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REDISCOVERY OF THE RARE FLAT BUG *MEZIRA TREMULAE* (HEMIPTERA: HETEROPTERA: ARADIDAE) IN SLOVAKIA

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V. Hemala, M. Wiezik, V. Franc: Znovuobjavenie vzácnej podkôrničky osikovej, *Mezira tremulae* (Hemiptera: Heteroptera: Aradidae) na Slovensku

Abstrakt: Podkôrnička osiková (*Mezira tremulae*) je vzácny druh bzdochy z čeľade podkôrničkovité (Aradidae), žijúci na starých, drevokazných hubami napadnutých pahýľoch a kmeňoch opadavých listnatých stromov (najčastejšie osika, ale aj topoľ, buk, jaseň, lipa, orech, breza, javor, dub), veľmi vzácne dokonca aj ihličnanov (jedľa, borovica). Z územia Slovenska bolo doteraz známych iba päť lokalít, z toho dve s nálezmi staršími než 130 rokov (okolie Trenčína, Sninský kameň vo Vihorlate) a tri z rokov 1956, 1960, 1968 a 1973 (Remetské Hámre, Horné Orešany, Malacky). V príspevku prezentujeme tri recentné nálezy druhu, z lokality Bžany–Valkov v roku 2002 (východné Slovensko), z Drienčanského krasu v roku 2013 a z Kremnických vrchov v roku 2017 (oba stredné Slovensko). Zatiaľ čo prvý spomenutý nález predstavuje potvrdenie prítomnosti druhu na území Slovenskej republiky po 29 rokoch (a tiež potvrdenie výskytu druhu v oblasti východného Slovenska), druhý spomenutý predstavuje prvý nález druhu pre oblasť stredného Slovenska a zároveň potvrdenie výskytu druhu v Západných Karpatoch po 53 rokoch. Vzhľadom na to, že v prípade dvoch z týchto nálezov bolo zaznamenaných alebo pozorovaných viac než desať jedincov, jedná sa tiež o potvrdenie prítomnosti prežívajúcich populácií druhu na Slovensku. V diskusii príspevku hodnotíme doterajší stav poznania druhu v susedných a geograficky blízkych krajinách (najmä vzhľadom na horský systém Karpát) a taktiež navrhujeme zaradenie druhu do červeného zoznamu ohrozených druhov Slovenska v kategórii „ohrozený“.

Kľúčové slová: saproxylický hmyz, bzdochy, podkôrnička osiková, mŕtve drevo, Kremnické vrchy, Drienčanský kras, Slovensko, Karpaty

