environmental characteristics of sampling sites were extracted from publications, unpublished records or directly measured in the field. Data from repeatedly sampled sites were pooled and presented only once.

In order to assess completeness of the species inventory, we constructed an analytical sample-based accumulation (rarefaction) curve with unconditional confidence intervals (Colwell *et al.* 2004). Consistent with the rarefaction method, we used the asymptotic richness estimator Chao2 (Chao 1987) to estimate the total number of water bug species, including those unobserved. Since detection probabilities of the species were relatively homogeneous ($CV = 0.61$) we used the bias-corrected form of the estimator (Chao 2005). The analyses were performed in EstimateS 9.1.0 (Colwell 2013) and Spade (Chao & Shen 2010).

Results

We recorded the occurrence of water bugs at 767 sites in Slovakia, with information obtained from unpublished sources (511 sites) and derived from the literature (256 sites). The sites were more or less evenly distributed in both the Pannonian and Carpathian regions (Fig. 2) and covered a range of environmental conditions; elevation: 96–2060 m, water pH: 4.6–9.7, water conductivity: 6–1725 $\mu\text{S}\cdot\text{cm}^{-1}$ (Fig. 3). The majority of the sampling sites was located in lower elevations (< 400 m) and the number of records steadily decreased toward higher elevations. However, accounting for the surface area of the elevational belts, the lowest sampling effort was encountered in mid-elevations (800–1200 m). Regarding water quality, attention has been paid chiefly to waterbodies that have relatively low conductivity (< 800 $\mu\text{S}\cdot\text{cm}^{-1}$) and are slightly alkaline ($\text{pH} = 7.5\text{--}8.5$).

We obtained 14,232 individuals of water bugs from unpublished sources (our extensive sampling and collections), from which we identified 52 species. Unpublished data were supplemented by a literature review of every publication related to water bugs of Slovakia, which revealed 50 species. Hence, the current checklist of water bug species includes 56 species from 11 families (Table 1). More specifically, we list 36 species of Nepomorpha (Nepidae—2, Micronectidae—5, Corixidae—21, Naucoridae—1, Aphelocheiridae—1, Notonectidae—5, Pleidae—1) and 20

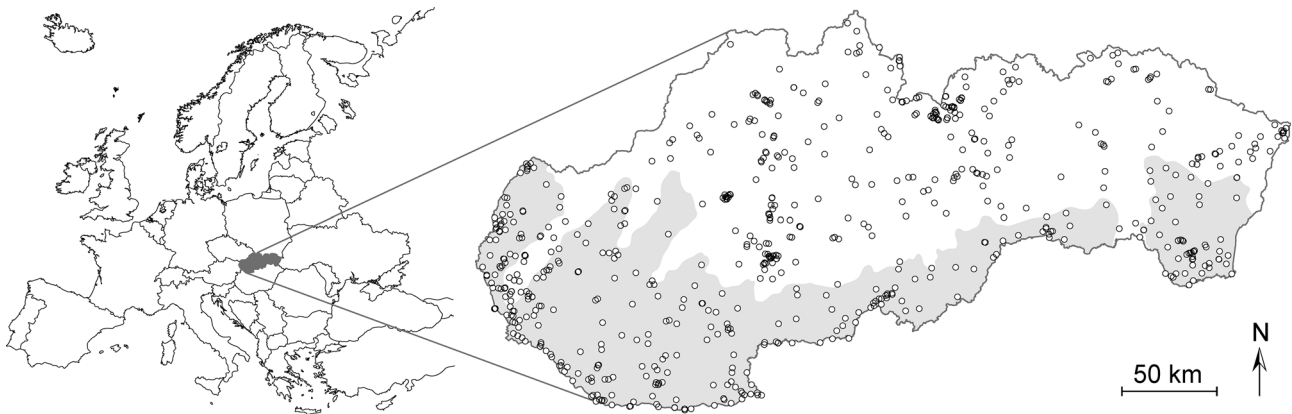


FIGURE 2. Map of Slovakia with the location of sites with recorded presence of water bugs (circles). Only sites with clearly identifiable coordinates were plotted (93% of all sites). Bioregions are distinguished by colour; Pannonian bioregion—light gray and Carpathian bioregion—white.

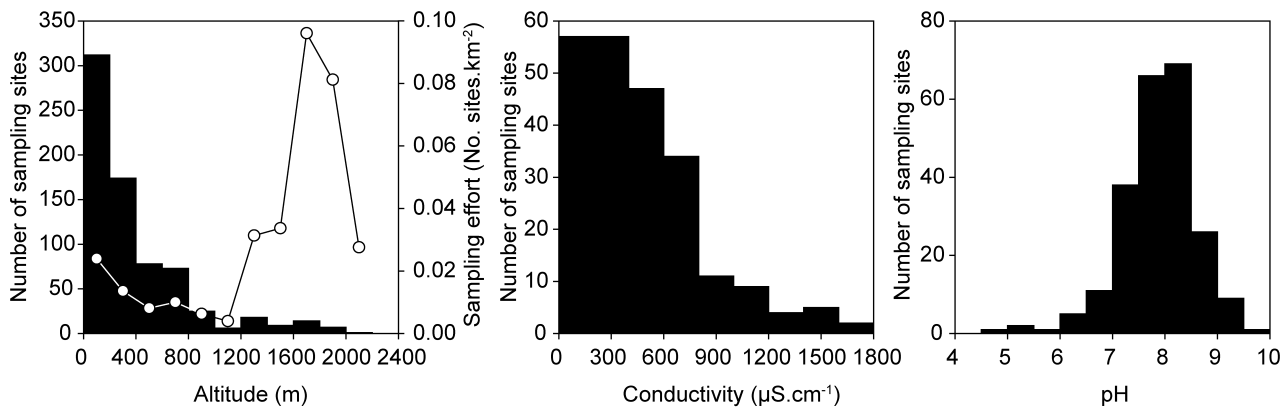


FIGURE 3. Distribution of sampling sites (histograms) according to elevation, water conductivity and pH. The sampling effort (circles) represents number of sampling sites standardized by the area of the respective elevational belt. Note that unequal number of sampling sites among plots reflects different availability of environmental data.

species of Gerromorpha (Mesoveliidae—1, Hydrometridae—2, Hebridae—2, Veliidae—5, Gerridae—10) in Slovakia. *Microvelia buenoi* Drake, 1920 is recorded for the first time from the area. *Gerris lacustris* (Linnaeus, 1758) was the most frequently occurring species, whereas *M. buenoi*, *Hesperocorixa parallela* (Fieber, 1860), *Corixa panzeri* Fieber, 1848, *Arctocorisa carinata* (C.R. Sahlberg, 1819) and *Anisops sardeus* Herrich-Schäffer, 1849 were found only at single locations (Fig. 4).

The species inventory of water bugs appears to be nearly complete as the accumulation curve reached an asymptote (Fig. 5). Expected total species richness calculated by the Chao2 estimator was 58 species (95% CI: 56–70), meaning that only two species are expected to remain undetected. Overall, the analysis suggests a high degree of inventory completeness (~97 %).

Discussion

This paper presents the first comprehensive checklist of aquatic and semi-aquatic Heteroptera of Slovakia listing 56 species from 11 families. Here, we briefly discuss new records and completeness of the species inventory and provide some suggestions for further research of aquatic Heteroptera in the area.

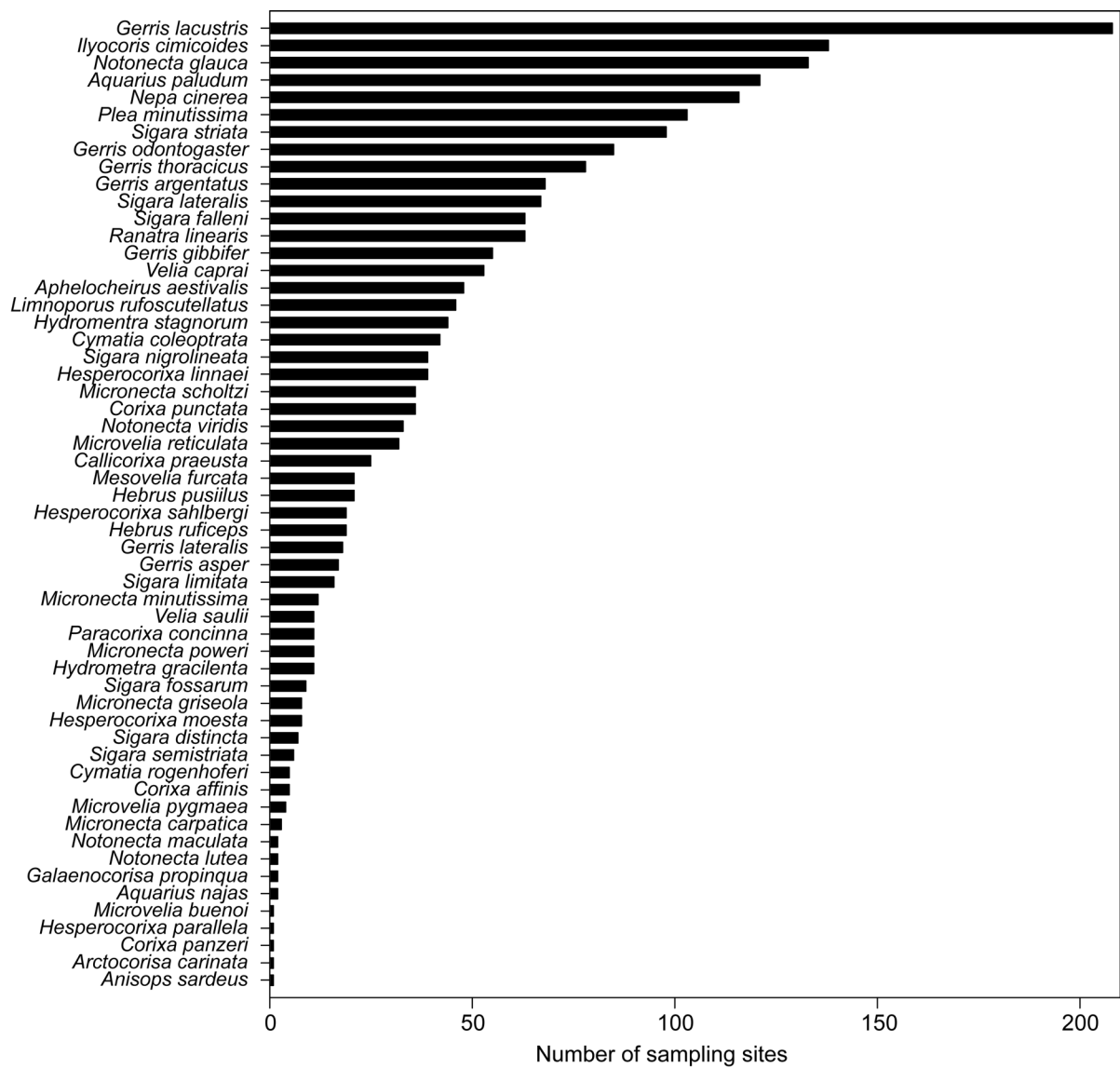


FIGURE 4. Frequency of occurrence of water bugs in Slovakia.