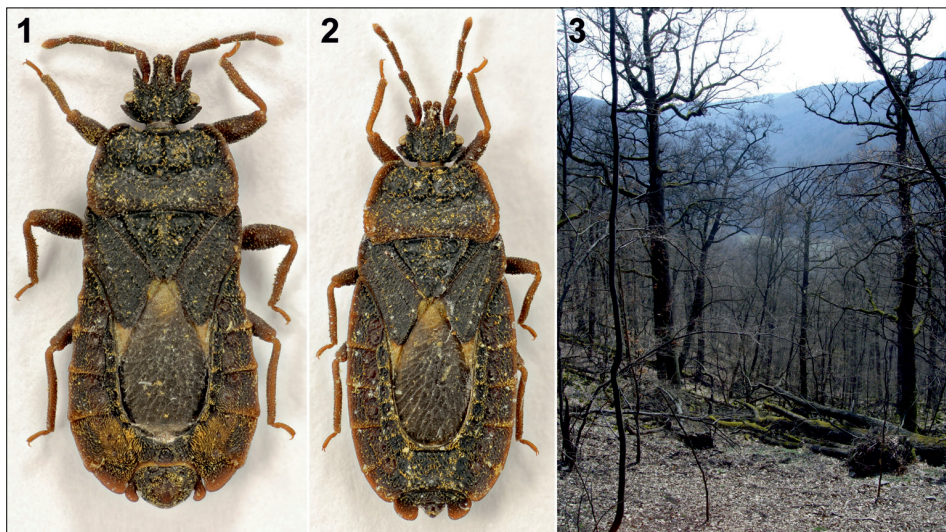
INTRODUCTION

Mezira tremulae (Germar, 1822) (Hemiptera: Heteroptera: Aradidae: Mezirinae) is a rare flat bug species living in fissures or under loose bark of older stubs and trunks of different deciduous trees (*Fagus*, *Populus*, *Fraxinus*, *Tilia*, *Juglans*, *Betula*, *Acer*, *Quercus*) infested by fungi (STEHLÍK & HEISS 2001; HEISS & PÉRICART 2007; WACHMANN et al. 2007). In eastern Europe it was occasionally reported also from coniferous trees (*Abies*, *Pinus*) (STICHEL 1962; WAGNER 1966; WACHMANN et al. 2007). The species currently comprises three different subspecies: i) the nominotypical *M. tremulae tremulae* occurring exclusively in Europe (Austria, Bosnia and Herzegovina, Bulgaria, Belarus, Croatia, Czech

Republic, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Moldavia, Norway, Poland, Romania, European Russia, Slovakia, Sweden and Ukraine); ii) *M. tremulae caucasica* Vásárhelyi, 1978 reported from Caucasian regions of Russia, Azerbaijan and Georgia; and iii) *M. tremulae ussuriensis* Vásárhelyi, 1982 known from the Russian Far East and Japan (HORVÁTH 1886, 1897; KIS 1975; FJELLBERG et al. 1996; HEISS 2001, 2006; AUKEMA et al. 2013; ECKELT & HEISS 2017). In Slovakia, the species has been known only from five localities, situated both in lowlands and mountainous areas with volcanic or limestone bedrock up to the range 1000 m altitude (STEHLÍK & HEISS 2001).

MATERIAL AND METHODS

Voucher specimens were collected by hand, killed in a vial with vapours of ethyl acetate and dry mounted on card stock. The material is deposited in the following collections: Marion Mantič private collection, Hlučín, Czech Republic (MMHC); National Museum, Prague, Czech Republic (NMPC); Valerián Franc private collection, Banská Bystrica, Slovakia (VFBS); Vladimír Hemala private collection, Jalovec, Slovakia (VHJS); and Technical University collection, Zvolen, Slovakia (TUZS). Habitus photographs were taken using a Canon MP-E 65 mm macro lens attached to a Canon EOS 6D camera and stacked from multiple layers using the Helicon Focus 5.1 Pro software. The map of distribution was created using the QGIS 2.18.3 software.



Figs 1–3. 1–2 – habitus of *Mezira tremulae* (Germar, 1822) (both specimens from Kremnické vrchy Mts.): 1 – ♂, 2 – ♀. Photo: Ľuboš Dembický. 3 – locality site in Budča environs, Kremnické vrchy Mts. Photo: Michal Wiezik

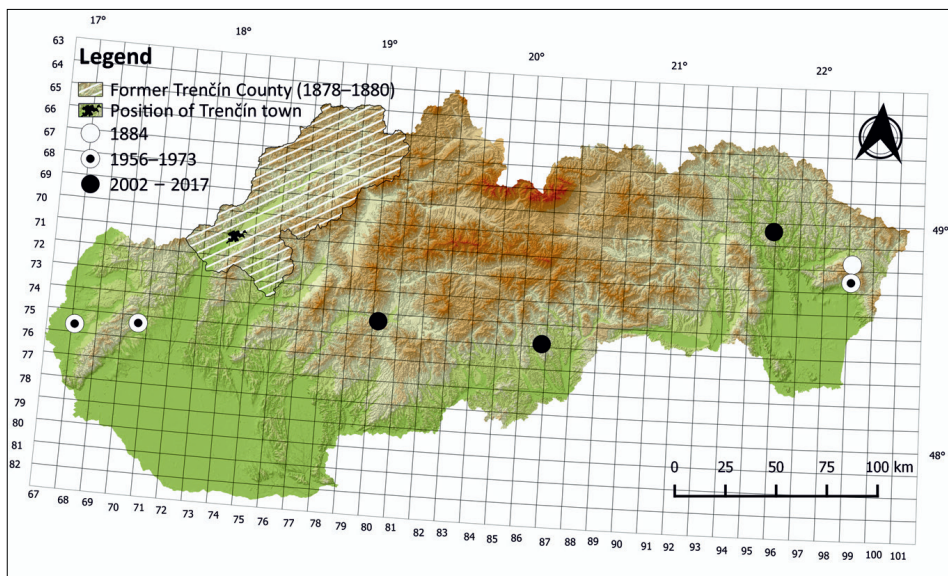


Fig. 4. Distribution of *Mezira tremulae* (Germar, 1822) in Slovakia. The crosshatched area with marked position of Trenčín town shows the area of former Trenčín county, in which the unspecified locality/ies mentioned by BRANCSIK (1878, 1880) is/are situated. Map arranged by Attila Balázs.

REVIEW OF THE RECORDS FROM SLOVAKIA

All available Slovak records of *Mezira tremulae* are reviewed below and arranged chronologically. Codes of Central European mapping grid (EHRENDORFER & HAMANN 1965) follow NOVÁK (1989). Photographs of recorded specimens are shown on Figures 1 and 2. For a map of the distribution see Fig. 4. Abbreviations: ditto – at the same locality, spec. – unsexed adult.

- 1) Trencsén megye (= Trenčín county), no more details – only listed (BRANCSIK 1878);
- 2) Trencsén körül odvas fában (= Trenčín surroundings, in a tree cavity), no more details (BRANCSIK 1880; probably identical with previous record);
- 3) Szinnaikő (= Sninský kameň Mt.) (7099), under the tree bark, 4.xi.1884, 2 spec., K. Chyzer lgt., G. Horváth det. (CHYZER 1885; as *Brachyrhynchus tremulae*);
- 4) Remetské Hámre (7198), 250–500 m a.s.l., vii.1956, 1 ♀, J. Gottwald lgt.; ditto, vii.1973, 1 ♀, J. Gottwald lgt. (STEHLÍK & HEISS 2001);
- 5) Horné Orešany (7570), 211–356 m a.s.l., 1960, 1 ♀, I. Löbl lgt. (STEHLÍK & HEISS 2001);
- 6) Malacky (7567–68), 165–195 m a.s.l., 6.vii.1968, 1 ♂, J. Hladil lgt. (STEHLÍK & HEISS 2001);

- 7) Bžany – Valkov (6995), on *Fagus sylvatica*, under the bark of fallen tree on a meadow, in tree hollow covered with mycelium, 7.vii.2002, 1 ♂ 13 ♀♀, M. Mantič lgt., P. Kment det. (1 ♂ 6 ♀♀ coll. NMPC, 7 ♀♀ coll. MMHC);
- 8) Revúcka vrchovina Highland, Drienčanský kras Karst, Hostišovce environs (48°30'15.25"N 20°7'22.80"E, 7486), older xerothermic oak forest containing some admixture of *Carpinus* sp. and *Acer campestre*, 383 m a.s.l., 1.v.2013, 2 ♀♀, V. Franc lgt. et det. (coll. VFBS).
- 9) Kremnické vrchy Mts., Budča environs, slopes of Bučan and Bukovina hills, ca. 1–3 km W from the village (7480; Fig. 3), oak forest, under the bark of standing dead sessile oak (*Quercus petraea*) in the initial stage of decomposition (with compact but peeling bark), ca. 460 m a.s.l., 16.v.2017, 1 ♂ 2 ♀♀ captured and ca. 10 spec. observed, M. Wiezik lgt. et observ., V. Hemala det. (1 ♂ 1 ♀ coll. VHJS, 1 ♀ coll. TUZS).