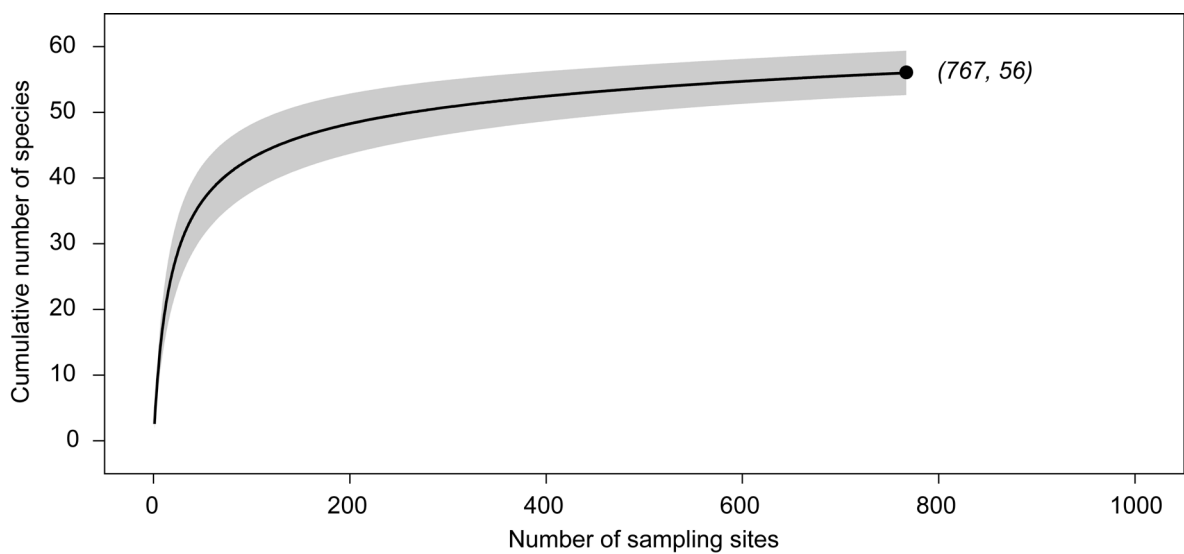


FIGURE 5. Sample-based rarefaction curve of water bug diversity in Slovakia. The numbers in parentheses are the sample size and the observed total number of species (coordinates of black circle). Gray area represents the 95% confidence envelope of the estimate.

Newly recorded species

Microvelia buenoi and *Corixa panzeri* are evidenced here for the first time from Slovakia. Five other species (*Arctocorisa carinata*, *Sigara distincta*, *Anisops sardeus*, *Notonecta lutea* and *N. maculata*) were recorded for the first time during our study. While the records of *A. sardeus* and *A. carinata* were properly published (Reduciendo Klemenová & Svitok 2014, Novikmec *et al.* 2015), the remaining three species were mentioned only in a conference abstract (Klementová *et al.* 2012) and thus their exact records are provided here. *Hesperocorixa parallela* was recorded from Slovakia by Soós (1959), but that record was overlooked by all subsequent authors (cf. Hoberlandt 1977).

Arctocorisa carinata carinata (C. R. Sahlberg, 1819)

Published record. Vysoké Tatry Mts., Vyšné Tomanovské pleso lake (49.21737°N, 19.91019°) (Novikmec *et al.* 2015).

Comment. *Arctocorisa carinata* was listed from Slovakia in the checklist by Hoberlandt (1977) but omitted in Palaearctic catalogue by Polhemus *et al.* (1995). Štys (1976) wrote: ‘... known from Czechoslovakia from Štrbské pleso in High Tatra (Szilády, 1904, as *Corisa cognata*) only’. However, this information was apparently based on incorrect translation of the Hungarian text by Szilády (1904), who only mentioned *Corisa cognata* as another species that might occur in that mountain lake. The first record of *A. carinata* in Slovakia was thus provided by Novikmec *et al.* (2015).

Corixa panzeri Fieber, 1848

Material examined. Com. Trenčín [= Trenčín District], 1 ♀, lgt. K. Brancsik, det. L. Hoberlandt 1953, revid. P. Kment & B. Reduciendo Klementová (coll. National Museum, Prague, Czech Republic).

Remarks. The species was collected in the wide environs of Trenčín city in 1874–1915 when K. Brancsik was working in that area (Koleška 1979); information on the exact location and date of sampling are missing.

Distribution. This Palaearctic species is distributed longitudinally from Ireland to Tajikistan and latitudinally from Sweden to Algeria, Morocco and Tunisia (Jansson 1986, Polhemus *et al.* 1995, Protić 1998, Rabitsch & Zettel 2000, Dolmen 2004, Straka *et al.* 2009, Fent *et al.* 2011, Kment & Beran 2011). In Europe, *C. panzeri* is frequently found in coastal zones and becomes scarce in inland areas. In landlocked regions of Europe, records of the species are usually restricted to single specimens with the exception of the Pannonian lowlands (Straka *et al.* 2009, Kment & Beran 2011). Although the occurrence of this species in Slovakia was listed by Polhemus *et al.* (1995) and the species was collected in southern Slovakia by P. Štys (pers. comm.), there is no confirmed record so far. The first direct evidence, presented here, was obtained by our study of a single specimen collected by K. Brancsik and deposited in National Museum in Prague. *Corixa panzeri* prefers temporary, fish-less habitats with slightly saline waters, mineral-rich substrates and rich vegetation cover (e.g., Wróblewski 1980, Boix *et al.* 2001, Aukema *et al.* 2002, Straka *et al.* 2009).

Hesperocorixa parallela (Fieber, 1860)

Published record. ‘Rozsnyó: Ökörhegy [= Rožňava, Volovské vrchy Mts., Skalisko Mt., Volovec pass] (Bartkó [leg.], VII.1913 1 m*, 1280 m)’ (Soós 1959).

Comment. *Hesperocorixa parallela* is a mountain species with scattered occurrence in southern Europe, Caucasus, Transcaucasia, Turkey, Near East and Iran (Polhemus *et al.* 1995, Aukema *et al.* 2013). In Central Europe the species is confined only to the Carpathians (Slovakia, Poland, Transcarpathian Ukraine, Romania) (Soós 1959, Polhemus *et al.* 1995) where it prefers small and shallow tarns usually above 1700 m a.s.l. (Wróblewski 1980). The Slovak record by Soós (1959) was overlooked by Hoberlandt (1977) and Polhemus *et al.* (1995).

Sigara (Subsigara) distincta (Fieber, 1848)

Material examined. Kysihýbeľ [pond], 48°27'30"N, 18°56'13"E, 487 m a.s.l., 13.ix.2011, 3 ♂♂ 2 ♀♀, lgt. M. Svitok, det. B. Reduciendo Klementová (coll. Dept. of Ecology and General Biology, Technical University in Zvolen, Slovakia - DEGB); Tatra Mts., Jamské pleso [glacial lake], 49°07'58"N, 20°00'44"E, 1453 m a.s.l., 21.ix.2010, 1 ♂, lgt. M. Očadlík, det. B. Reduciendo Klementová (coll. DEGB); Nová Sedlica [pond], 49°05'02"N, 22°27'41"E, 637 m a.s.l., 25.viii.2012, 1 ♀, lgt. M. Svitok, det. B. Reduciendo Klementová (coll. DEGB); Nová Sedlica [pond], 49°05'02"N, 22°27'41"E, 637 m a.s.l., 23.iv.2013, 1 ♀, lgt. M. Svitok, det. B. Reduciendo Klementová (coll. DEGB); Lipovec [pond], 49°07'28"N, 18°55'33"E, 382 m a.s.l., 17.iv.2013, 1 ♂, lgt. M. Svitok, det. B. Reduciendo Klementová (coll. DEGB); Jastrabá [pond], 48°38'21"N, 18°57'37"E, 405 m a.s.l., 15.iv.2013, 5 ♂♂ 5 ♀♀, lgt. M. Svitok, det. B. Reduciendo Klementová (coll. DEGB); Alekšince [pond], 48°22'19"N, 17°57'14"E, 151 m a.s.l., 20.iv.2009, 1 ♀, lgt. J. Cunev, det. B. Reduciendo Klementová (coll. DEGB); Tatra Mts., Bielovodská dolina valley [unknown], 49°13'59"–49°12'40"N, 20°06'02"–20°06'19"E, 1050–1170 m a.s.l., 9.viii.1967, 1 ♀, lgt. J. L. Stehlík, det. P. Kment (coll. Moravian Museum, Brno, Czech Republic).