Note: Record of *M. tremulae* from Bratislava cited in STEHLÍK & HEISS (2001) is based on a misinterpretation of the data from HORVÁTH (1886, 1897), who listed only previously published records from Trencsén and Szinnaikő, but not even one record from Bratislava (or Pozsony or Pressburg).

DISCUSSION

Only eight localities (including recent records) of *Mezira tremulae* are known from Slovakia. The oldest known Slovak record comes from the BRANCSIK'S (1878) list of Hemiptera of the former Trenčín county and lacks any detailed collection data. Moreover, it is not sure whether BRANCSIK (1880) only listed the same record from his older paper (BRANCSIK 1878) adding more accurate location (environs of Trenčín) or whether he reported on a different finding. Last record from the 19-th century comes from the Sninský kameň Mt. (Vihorlat Mts. in eastern Slovakia) (CHYZER 1885). After a 72-year gap, the species was firstly recorded in 1956 from Remetské Hámre situated at the southern slopes of Vihorlat Mts. (only ca. 9 km from the Sninský kameň Mt.) (STEHLÍK & HEISS 2001). The species was later recorded only sporadically, from southwestern Slovakia in 1960 (Horné Orešany) and 1968 (Malacky), and repeatly from Remetské Hámre in 1973 (STEHLÍK & HEISS 2001).

Relatively recent record of the species from Bžany–Valkov in the neighbourhood of Veľká Domaša reservoir (Ondava river, eastern Slovakia) in 2002 represents the confirmation of the occurrence of *M. tremulae* in Slovakia after almost three decades. Further recent records from the environs of Hostišovce in the Drienčanský kras Karst (Revúcka vrchovina Highland) in 2013 and from the Kremnické vrchy Mts. in 2017 represent virtually the first records of *M. tremulae* from the region of central Slovakia.

While the Trenčín surroundings, Horné Orešany and Kremnické vrchy Mts. belong to the Western Carpathians, localities Sninský Kameň Mt., Remetské Hámre and Bžany–Valkov are parts of the Eastern Carpathians. Malacky represents

the only Slovak locality of *M. tremulae* situated out of Carpathians, in the Vienna Basin (part of Pannonian Basin). The species is not known from Hungarian, Polish, Austrian and Czech parts of Western Carpathians (see discussion below) and therefore, two most recent records from Slovakia (Drienčanský kras Karst, Kremnické vrchy Mts.) represent also the first confirmation of the occurrence of *M. tremulae* in the Western Carpathians after 53 years.

The distribution of *M. tremulae* in selected European countries:

Hungary: The species was reported from three localities dated in the 19-th century: Szentmártonkáta, Vadé (= Vadépuszta, part of the Gamás village), Visz (HORVÁTH 1897), later it was found in Bakonyszücs in 1906 (VÁSÁRHELYI 1975) and was reported from the area of Dömsöd and Apajpuszta (= Apaj) villages (VÁSÁRHELYI 1978). All localities are situated in the Pannonian Basin.

Romania (Banat and Transylvania): BURMEISTER (1835), in his description of *Brachyrhynchus dilatatus* Burmeister, 1835 (a junior synonym of *M. tremulae*; synonymized by BAERENSPRUNG 1858), stated ambiguous location „Bannat“ (= Banat), which is a historical area corresponding with areas situated in territories of three countries in the present time (Hungary, Romania and Serbia). Therefore, HEISS (2001) listed occurrence in Romania as doubtful in the list of countries in the Palaearctic catalogue (marked by the exclamation mark), but HORVÁTH (1886, 1897) listed even four localities clearly situated in the present Romania (three from Transylvania and one from Banat): Hátszeg (= Hațeg), Felső-Farkadin (= Fărcădin), Malomviz (= Râu de Mori) and Mehádia (= Mehadia). Later records are known also from Băile Herculane in Banat (three records, one without date and two in 1934 and 1994) (DORN 1936; HEISS 2006) and from near surroundings of the Mraconia Gulf, a part of Porțile de Fier located in Banat in the past, now in Oltenia region (only one record in 1969) (KIS 1975).