Remarks. In Slovakia, *S. distincta* dwells in a very wide variety of environmental conditions: elevation: 151–1453 m, pH: 5.3–9.2, conductivity: 9–580 $\mu\text{S}\cdot\text{cm}^{-1}$. The species is occasionally found in sympatry with *S. striata*.

Distribution. *Sigara distincta* is widespread in Europe, Siberia and north Africa, but is lacking in the southwestern part of Europe (Jastrey 1981, Nieser 1982). This species tolerates a wide range of habitats but prefers stagnant waters in higher elevations with low pH (5–6) and conductivity ($< 200 \mu\text{S}\cdot\text{cm}^{-1}$) (Mercken 1989, Lock *et al.* 2013).

Notonecta (Notonecta) lutea Müller, 1776

Material examined. Klin, Klinské rašelinisko [peat bog], 49°25'42"N, 19°29'46"E, 611 m a.s.l. 19.v.1993, 2 ♂♂, lgt. P. Bitušík, det. B. Reduciendo Klementová (coll. DEGB). Klin, Klinské rašelinisko [peat bog], 49°25'42"N, 19°29'46"E, 611 m a.s.l., 19.vii.1990, 1 specimen (macropterous), lgt. P. Bitušík, det. B. Reduciendo Klementová (coll. Central Slovakia Museum in Banská Bystrica, Slovakia).

Remarks. The species was found in ombrogenous peat bog pools with pH of water from 4 to 6 (Hindák 2012).

Distribution. *Notonecta lutea* is distributed in central, northern and eastern Europe, Russia and Kazakhstan (Jaczewski & Wróblewski 1978, Dioli 1994, Polhemus *et al.* 1995, Soós *et al.* 2009, Berchi 2013). This species is common in bogs overgrown with heather or *Sphagnum* spp. but can be also found in ditches or swamps with dystrophic, mixtrophic or eutrophic water (Jastrey 1981, Nieser 1982).

Notonecta (Notonecta) maculata Fabricius, 1794

Material examined. Bratislava [garden pond], 48°10'11"N, 17°06'12"E, 279 m a.s.l., 07.vii.2011, 1 ♂ 2 ♀♀, lgt. F. Rovný, det. B. Reduciendo Klementová (coll. DEGB). Podolie, Dudváh [river], 48°39'53"N, 17°46'59"E, 167 m a.s.l., 25.x.2013, 1 spec., lgt. V. Janský, det. B. Reduciendo Klementová (coll. Central Slovakia Museum in Banská Bystrica, Slovakia).

Remarks. *Notonecta maculata* was found in small (7.2 m², max. depth 0.25 m), fishless garden pond and lowland stream.

Distribution. This Palaearctic species is distributed in southern and central Europe, Great Britain, Denmark, Sweden, northern Africa, Turkey, Israel, Lebanon, Syria, Iraq, Iran and Pakistan (Jaczewski & Wróblewski 1978, Polhemus *et al.* 1995, Protić 1998, Kanyukova 2006, Soós *et al.* 2009, Fent *et al.* 2011, Berchi 2013). Kment & Baňar (2012) recorded *N. maculata* in neighbouring Moravia from one locality (Javorník, Teplica brook) just a few meters from the Slovak border. *Notonecta maculata* is found only locally and prefers small habitats (ponds and brooks) with clay substrate and a restricted amount of vegetation, usually found during early successional stages of the pools (Bosmans 1982, Lock *et al.* 2013).

Microvelia (Microvelia) buenoi Drake, 1920

Material examined. Martovce, Žitava River [alluvia], 47°51'38"N, 18°08'25"E, 106 m a.s.l., 26.ix.2014, 1 ♀ (apterous), lgt. & det. P. Kment (coll. National Museum, Prague, Czech Republic).

Remarks. The species was found in heavily vegetated river alluvia in species-rich assemblages of aquatic invertebrates including the following water bugs: *Nepa cinerea*, *Hesperocorixa linnaei*, *Sigara striata*, *Cymatia coleoptrata*, *Ilyocoris cimicoides*, *Notonecta glauca*, *Plea minutissima*, *Hydrometra gracilentata*, *Microvelia reticulata* and *Gerris argentatus*.

Distribution. This Holarctic species is distributed from the United Kingdom to northern China, Canada and northern United States. The southern boundary in Europe is delineated by France, Germany, Austria, Hungary, Romania and Ukraine; it is absent in southern Europe (Putshkov & Putshkov 1996, Rabitsch & Zettel 2000, Aukema *et al.* 2013, Kment *et al.* 2013, Berchi & Kment 2015). The species prefers shaded littoral zones of ditches, marshes and ponds, where it is particularly abundant among emergent macrophytes and submerged branches of shore vegetation (Wróblewski 1980, Aukema *et al.* 2002). Kurzatkowska (1999) considered *M. buenoi* a tyrrhophilous species, inhabiting various dystrophic, polyhumic waters, especially in forests.

Completeness of the species inventory

The last extensive checklist of water bugs from Slovakia comprised 44 species (Hoberlandt 1977) and this number expanded to 56 species by 2015. Based on the total richness estimate, we expect that future surveys will add few additional species into the checklist (Fig. 5). The occurrence of *Arctocorisa germari germari* (Fieber, 1848), *Cymatia bonsdorffii* (C. R. Sahlberg, 1819), *Corixa dentipes* Thomson, 1869, *Hesperocorixa castanea* (Thomson, 1869), *Sigara (Microcorixa) hellensi* (C. R. Sahlberg, 1819), *S. (Subsigara) longipalis* (J. Sahlberg, 1878), *Notonecta (N.) obliqua* Thunberg, 1787, *N. (N.) meridionalis* Poisson, 1926, and *N. (N.) reuteri reuteri* Hungerford, 1928 may be reasonably expected given their environmental requirements and their presence in neighbouring countries (Wróblewski 1980, Kment & Smékal 2002, Polhemus *et al.* 2005, Rabitsch 2005a, Boda *et al.* 2015).

TABLE 1. Checklist of aquatic and semi-aquatic Heteroptera (Nepomorpha and Gerromorpha) occurring in Slovakia and references to the first records. The species list is arranged by infraorder, family, genus, (subgenus), species and subspecies, and follows standard nomenclature (Andersen 1995, Polhemus *et al.* 1995, Aukema *et al.* 2013).

Taxa	First record
Nepomorpha	
Nepidae	
<i>Nepa cinerea</i> Linnaeus, 1758	Bartholomeides (1808), Horváth (1870)
<i>Ranatra (Ranatra) linearis</i> (Linnaeus, 1758)	Brancsik (1880)
Micronectidae	
<i>Micronecta (Dichaetonecta) scholtzi</i> (Fieber, 1860)	Brtek (1954)
<i>Micronecta (Micronecta) carpatica</i> Wróblewski, 1958	Wróblewski (1960)
<i>Micronecta (Micronecta) griseola</i> Horváth, 1899	Wróblewski (1960)
<i>Micronecta (Micronecta) minutissima</i> (Linnaeus, 1758)	Wróblewski (1960)
<i>Micronecta (Micronecta) poweri poweri</i> (Douglas & Scott, 1869)	Wróblewski (1960)
Corixidae	
<i>Arctocorisa carinata carinata</i> (C.R. Sahlberg, 1819)	Klementová <i>et al.</i> (2012)
<i>Callicorixa praeusta praeusta</i> (Fieber, 1848)	Horváth (1897)
<i>Corixa affinis</i> Leach, 1817	Horváth (1987)
<i>Corixa panzeri</i> Fieber, 1848	present study
<i>Corixa punctata</i> (Illiger, 1807)	Horváth (1897), Brtek (1954)

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TABLE 1. (Continued)

Taxa	First record
<i>Cymatia coleoptrata</i> (Fabricius, 1777)	Brancsik (1891)
<i>Cymatia rogenhoferi</i> (Fieber, 1864)	Brtek (1954)
<i>Glaenocorisa propinqua</i> (Fieber, 1860)	Szilády (1904)
<i>Hesperocorixa linnaei</i> (Fieber, 1848)	Brtek (1954)
<i>Hesperocorixa moesta</i> (Fieber, 1848)	Horváth (1897)
<i>Hesperocorixa parallela</i> (Fieber, 1860)	Soós (1959)
<i>Hesperocorixa sahlbergi</i> (Fieber, 1848)	Balthasar (1937)
<i>Paracorixa concinna concinna</i> (Fieber, 1848)	Horváth (1897)
<i>Sigara (Pseudovermicorixa) nigrolineata nigrolineata</i> (Fieber, 1848)	Soós (1959)
<i>Sigara (Retrocorixa) limitata limitata</i> (Fieber, 1848)	Petrickó (1892)
<i>Sigara (Retrocorixa) semistriata</i> (Fieber, 1848)	Horváth (1897)
<i>Sigara (Sigara) striata</i> (Linnaeus, 1758)	Brtek (1954)
<i>Sigara (Subsigara) distincta</i> (Fieber, 1848)	Klementová <i>et al.</i> (2012)
<i>Sigara (Subsigara) falleni</i> (Fieber, 1848)	Brtek (1954)
<i>Sigara (Subsigara) fossarum</i> (Leach, 1817)	Vysloužil (1979)
<i>Sigara (Vermicorixa) lateralis</i> (Leach, 1817)	Brtek (1954)
Naucoridae	
<i>Ilyocoris cimicoides cimicoides</i> (Linnaeus, 1758)	Horváth (1870)
Aphelocheiridae	
<i>Aphelocheirus (Aphelocheirus) aestivalis</i> (Fabricius, 1794)	Horváth (1897)
Notonectidae	
<i>Anisops sardeus sardeus</i> Herrich-Schäffer, 1849	Klementová <i>et al.</i> (2012)
<i>Notonecta (Notonecta) glauca glauca</i> Linnaeus, 1758	Mocsáry (1875)
<i>Notonecta (Notonecta) lutea</i> Müller, 1776	Klementová <i>et al.</i> (2012)
<i>Notonecta (Notonecta) maculata</i> Fabricius, 1794	Klementová <i>et al.</i> (2012)
<i>Notonecta (Notonecta) viridis</i> Delcourt, 1909	Stehlík & Hoberlandt (1953)
Pleidae	
<i>Plea minutissima minutissima</i> Leach, 1817	Brtek (1954)
Gerromorpha	
Mesoveliidae	
<i>Mesovelia furcata</i> Mulsant & Rey, 1852	Horváth (1884)
Hydrometridae	
<i>Hydrometra gracilentata</i> Horváth, 1899	Horváth (1899)
<i>Hydrometra stagnorum</i> (Linnaeus, 1758)	Brancsik (1878)
Hebridae	
<i>Hebrus (Hebrus) pusillus pusillus</i> (Fallen, 1807)	Brancsik (1878)
<i>Hebrus (Hebrus) ruficeps</i> Thomson, 1871	Horváth (1884)
Veliidae	
<i>Microvelia (Microvelia) buenoi</i> Drake, 1920	present study
<i>Microvelia (Microvelia) reticulata</i> (Burmeister, 1835)	Horváth (1897)
<i>Microvelia (Microvelia) pygmaea</i> (Dufour, 1833)	Kment <i>et al.</i> (2013)
<i>Velia (Plesiovelia) caprai caprai</i> Tamanini, 1947	Teyrovský (1969)

.....continued on the next page

TABLE 1. (Continued)

Taxa	First record
<i>Velia (Plesiovelia) saulii</i> Tamanini, 1947	Tamanini (1949)
Gerridae	
<i>Aquarius najas</i> (De Geer, 1773)	Balthasar (1942)
<i>Aquarius paludum paludum</i> (Fabricius, 1794)	Horváth (1870)
<i>Gerris (Gerris) argentatus</i> Schummel, 1832	Horváth (1897)
<i>Gerris (Gerris) gibbifer</i> Schummel, 1832	Balthasar (1937)
<i>Gerris (Gerris) lacustris</i> (Linnaeus, 1758)	Mocsáry (1875)
<i>Gerris (Gerris) odontogaster</i> (Zetterstedt, 1828)	Ortvay (1902)
<i>Gerris (Gerris) thoracicus</i> Schummel, 1832	Horváth (1870)
<i>Gerris (Gerriselloides) asper</i> (Fieber, 1860)	Horváth (1897)
<i>Gerris (Gerriselloides) lateralis</i> Schummel, 1832	Teyrovský (1969)
<i>Limnporus rufoscutellatus</i> (Latreille, 1807)	Horváth (1897)

Arctocorisa germari germari is a Euro-Siberian species distributed from Ireland and Norway to East Siberia (Polhemus *et al.* 2005; Aukema *et al.* 2013). Among neighbouring countries, the species is known from scattered records in Austria, Czech Republic, and Poland (e.g., Wróblewski 1980, Rabitsch & Zettel 2000, Kment *et al.* 2013). This boreo-montaneous species inhabits pelagial zone of oligotrophic waters, including those with very low pH (Savage 1989, Wollmann 2000, Bonte *et al.* 2001).

Another Euro-Siberian species with occurrence expected in Slovakia is *Cymatia bonsdorffii*. This species is distributed in Europe (except for south Europe), Siberia, Russia, Kazakhstan, Mongolia, and China and it occurs in all neighbouring countries except Hungary (Polhemus *et al.* 2005). In central Europe, *C. bonsdorffii* dwells in dystrophic waterbodies with well developed vegetation, lower pH and low conductivity (Bonte *et al.* 2001, Kurzątkowska 2008).

Corixa dentipes is widespread in Europe and known in all neighbouring countries except Hungary (Polhemus *et al.* 1995, Boda *et al.* 2015). The species dwells in various habitats with shallow water and rich detritus supply (e.g., ponds, ditches), very low pH (3–5) and low conductivity ($< 500 \mu\text{S}\cdot\text{cm}^{-1}$) avoiding eutrophic waters (Wollmann 2000, Bonte *et al.* 2001). It was recorded from Trenčín environs by Brancsik (1887), but later the record was found to be based on misidentification of *Corixa punctata* (see Horváth 1897: 45).

Hesperocorixa castanea occurs through northern and western Europe, western parts of central Europe and in the Iberian Peninsula (Polhemus *et al.* 1995). The species is known from the Czech Republic (western Bohemia) and Poland and Polhemus *et al.* (1995) listed its occurrence in Slovakia with a question mark. We found several juvenile and/or female specimens of small *Hesperocorixa* in Tatra Mountains that resembles *H. castanea*. However, only adult and fully developed males can be reliably determined to the species level. Thus we tentatively identified those individuals as *H. moesta*, which are morphologically very similar species from the same lineage (Dunn 1979, Jansson 1986). *Hesperocorixa castanea* is considered a typical raised bog species with preference for shallow, acidic waters of low conductivity (van Duinen 2003, Lock *et al.* 2013, Hannigan & Kelly-Quinn 2014).

Another species that could possibly occur in Slovakia is *Sigara hellensi*. This species is sparsely distributed in the central Europe, southern Scandinavia, southern Finland and western Russia (Jansson 1986, Polhemus *et al.* 1995), and was recorded in all neighbouring countries including the boundary regions (Teyrovský 1930, Kment & Smékal 2002). *Sigara hellensi* is rheophilous species, mostly inhabiting shady places with sparse vegetation in larger streams and rivers with clean and cold water, sandy-muddy bottom and low current velocity (Karg 1966, Krajewski 1969a, Wróblewski 1980).

Sigara longipalis is a boreo-montaneous species distributed in central, north and northeast Europe and Siberia (Nieser 1982, Rabitsch & Zettel 2000, Polhemus *et al.* 2005). Among neighbouring countries, *S. longipalis* is known from the Czech Republic and Poland. The species occurs typically in unshaded ponds with clear water and sparse vegetation (Krajewski 1969b, Bonte *et al.* 2001, Rabitsch & Zettel 2000).

Polhemus *et al.* (1995) listed the presence of *Notonecta obliqua* and *N. reuteri* from Slovakia; however, no direct evidence is available and we presume that information is based on misinterpretation of the records from the

former Czechoslovakia, which pertain to Czech Republic. Both species are known in all neighbouring countries except for *N. obliqua* in Ukraine [in the Czech Republic the species is limited only to western Bohemia (Kment & Smékal 2002)]. The range of *N. reuteri* extends more toward the north, whereas *N. obliqua* occurs also in southern Europe. However, *N. obliqua* could be easily confused with the dark form of *N. meridionalis* (cf. Kanyukova 2005, Fent *et al.* 2011); thus, records of *N. obliqua* from southern Europe require careful revision. Both species prefer bogs and fens with acidic waters and low conductivity (Jaczewski & Wróblewski 1978, Dolmen 1989, Soldán *et al.* 1996, Lock *et al.* 2013).

Notonecta meridionalis occurs in southern parts of western and central Europe, southern Europe, Crimea, Morocco, Algeria, Tunisia and Turkey (Polhemus *et al.* 1995, Kment & Beran 2011). The species is known from all neighbouring countries except Poland. However, the identification of *N. meridionalis* is complicated by the variability of its hemelytral colouration and, consequently, the species is often confused with the morphologically similar species *Notonecta glauca* and *N. obliqua* (Kanyukova 2006, Soós *et al.* 2009, Fent *et al.* 2011, Berchi *et al.* 2012). *Notonecta meridionalis* occurs in a wide range of habitats (pools, oxbow lakes, springs and streams) often in sympatry with other species of *Notonecta* (Fent *et al.* 2011, Kment & Beran 2011, Berchi *et al.* 2012).

Other species present in some neighbouring countries such as *Micronecta (Dichaetonecta) pusilla* (Horváth, 1895), *Sigara (Sigara) assimilis* (Fieber, 1848), *Sigara (Subsigara) scotti* (Douglas & Scott, 1868), *Sigara (Subsigara) iactans* Jansson, 1983, or *Mesovelvia termalis* Horváth, 1915 could be recorded in Slovakia at the edge of their area, but this seems improbable under the current climatic conditions. Polhemus *et al.* (1995) also asserted the occurrence of *Naucoris maculatus* from Slovakia with a question mark. This is an apparent error, because the species is regarded as Atlanto-Mediterranean and is common in the United Kingdom, France, Belgium, the Netherlands, Spain, Portugal, Italy, Anatolia and Israel (Nau & Brooke 2005).

Ongoing climate change was suggested to be the major driving force behind the recent range shifts of heteropteran species (Rabitsch 2008). Expansions of *A. sardeus* (see Reduciendo Klementová & Svitok 2014 and references therein) and *Microvelia pygmaea* (Kment *et al.* 2013) in central Europe are such examples. However, the effect of elevated temperatures is complex and can alter not only distributional ranges but also phenology, voltinism, physiology and behaviour of Heteroptera and ultimately the structure of communities (Musolin 2007). Consequently, species turnover induced by climate change should be expected.

Recommendations for future research

By extensive sampling and study of available data on water bugs from Slovakia, we have attempted to establish the first comprehensive species list. Despite the considerable effort, several species are expected to be missing in the inventory. We consider this checklist as a first step towards knowledge of the regional water bug fauna and its effective biological conservation. We suggest that future research in the area should focus on:

- 1 sampling specific habitats that were overlooked in previous research such as dystrophic waterbodies, newly created waterbodies in initial succession stages, or larger pristine streams, which may harbour previously unrecorded species (e.g. *Cymatia bonsdorffii*, *Corixa dentipes*, *Hesperocorixa castanea*, *Notonecta reuteri*, *N. obliqua* and *Sigara hellensi*);
- 2 describing diversity patterns and clarifying underlying mechanisms;
- 3 identifying the major threats to diversity of water bugs; and
- 4 establishing a well-documented national red list of threatened species.