Ukraine: The species is known only from older records from Bukovina, Zakarpat'ye, Volyn' and Kiev regions (STOBIECKI 1915; KRASUCKI 1923; GROSS-HEIM 1930, 1931; KIRITSHENKO 1951; ROSHKO 1955, 1967; PUTSHKOV 1974; listed in PUTSHKOV & PUTSHKOV 1996). The nearest known locality to the Slovak state border is Uzhhorod (ROSHKO 1955).

Poland: The species is known from multiple historical sites (KOTULA 1890; SCHUMACHER 1919; STRAWIŃSKI 1956; VÁSÁRHELYI 1982; LIS 1991, 1993; KUBISZ 1992; CMOLUCHOWA & LECHOWSKI 1994) and from eight recent records (HEBDA 2011; TATUR-DYTKOWSKI 2014; HEBDA et al. 2016). The nearest known locality to Slovak border is Barwinek in Beskid Niski Mts. (Outer Eastern Carpathians), which is situated only ca. 1.6 km from the border (KUBISZ 1992). Further relatively near localities are in the area around the Przemyśl town, located also in Outer Eastern Carpathians (Przemyśl, Ostrów, Paniński Czub Mt., Prałkowce and Sława Mt. near Bircza), but all of them being old records before 1890 (see KOTULA 1890, reviewed in LIS 1990). The species has not been recorded from the Polish parts of Western Carpathians.

Czech Republic: The species is known only from a single locality in Southern Bohemia, one male specimen collected in 1984 (KMENT et al. 2003). It is currently treated as regionally extinct (RE) (KMENT et al. 2017; previously stated as critically endangered in KMENT & VILÍMOVÁ 2006).

Austria: The species is known only from one recent record from Lower Austria situated only ca. 340 m from the Slovak border (floodplain forest near Hohenau) with observation of more than 100 specimens under the bark of *Populus alba* (ECKELT & HEISS 2017).

Conservation (ecosozological) status:

Although, *Mezira tremulae* is included in several Red Lists of European countries (DOROW et al. 2003 – Germany: Hessen; KMENT & VILÍMOVÁ 2006 – Czech Republic, older edition; ØDEGAARD et al. 2010 – Norway; KMENT et al. 2017 – Czech Republic, new edition), interestingly, it is not mentioned in the Red List of Slovak Heteroptera (ŠTEPANOVIČOVÁ & BIANCHI 2001). Based on its well known biology, sporadic recordings and only three recent localities of occurrence, we propose *M. tremulae* to be treated as endangered (EN) and included into the Red List of Slovak Heteroptera.

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REFERENCES

- AUKEMA, B., RIEGER, C., RABITSCH, W. 2013. Catalogue of the Heteroptera of the Palaearctic Region. Volume 6. Supplement. The Netherlands Entomological Society, Amsterdam, xxiii + 629 pp.
- BAERENSPRUNG, F. von 1858. Synonymische Bemerkungen. Ueber Hemiptera. Berliner Entomologische Zeitschrift 2: 79–81.
- BRANCSIK, K. 1878. Trenčsén megye Hemipteráinak felsorolása. [List of Hemiptera of the Trenčín county]. A Trenčsén megyei Természettudományi egyesület évkönyve (Jahresheft des naturwissenschaftlichen Vereines des Trenčsiner Komitates) 1: 29–33.
- BRANCSIK, K. 1880. Adatok Trenčsén megye Hemiptera faunájához. Zur Hemipterenfauna des Trenčsiner Komitates. Évkönyv melyet a Trenčsén megyei Természettudományi egyesület megbízásából 3: 23–30.
- BURMEISTER, H. 1835. Handbuch der Entomologie. Zweiter Band. Besondere Entomologie. Erste Abtheilung. Schnabelkerfe. Rhynchota. Theodor Christian Friedrich Enslin, Berlin, iv + 400 pp.