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References

- Andersen, N.M. (1995) Infraorder Gerromorpha Popov, 1971—semiaquatic bugs. In: Aukema, B. & Rieger, Ch. (Eds.), *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 1. Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha and Leptopodomorpha*. The Netherlands Entomological Society, Amsterdam, pp. 77–114.
- Aukema, B., Cuppen, J.G.M., Nieser, N. & Tempelman, D. (2002) Verspreidingsatlas Nederlandse wantsen (Hemiptera: Heteroptera). Deel I: Dipsocoromorpha, Nepomorpha, Gerromorpha & Leptopodomorpha. [Distributional atlas of Dutch true bugs (Hemiptera: Heteroptera). Vol. I: Dipsocoromorpha, Nepomorpha, Gerromorpha & Leptopodomorpha]. *European Invertebrate Survey—Nederland*, Leiden, 169 pp [in Dutch].
- Aukema, B., Rieger, C. & Rabitsch, W. (2013) *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 6. Supplement*. The Netherlands Entomological Society, Amsterdam, xxiii + 629 pp.
- *Balthasar, V. (1936) Limnologické výskumy v slovenských vodách. (Ein Beitrag zur Kenntnis der Fauna der toten Donaugewässer in der Slowakei). *Práce Učené Společnosti Šafaříkovy v Bratislavě*, 19, 1–75. [in Czech, German summary]
- *Balthasar, V. (1937) Slovenské plošnice. Katalog a pokus o rosbor zložek fauny slovenských Heteropter. (Die Heteropteren der Slowakei. Ein Katalog und Analyse der faunistischen Komponenten der slowakischen Heteropteren). *Bratislava, Časopis pro Výskum Slovenska a Podkarpatské Rusi*, 11, 194–249. [in Czech, German summary]
- *Balthasar, V. (1942) Pozoruhodné nálezy plošnic na Moravě a na Slovensku. (Über einige beachtenswerte Wanzen-Arten aus Mähren und Slowakei). *Entomologické Listy*, 5, 25–28. [in Czech, German summary]
- *Bartholomaeides, L. (1808) Caput III. Sectio I. De productis naturae in terris Gömöriensibus obviis, juxta tria regna summarie recensitis. In: Bartholomaeides, L. (Ed.), *Inclyti Superioris Ungariae Comitatus Gömöriensis notitia historico-geographico-statistica*. Josephi Caroli Mayer, Leutschoviae [= Levoča], pp. 311–338.
- *Benedek, P. (1970) The semiaquatic Heteroptera in Carpathian Basin with notes on the distribution and the phenology of the species. *Faunistische Abhandlungen, Staatliche Museum für Tierkunde in Dresden*, 3 (6), 27–49.
- Berchi, G.M. (2013) Checklist and distribution of the family Notonectidae in Romania, with the first record of *Notonecta maculata* Fabricius, 1794 (Hemiptera: Heteroptera: Nepomorpha). *Zootaxa*, 3682 (1), 121–132. <http://dx.doi.org/10.11646/zootaxa.3682.1.5>
- Berchi, G.M. & Kment, P. (2015) Review of the family Veliidae in Romania (Hemiptera: Heteroptera: Gerromorpha). *Zootaxa*, 3963 (1), 74–88. <http://dx.doi.org/10.11646/zootaxa.3963.1.5>
- Berchi, G.M., Kment, P. & Petrovici, M. (2012) First record of the backswimmer *Notonecta meridionalis* (Hemiptera: Heteroptera: Notonectidae) in Romania. *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"*, 55, 217–220. <http://dx.doi.org/10.2478/v10191-012-0013-y>
- *Bianchi, Z. (1996) Heteroptera eines Mosaikbiotops in der Borska Ebene (Slowakei). (Heteroptera of mosaic biotops in Borska lowland (Slovakia)). *Verhandlungen des 14. Internationalen Symposiums über Entomofaunistik in Mitteleuropa (SIEEC)*. München, pp. 216–223.
- *Bitušik, P. & Turanová, M. (1997) Letný aspekt výskytu vodného hmyzu Chráneného prírodného náleziska Jazierko pri Jezernici. (Summer aspect of aquatic insect of Protected natural locality Jazierko pri Jezernici). *Entomofauna Carpatica*, 9, 76–79. [in Slovak]
- Boda, P., Bozóki, T., Vásárhelyi, T., Bakonyi, G. & Várбірó, G. (2015) Revised and annotated checklist of aquatic and semi-aquatic Heteroptera of Hungary with comments on biodiversity patterns. *ZooKeys*, 501, 89–108. <http://dx.doi.org/10.3897/zookeys.501.8964>
- Bonte, D., Vandomme, V., Muylaert, J. & Bosmans, R. (2001) *Een gedocumenteerde Rode Lijst van de water-en oppervlaktewantsen van Vlaanderen. (A documented red list of aquatic and semiaquatic true bugs of Flanders)*. Universiteit Gent, Gent, 118 pp. [in Dutch]
- Boix, D., Sala, J. & Moreno-Amich, R. (2001) The faunal composition of Espolla pond (NE Iberian Peninsula): The neglected biodiversity of temporary waters. *Wetlands*, 21, 577–592. [http://dx.doi.org/10.1672/0277-5212\(2001\)021\[0577:TFCOEP\]2.0.CO;2](http://dx.doi.org/10.1672/0277-5212(2001)021[0577:TFCOEP]2.0.CO;2)
- *Borodovičová, N.D. (1968) The benthic population of water bodies in the Blatská dolina near Vihorlat (Prior to creation of the storage reservoir). *Věstník Československé Společnosti Zoologické*, 32 (2), 104–115.
- Bosmans, R. (1982) Distribution and ecology of the Belgian Corixidae (Hemiptera). *Academia Analecta*, 44, 21–60.
- *Brancsik, K. (1878) Trencsén megye Hemipteráinak felsorolása. (Checklist of Hemiptera of Trencin region) *A Trencsén Megyei Természettudományi Egylet Évkönyve* [= *Jahresheft des Naturwissenschaftlichen Vereines des Trencsener Komitates*], 1, 29–33. [in Hungarian]

- *Brancsik, K. (1880) Adatok Trencsén megye Hemiptera faunájához. (Zur Hemipterenfauna des Trencsiner Comitatus). *Évkönyv Melyet a Trencsén Megyei Természettudományi Egylet Megbizásából* [= *Jahresheft des Naturwissenschaftlichen Vereines des Trencsiner Comitatus*], 3, 24–30. [in Hungarian, German title]
- *Brancsik, K. (1887) Adatok Trencsénmegye Hemiptera faunájához. (Zur Hemipterenfauna des Trencsiner Comitatus). *Évkönyve a Trencsén Vármegyei Természettudományi Egylet* [= *Jahresheft des Naturwissenschaftlichen Vereines des Trencsiner Comitatus*], 9, 55–56. [in Hungarian, German title]
- *Brancsik, K. (1891) Additamenta ad Faunam Comitatus Trenciniensis. *Évkönyve a Trencsén Vármegyei Természettudományi Egylet* [= *Jahresheft des Naturwissenschaftlichen Vereines des Trencsiner Comitatus*], 13–14, 43–46.
- *Brancsik, K. (1893) Durch das Trencsiner Comitatus. (Through the Trenčín County). *Jahresheft des Naturwissenschaftlichen Vereines des Trencsiner Comitatus*, 14–15 (1892–93), 135–159.
- *Brtek, J. (1954) Predbežná správa z výskumu vodných Hemipter Dunaja. (A preliminary report from the research of aquatic Hemiptera of Danube river) *Biológia* (Bratislava), 8 (6), 533–537. [in Slovak]
- *Brtek, J. (1980) Zoznam pijavic (Hirudinea) a vodných bzdôch (Hemiptera) zistených v odvodňovacom kanáli v “Hamskom trstí”. (List of leeches (Hirudinea) and water bugs (Hemiptera) found in drainage channel in “Hamské trstie”). pp. 104–105. In Klokner, L. (ed.), *Odborné výsledky zo XVI. Tábora ochrancov prírody—Ostrov Veľký Lél, okres Komárno*. [Research results from the XVI. Camp of environmentalists—Veľký Lél Island, Komárno district]. [in Slovak]
- *Bryja, J. & Kment, P. (2004) Ploštice (Heteroptera) Bukovských vrchu (NP Poloniny). (True bugs (Heteroptera) of Bukovské vrchy Mts. (NP Poloniny). *Folia Faunistica Slovaca*, 9, 31–36. [in Czech, English abstract]
- *Bryja, J. & Kment, P. (2007) True bugs (Heteroptera) of the Bukovské vrchy Hills (Poloniny National Park, Slovakia). *Acta Musei Moraviae, Scientiae Biologicae*, 92, 1–51.
- *Bulánková, E. (1993) Nové nálezy ohrozeného druhu *Aphelocheirus aestivalis* (Aphelocheiridae, Heteroptera) na Slovensku. (New sites of endangered species *Aphelocheirus aestivalis* (Aphelocheiridae, Heteroptera) in Slovakia). *Správy Slovenskej Entomologickej Spoločnosti SAV, Bratislava*, 5, 31–33. [in Slovak, English summary]
- *Bulánková, E. (1995) Dragonflies (Odonata) and aquatic bugs (Heteroptera) of stagnant waters in the region of the Gabčíkovo project. In: Mucha, I. (Ed.), *Gabčíkovo part of the hydroelectric power project—Environmental impact review*. Faculty of Natural Sciences, Comenius University, Bratislava, Slovakia, pp. 297–301.
- *Bulánková, E. (2003) Heteroptera. In: Šporka, F. (Ed.), *Vodné bezstavovce (makrovertebráta) Slovenska. Súpis druhov a autekologické charakteristiky. (Slovak aquatic macroinvertebrates. Checklist and catalogue of autecological notes)*. Slovak Hydrometeorological Institute, Bratislava, 590 pp. [in Slovak]
- *Bulánková, E., Krno, I. & Halgoš, J. (1994) Macrozoobenthos of the Morava river basin and tributaries of the Morava. *Ekológia, Supplement*, 1, 63–76.
- *Bulánková, E., Krno, I. & Halgoš, J. (1996) Preimaginal stages of some groups of aquatic insect in Žilina Valley. *Acta Zoologica Universitatis Comenianae*, 40, 11–27.
- *Bulánková, E. & Némethová, D. (2007) Linkages between land-use, water quality, physical habitat conditions and selected macroinvertebrate assemblages of the Hron River (Slovakia). *Acta Universitatis Carolinae Environmentalica*, 21, 35–46.
- Chao, A. (1987) Estimating the population size for capture-recapture data with unequal catchability. *Biometrics*, 43, 783–791. <http://dx.doi.org/10.2307/2531532>
- Chao, A. (2005) Species estimation and applications. In: Kotz, S., Balakrishnan, N., Read, C.B. & Vidakovic, B. (Eds.), *Encyclopedia of Statistical Sciences vol. 12, 2nd edition*. Wiley, New York, pp. 7907–7916.
- Chao, A. & Shen, T.-J. (2010) Program SPADE (Species Prediction And Diversity Estimation). Program and User's Guide published at <http://chao.stat.nthu.edu.tw> (Accessed 11 Dec. 2015)
- Colwell, R.K., Mao, C.X. & Chang, J. (2004) Interpolating, extrapolating, and comparing incidence-based species accumulation curves. *Ecology*, 85, 2717–2727. <http://dx.doi.org/10.1890/03-0557>
- Colwell, R.K. (2013) EstimateS: Statistical estimation of species richness and shared species from samples. Version 9. User's Guide and application published at <http://purl.oclc.org/estimates> (Accessed 11 Dec. 2015)
- *Deván, P. (2001) K poznaniu fauny stojatých vôd nivy Moravy pri Skalici. (Contribution to the knowledge of the fauna of stagnant waters in the floodplain of Morava River near Skalica). *Sborník Přírodovědeckého Klubu v Uherském Hradišti*, 6, 134–137. [in Slovak, English abstract]
- Dioli, P. (1994) *Notonecta lutea* Müller, 1776, nuova per la fauna italiana e osservazioni su *N. reuteri* Hungerford, 1928 e su *N. pallidula* Poisson, 1926. (*Notonecta lutea* Müller, 1776, new for the Italian fauna and observations on *N. reuteri* Hungerford, 1928 and on *N. pallidula* Poisson, 1926). *Bolletino della Società Entomologica Italiana*, 125, 195–198. [in Italian]
- Dolmen, D. (1989) *Notonecta reuteri* Hungerford (Hemiptera, Notonectidae) rediscovered in Norway. *Fauna Norvegica. Ser. B*, 36, 103.
- Dolmen, D. (2004) *Corixa panzeri* (Fieber), a species new to Norway, and *Paracorixa concinna* (Fieber) (Hemiptera-Heteroptera, Corixidae), in Gjerstadvannet, Arendal. *Norwegian Journal of Entomology*, 51, 27–29.
- Duinen, G.J.A. van, van Brock, A.M., Kuper, J.T., Leuven, R.S., Peeters, T.M., Roelofs, J.G., Velde, G., van der Verberk, W.C.E.P. & Esselink, H. (2003) Do restoration measures rehabilitate fauna diversity in raised bogs? A comparative study on aquatic macroinvertebrates. *Wetlands Ecology and Management*, 11, 447–459. <http://dx.doi.org/10.1023/B:WETL.0000007196.75248.a5>
- Dunn, C.E. (1979) A revision and phylogenetic study of the genus *Hesperocorixa* Kirkaldy (Hemiptera: Corixidae).

- *Elexová, E. (1998a) Interaction of the Danube river and its left side tributaries in Slovak stretch from benthic fauna point of view. *Biológia* (Bratislava), 53, 621–632.
- *Elexová, E. (1998b) Poznámky k makrozoobentosu Laborca v oblasti elektrárne Vojany. (The notes on macroinvertebrates of Laborec River in the area of power station Vojany). *Natura Carpatica*, 39, 63–72. [in Slovak, English summary]
- *Elexová, E. & Némethová, D. (2003) The effect of abiotic environmental variables on the Danube macrozoobenthic communities. *Limnologica*, 33, 340–354.
[http://dx.doi.org/10.1016/S0075-9511\(03\)80028-2](http://dx.doi.org/10.1016/S0075-9511(03)80028-2)
- *Faková, M. (2005) Nové nálezy bzdochy *Aphelocheirus aestivalis* na Slovensku. (New records of the bug *Aphelocheirus aestivalis* (Heteroptera) in Slovakia). *Ochrana Prírody, Banská Bystrica*, 24, 139–140. [in Slovak, English summary]
- Fent, M., Kment, P., Çamur-Elipek, B. & Kirgiz, T. (2011) Annotated catalogue of Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha, and Leptopodomorpha (Hemiptera: Heteroptera) of Turkey, with new records. *Zootaxa*, 2856, 1–84.
- *Fritsch, K. (1880) Jährliche Periode der Insectenfauna von Österreich-Ungarn. V. Die Schnabelkerfe (Rhynchota). (Annual period of Insect of Austria-Hungary. V. The Hemiptera (Rhynchota). *Denkschriften der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse Wissenschaften*, 42, 217–255.
- *Gregor, J. (1985) Faunistické poznámky z okresu Trebišov. [Faunistic notes from Trebišov district]. In: Voskar J. & Renčík M. (Eds.), *IX. Východoslovenský tábor ochrancov prírody Borša—1985, Prehľad odborných výsledkov. [IX. East Slovak camp of environmentalists Borša—1985, Research results]*. Okresný národný výbor—Odbor kultúry, Okresný výbor Slovenského zväzu ochrancov prírody a krajiny, Trebišov, pp. 162–164. [in Slovak]
- Hannigan, E. & Kelly-Quinn, M. (2014) Aquatic invertebrate communities of ombrotrophic bogs in Ireland with special reference to microcrustaceans. *Biology and Environment: Proceedings of the Royal Irish Academy*, 114, 249–263.
<http://dx.doi.org/10.3318/bioe.2014.22>
- Hindák, F. (2012) Cyanobaktérie/sinice rašeliniska Klin, Horná Orava (Cyanobacteria of peat bog Klin, Horná Orava) In: Čiamporová-Zaťovičová Z. (Ed.), *XVI. konferencia Slovenskej limnologickej spoločnosti a České limnologickej spoločnosti—Zborník príspevkov*. 25.–29.6. 2012, Jasná, pp. 43–45. [in Slovak]
- *Hoberlandt, L. (1977) Heteroptera. In: Dlabola J. (Ed.), *Enumeratio Insectorum Bohemoslovakiae. Check List tschekoslowakische Insektenfauna. Acta Faunistica Entomologica Musei Nationalis Pragae*, Supplementum 4, pp. 61–82.
- *Horváth, G. (1870) Adatok a hazai félröpkék ismeretéhez. [Data to the knowledge of native heteropterans]. *Mathematikai és Természettudományi Közlemények*, 8, 3–14. [in Hungarian]
- *Horváth, G. (1884) A magyarországi vizenjáró poloskákrról. [On the semiaquatic bugs of Hungary]. *Rovartani Lapok*, 1, 187–188. [in Hungarian]
- *Horváth, G. (1897) Ordo Hemiptera. In: Paszlavszky, J. (Ed.), *A Magyar birodalom állatvilága. A Magyar Birodalomból eddig ismert állatok rendszeres lajstroma. Fauna Regni Hungariae. Animalium Hungariae hucusque cognitorum enumeratio systematica*. A K. M. Természettudományi Társulat, Budapest, pp. 5–64. [in Hungarian and Latin]
- *Horváth, G. (1899) Heteroptera nova Europae regionumque confinium. *Természettudományi Füzetek*, 22, 444–451.
- Jaczewski, T. & Wróblewski, A. (1976) *Hebridae, Mesoveliidae, Hydrometridae, Veliidae i nartniki—Gerridae. Klucze do oznaczania owadów polski. Tom. 18, Vol. 4. (Hebridae, Mesoveliidae, Hydrometridae, Veliidae and water striders—Gerridae. Identification Keys of insect of Poland. Vol. 18, Part 4.)*. Państwowe Wydawnictwo Naukowe, Warszawa, Wrocław, 31 pp. [in Polish]
- Jaczewski, T. & Wróblewski, A. (1978) *Corixidae, Notonectidae, Pleidae, Nepidae, Naucoridae i Aphelocheiridae. Klucze do oznaczania owadów polski. Tom. 18, Vol. 2. (Corixidae, Notonectidae, Pleidae, Nepidae, Naucoridae and Aphelocheiridae. Identification Keys of insect of Poland. Vol. 18, Part 2.)*. Państwowe Wydawnictwo Naukowe, Warszawa, Poznań, 68 pp. [in Polish]
- Jansson, A. (1986) The Corixidae (Heteroptera) of Europe and some adjacent regions. *Acta Entomologica Fennica*, 47, 1–94.
- Jastre, J.T. (1981) Distribution and ecology of Norwegian water-bugs (Hem., Heteroptera). *Fauna Norvegica, Series B* 28, 1–24.
- Kanyukova, E.V. (2006) *Vodnye poluzhestkokrylye nasekomye (Heteroptera: Nepomorpha, Gerromorpha) fauny Rossii i sopredelnykh stran. (Water bugs (Heteroptera: Nepomorpha, Gerromorpha) in fauna of Russia and neighbouring countries)*. Dal'nauka, Vladivostok, 296 pp. [in Russian].
- Karg, J. (1966) Pluskwiaki różnoskrzydłe (Heteroptera) wód okolic Gliwice i Rybnika. (Water-bugs (Heteroptera) of Gliwice and Rybnik environs). *Fragmenta Faunistica* (Warszawa), 12, 281–307. [in Polish, Russian and English summaries]
<http://dx.doi.org/10.3161/00159301FF1966.12.17.281>
- Klementová, B., Svitok, M., Bitušik, P., Bulánková, E., Kment, P., Manko, P., Matúšová, Z., Novikmec, M., Očadlík, M. & Rovný, F. (2012) Vodné bzdochy Slovenska: rozšírenie a ekológia, (Water bugs of Slovakia: distribution and ecology). In: Čiamporová-Zaťovičová Z. (Ed.), *XVI. Konferencia SLS a ČLS—Zborník príspevkov*. 25.–29.júna 2012, Jasná, 235 pp. [in Slovak]
- Kment, P. & Baňar, P. (2012) True bugs (Hemiptera: Heteroptera) of the Bílé Karpaty Protected Landscape Area and Biosphere Reserve. In: Malenovský, I., Kment, P. & Konvička, O. (Eds.), *Species inventories of selected insect groups in the Bílé Karpaty Protected Landscape Area and Biosphere Reserve (Czech Republic)*. *Acta Musei Moraviae, Scientiae Biologicae*, 96 (2), pp. 323–628.
- Kment, P. & Beran, L. (2011) Check-list of water bugs (Hemiptera: Heteroptera: Nepomorpha) in Croatia with two new records

- and four rediscoveries. *Natura Croatica*, 20, 159–178.
- *Kment, P., Bryja, J., Jindra, Z., Hradil, K. & Baňář, P. (2003) New and interesting records of true bugs (Heteroptera) from the Czech Republic and Slovakia II. *Klapalekiana*, 39, 257–306.
- *Kment, P., Hradil, K., Baňář, P., Balvín, O., Cunev, J., Ditrich, T., Jindra, Z. & Roháčová, M. (2013) New and interesting records of true bugs (Hemiptera: Heteroptera) from the Czech Republic and Slovakia V. *Acta Musei Moraviae, Scientiae Biologicae*, 98, 495–541.
- Kment, P. & Smékal, A. (2002) Příspěvek k faunistice některých vzácných vodních ploštic (Heteroptera: Nepomorpha, Gerromorpha) v České republice. (Contribution to the faunistics of some rare water bugs (Heteroptera: Nepomorpha, Gerromorpha) in the Czech Republic). *Sborník Přírodovědného Klubu v Uherském Hradišti*, 7, 155–181. [in Czech, English abstract]
- Koleška, Z. (1979) Seznam biografii československých entomologů (entomologové nežijící) I. (Index of biographies of Czechoslovak entomologists (deceased entomologists) I.) *Zprávy Československé Společnosti Entomologické*, 15 (Příloha), 1–32, 4 unpaginated plates. [in Czech]
- *Koščo, J. & Manko, P. (2006) Makrozoobentos a ryby riečky Turne. (Macrozoobenthos and Fish of Turňa river). *Natura Carpatica*, 47, 153–168. [in Slovak, English abstract]
- Krajewski, S. (1969a) Pluskwiaki wodne (Heteroptera) rzeki Grabia i jej terenu zalewowego (Wasserwanzen (Heteroptera) des Flusses Grabia und seines Überschwemmungsgebietes). *Polskie Pismo Entomologiczne*, 39, 465–513. [in Polish, Russian and German summaries]
- Krajewski, S. (1969b) Występowanie wioślaka *Sigara longipalis* (J. Sahlb.) (Heteroptera, Corixidae) w zbiornikach wodnych na terenie m Łodzi. (Vorkommen der Ruderwanzen *Sigara longipalis* (J. Sahlb.) (Heteroptera, Corixidae) in Wasserbecken in Łódź). *Zeszyty Naukowe Uniwersytetu Łódzkiego, Nauki Matematyczno-Przyrodnicze, Seria II*, 33, 31–35. [in Polish, German summary]
- Kurzątkowska, A. (1999) Water bugs (Hemiptera) of high bogs and transitional moors of Masurian Lake District. *Polskie Pismo Entomologiczne*, 68, 349–369.
- Kurzątkowska, A. (2008) Water bugs (Heteroptera) in small water bodies located in Olsztyn. *Oceanological and Hydrobiological Studies*, 37, 101–114.
<http://dx.doi.org/10.2478/v10009-008-0021-1>
- *Lapková, Z. (1989) Bzdochy (Heteroptera) Štátnej prírodnej rezervácie Abrod na Záhorí (1. časť). (Wanzen (Heteroptera) des staatlichen Naturschutzgebietes Abrod in Záhorie). *Entomologické Problémy*, 19, 53–58. [in Slovak, German and Russian summaries]
- Lock, K., Adriaens, T., Van De Meutter, F. & Goethals, P. (2013) Effect of water quality on waterbugs (Hemiptera: Gerromorpha & Nepomorpha) in Flanders (Belgium): results from a large-scale field survey. *Annales de Limnologie-International Journal of Limnology*, 49, 121–128.
<http://dx.doi.org/10.1051/limn/2013047>
- *Lőrincz, A. (1906) Adalék Magyarország Hemiptera-faunájához. II. [Contributions to Hemiptera fauna of Hungary. II.] *Rovartani Lapok*, 13, 189–192. [in Hungarian]
- *Majzlan, O., Antalíková, M. & Kalivodová, Z., (1998) Makrozoobentos potoka Čierna voda s ohľadom na pijavice (Hirudinea) a vodné chrobáky (Coleoptera). (Macrozoobenthos of the Čierna voda brook with respect to leeches (Hirudinea) and water beetles (Coleoptera)). *Folia Faunistica Slovaca*, 3, 45–49. [in Slovak, English abstract]
- *Manko, P. (2011) Interesujúce stvrdenia trzech rzadkich i zagrożonych merolimniczných gatunków owadów na Słowacji. (Interesting findings of three rare and endangered merolimnic insect species in Slovakia). *Forum Faunistyczne*, 1, 56–62. [in Polish, English summary]
- Mercken, L. (1989) *Verspreiding en ecologie van water- en oppervlaktewantsen (Hemiptera, Heteroptera) in Vlaanderen. (Distribution and ecology of aquatic and semiaquatic true bugs (Hemiptera, Heteroptera) in Flanders)*. Doct. Verhandeling RUG, 269 pp. [in Dutch]
- Miklós, L. (2002) *Atlas krajiny Slovenskej republiky, 1 vydanie. (Landscape Atlas of the Slovak Republic, 1st edition)*. Ministerstvo životného prostredia Slovenskej republiky, Bratislava & Slovenská agentúra životného prostredia, Banská Bystrica. [in Slovak]
- *Mocsáry, S. (1875) Adatok Zemplén és Ung megyék faunájához. [Data on fauna of Zemplín and Uzzhorod counties]. *Mathematikai és Természettudományi Közlemények*, 13, 131–185. [in Hungarian]
- Musolin, D.L. (2007) Insects in a warmer world: ecological, physiological and life-history responses of true bugs (Heteroptera) to climate change. *Global Change Biology*, 13, 1565–1585.
<http://dx.doi.org/10.1111/j.1365-2486.2007.01395.x>
- Nau, B.S. & Brooke, S.E. (2006) *Naucoris maculatus* Fabricius (Hem., Naucoridae), a saucer-bug new to Britain. *Entomologist's Monthly Magazine*, 141, 193–196.
- Nieser, N. (1982) De Nederlandse Water- en Oppervlaktewantsen (Heteroptera: Nepomorpha et Gerromorpha). [Aquatic and semiaquatic true bugs (Heteroptera: Nepomorpha and Gerromorpha) of the Netherland]. *Wetenschappelijke Mededelingen KNNV*, 155, 1–78. [in Dutch]
- Novikmec, M., Veselská, M., Bitušík, P., Hamerlík, L., Matúšová, Z., Klementová, B.R. & Svitok, M. (2015) Checklist of benthic macroinvertebrates of high altitude ponds of the Tatra Mountains (Central Europe) with new records of two species for Slovakia. *Check List*, 11 (1) (1522), 1–12.
<http://dx.doi.org/10.15560/11.1.1522>

- *Országh, I. (1966) Príspevok k poznaniu fauny bzdôch (Heteroptera) Jurského šúru a príľahých svahov Malých Karpát. (Contribution to further knowledge of Heteroptera fauna of "Jurský Šúr" and the adjacent slopes of the Little Carpathians). *Entomologické Problémy*, 6, 37–75. [in Slovak; Russian, English and German summaries]
- *Ortvay, T. (1902) XIV. Fejezet. Az ízeltlábúak köre. Afélszárnyúak. [Chapter XIV. Circle of the arthropods. The Hemiptera]. In: Ortvay, T.(Ed.), *Pozsonyvármegye és területén fekvő Pozsony, Nagyszombat, Bazin, Modors, Szentgyörgy városok állatvilága. Első kötet: Állatrajzi rész. [Fauna of Bratislava County and cities of Bratislava, Trnava, Pezinok, Modrá, Svätý Jur of its territory. Vol. 1: Zoographic part]*. Stampfel Károly, Pozsony [= Bratislava], pp. 510–558. [in Hungarian]
- Papáček, M. (2000) Chapter 24: Small Aquatic Bugs (Nepomorpha) with slight of underestimated economic importance. pp. 591–600. In: Schaefer, C.W. & Panizzi, A.R. (Eds.), *Heteroptera of Economic importance*. CRC Press, USA, 812 pp.
- Papáček, M. (2001) small aquatic and ripicolous bugs (Heteroptera: Nepomorpha) as predators and prey: The question of economic importance. *European Journal of Entomology*, 98, 1–12.
<http://dx.doi.org/10.14411/eje.2001.001>
- *Petricskó, J. (1892) 5. Félfedeliék (Hemiptera). [True bugs (Hemiptera)]. pp. 88–96. In: Petricskó J. (Ed.), *Selmeczbánya vidéke állattani tekintetben. [The environment of Banská Štiavnica in zoological aspect]*. Selmeczbányai gyógyászati és természettudományi egyesület [= Society for Medicine and Natural History of Selmeczbánya], Selmeczbánya [= Banská Štiavnica], 132 pp. [in Hungarian]
- Polhemus, D.A., Maciolek, J. & Ford, J. (1992) An ecosystem classification of inland waters for the tropical Pacific. *Micronesica*, 25, 155–173.
- Polhemus, J.T., Jansson, A. & Kanyukova, E. (1995) Infraorder Nepomorpha—water bugs. In: Aukema B. & Rieger Ch. (Eds.), *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 1. Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha and Leptopodomorpha*. The Netherlands Entomological Society, Amsterdam, pp. 13–76.
- Protić, L. (1998) Catalogue of the Heteroptera fauna of Yugoslav countries. Part one. *Prirodnjački Muzej u Beogradu, Posebna Izdanja*, 38, 1–215.
- Putshkov, V.G. & Putshkov, P.V. (1996) *Heteroptera of the Ukraine: Check list and distribution*. Ukrainian Academy of Sciences, Institute of Zoology & Russian Academy of Sciences, Zoological Institute, St. Petersburg, 109 pp.
- Rabitsch, W. & Zettel, H. (2000) Zur Wasserwanzenfauna (Heteroptera: Gerromorpha, Nepomorpha) des nördlichen Österreich. (On the aquatic bug fauna (Insecta, Heteroptera) of northern Austria). *Linzer Biologische Beiträge*, 32, 1257–1268. [in German, English abstract]
- Rabitsch, W. (2005a) Heteroptera (Insecta). In: Schuster, R. (Ed.), *Checklisten der Fauna Österreichs No. 2. Österreichische Akademie der Wissenschaften*, Wien, pp. 1–64.
- Rabitsch, W. (2005b) *Spezialpraktikum aquatische und semiaquatische Heteroptera. (Special internship on aquatic and semiaquatic Heteroptera)*. Available from: http://homepage.univie.ac.at/wolfgang.rabitsch/Bestimmungsschluesel_comb.pdf (accessed 16 August 2015)
- Rabitsch, W. (2008) The times they are a-changin': driving forces of recent additions to the Heteroptera fauna of Austria. In: Grozeva, S. & Simov, N. (Eds.), *Advances in Heteroptera research. Festschrift in honour of 80th anniversary of Michail Josifov*. PenSoft, Sofia, Moscow, pp. 309–326.
- Reduciendo Klementová, B. & Svitok, M. (2014) *Anisops sardeus* (Heteroptera): A new expansive species in Central Europe. *Biologia* (Bratislava), 69, 676–680.
<http://dx.doi.org/10.2478/s11756-014-0354-z>
- *Roháčová, M. (1996) Heteroptera ve sbírkách Muzea Beskyd I. (Amphiboicorisae). [Heteroptera in the collections of the Museum Beskyd I. (Amphiboicorisae)]. *Práce a Studia Muzea Beskyd ve Frýdku-Místku*, 10, 112–115. [in Czech, English summary without title]
- *Roháčová, M. (1999) Faunistic notes of some less frequent bug species (Heteroptera) in Slovakia. *Entomofauna Carpatica*, 11, 90–92.
- *Rus, I. (2004) Katalog sbírky ploštíc (Heteroptera) kolínského rodáka Otokara Kubíka uložené v Regionálním muzeu v Kolíne část I. (Catalogue of the Heteroptera collection of Otokar Kubík deposited in the Regional Museum Kolín, part. 1) *Práce muzea v Kolíne, Řada Přírodovědná*, 6, 15–80. [in Czech, English abstract]
- Savage, A.A. (1989) *Adults of the British aquatic Hemiptera Heteroptera: a key with ecological notes*. Freshwater Biological Association, Cumbria, 173 pp.
- Savage, A.A. (1999) *A key to the larvae of British Corixidae*. The Freshwater Biological Association, The Ferry House, 56 pp.
- Schuh, R.T. & Slater, J.A. (1995) *True bugs of the world (Hemiptera: Heteroptera): Classification and natural history*. Cornell University Press, New York, 337 pp.
- Soldán, T., Papáček, M., Novák, K. & Zelený, J. (1996) The Šumava Mountains: an unique biocentre of aquatic insects (Ephemeroptera, Odonata, Plecoptera, Megaloptera, Trichoptera and Heteroptera-Nepomorpha). *Silva Gabreta*, 1, 179–186.
- Soós, N., Boda, P. & Csabai, Z. (2009) First confirmed occurrences of *Notonecta maculata* and *N. meridionalis* (Heteroptera: Notonectidae) in Hungary with notes, maps, and a key to the *Notonecta* species of Hungary. *Folia Entomologica Hungarica*, 60, 67–78.
- *Soós, V.Á. (1959) Revision und Ergänzungen zum Heteropteren—Teil des Werkes "Fauna Regni Hungariae" I. 1. Corixidae. *Annales Historico-Naturales Musei Nationalis Hungarici*, 51, 429–441.
- *Stehlík, J.L. & Hoberlandt, L. (1953) Zajímavé nálezy Heteropter na Moravě a na Slovensku. (Interesting founds of Heteroptera in Moravia and Slovakia). *Acta Musei Moraviae, Scientiae Naturales*, 38, 160–167. [in Czech; Russian and

English summaries]

- Stehlík, J.L. & Vavřínová, I. (1991) Results of the investigation on Hemiptera in Slovakia made by the Moravian Museum (Introduction, Pentatomoidea I). *Acta Musei Moraviae, Scientiae Naturales*, 76, 185–224.
- Straka, M., Kment, P., Sychra, J. & Helešic, J. (2009) The proposed Úvalský rybník Nature Monument, an important refuge for wetland insects in South Moravia (Czech Republic): A species inventory of Odonata, Heteroptera and Coleoptera (partim) with the first Czech record of *Corixa panzeri* (Corixidae). *Acta Musei Moraviae, Scientiae Biologicae*, 94, 87–116.
- *Szilády, Z. (1904) A tengerszemek faunájából. [On the fauna of tarns]. *Rovartani Lapok*, 11, 113–120. [in Hungarian]
- *Štepanovičová, O. & Degma, P. (1999) Effects of some environmental factors on structure of bug taxocenoses (Heteroptera) in floodplain forest epigaeon of the Danube region. *Acta Societatis Zoologicae Bohemicae*, 63, 225–236.
- *Štys, P. (1976) Faunistic records from Czechoslovakia. Heteroptera. *Acta Entomologica Bohemoslovaca*, 73, 61.
- *Štys, P. (1997) Bzdochy (Heteroptera). In: Sláviková & Krajčovič (Eds.), *Ochrana biodiverzity a obhospodarovanie trvalých trávnych porastov v chránenej krajinej oblasti—biosférickej rezervácii Poľana*. (True bugs (Heteroptera). In: Sláviková D. & Krajčovič V. (Eds.), *Protection of biodiversity and maintenance of permanent grasslands in protected landscape areas - Biosphere Reserve Poľana*). Bratislava, pp. 73–76. [in Slovak]
- *Tamanini, L. (1949) 3° contributo allo studio del genere *Velia* Latr. (Hemipt.-Heteropt., Veliidae). *Acta Entomologica Musei Nationalis Pragae*, 26 (366), 1–10.
- Tempelman, D. & van Haaren, T. (2009) *Water—en Oppervlaktewantsen van Nederland*. [Aquatic and semiaquatic true bugs of Netherlands]. Jeugdbondsuitgeverij, Utrecht, 116 pp. [in Dutch]
- Teyrovský, V. (1930) Příspěvek k znalosti fauny vodních ploštic západní části Československé republiky. [Contribution to the knowledge of water bug fauna of the western part of the Czechoslovak Republic]. *Sborník Klubu Přírodovědného* (Brno), 12 (1929), 88–94. [in Czech, German summary without title]
- *Teyrovský, V. (1969) Einige Bemerkungen über die Gerroiden—Fauna der Hohen Tatra. *Abhandlungen und Berichte des Naturkundemuseums Görlitz*, 44, 187–194.
- *Vysloužil, J. (1979) Faunistic records from Czechoslovakia. Heteroptera: Corixidae: *Sigara fossarum*, Nabidae: *Stalia boops*, Anthocoridae: *Anthocoris butleri*, *Scoloposcelis obscurella*, Miridae: *Piezocranum simulans*, *Campyloneura virgula*, *Hypseloecus visci*. *Acta Entomologica Bohemoslovaca*, 76, 206.
- Wollmann, K. (2000) Corixidae (Hemiptera, Heteroptera) in acidic mining lakes with pH ≤ 3 in Lusatia, Germany. *Hydrobiologia*, 433, 181–183.
<http://dx.doi.org/10.1023/A:1004051629258>
- *Wróblewski, A. (1960) Micronectinae (Hemiptera, Corixidae) of Hungary and some adjacent countries. *Acta Zoologica Academiae Scientiarum Hungarici*, 6, 439–458.
- Wróblewski, A. (1980) *Pluskwiaki (Heteroptera). Fauna słodkowodna Polski*. [True bugs (Heteroptera). Freshwater fauna of Poland.] Vol. 8. Państwowe Wydawnictwo Naukowe, Warszawa, Poznań, 156 pp. [in Polish]