- CHYZER, K. 1885. Ritka kéregpoloska. [Rare flat bug]. *Rovartani lapok* 2(8): 173.
- CMOLUCHOWA, A., LECHOWSKI, L. 1994. Łądowe pluskwiaki różnoskrzydłe (Heteroptera) Roztocza. [Land true bugs (Heteroptera) of Roztocze]. *Fragmenta Faunistica* 37(7): 181–199.
- DORN, K. 1936. Verbreitung und Lebensweise von *Mezira tremulae* Germ. (Hem.-Heteropt.). *Mitteilungen aus der Entomologischen Gesellschaft zu Halle (Saale)* 14: 60–63.
- DOROW, W. H. O., REMANE, R., GÜNTHER, H., MORKEL, C., BORNHOLDT, G., WOLFRAM, E. M. 2003. Rote Liste und Standardartenliste der Landwanzen Hessens (Heteroptera: Dipsocoromorpha, Leptopodomorpha, Cimicomorpha, Pentatomomorpha) mit Angaben zu Gefährdungsursachen und Habitatkorrelationen. Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz, Wiesbaden, 80 pp.
- ECKELT, A., HEISS, E. 2017. *Mezira tremulae tremulae* (Germar, 1822) (Heteroptera: Aradidae), Erstnachweis für Österreich. *Beiträge zur Entomofaunistik* 18: 151–153.
- EHRENDORFER, F., HAMANN, U. 1965. Vorschläge zu einer floristischen Kartierung von Mitteleuropa. *Berichte der Deutschen Botanischen Gesellschaft* 78: 35–50.
- FJELLBERG, A., HANSSEN, O., HANSEN, S. O. 1996. *Mezira tremulae* (Germar) from stands of old aspens in South Norway (Hemiptera, Meziridae). *Fauna Norvegica* 43(1): 61–62.
- GROSS-HEIM, V. A. 1930. Polutverdokryl'ci – (Hemiptera–Heteroptera) Kyivskoi guberni. Halbflügler – (Hemiptera–Heteroptera) des Gouvernements Kiew. *Zbirnik Prats' zoologichnogo Muzeyu (Travaux du Musée Zoologique)* 8: 129–171 + 172–175.
- GROSS-HEIM, V. A. 1931. Materiialy do spisky polutverdokryl'civ (Hemiptera–Heteroptera) Ukrainy. Beiträge zum Verzeichnis der Halbflügler (Hemiptera–Heteroptera) der Ukraine. *Zbirnik Prats' zoologichnogo Muzeyu (Travaux du Musée Zoologique)* 10: 63–114.
- HEBDA, G. 2011. Nowe dane o rozmieszczeniu łądowych pluskwiaków różnoskrzydłych (Hemiptera: Heteroptera) w Puszczy Białowieskiej. [New data on the distribution of terrestrial true bugs (Hemiptera: Heteroptera) in the Białowieża Primeval Forest]. *Heteroptera Poloniae – Acta Faunistica* 3: 11–19.
- HEBDA, G., MELKE, A., PLEWA, R., SZAFRANIEC, S., RUTKOWSKI, T. 2016. Nowe stanowiska korowcowatych (Hemiptera: Heteroptera: Aradidae) w Polsce. [New localities of flat bugs (Hemiptera: Heteroptera: Aradidae) in Poland]. *Acta Entomologica Silesiana* 24(online 010): 1–10.
- HEISS, E. 2001. Superfamily Aradoidea Brullé, 1836. Pp. 3–34. In: AUKEMA, B., RIEGER, C. (eds): *Catalogue of the Heteroptera of the Palaearctic Region. Volume 4. Pentatomomorpha I*. The Netherlands Entomological Society, Amsterdam, xiv + 346 pp.
- HEISS, E. 2006. New records of Aradidae from the Balkan countries (Heteroptera, Aradidae). *Acta entomologica serbica* 11(1/2): 1–10.
- HEISS, E., PÉRICART, J. 2007. Faune de France. France et régions limitrophes. 91. Hémiptères Aradidae Piesmatidae et Dipsocoromorphes Euro-Méditerranéens. *Fédération Française des Sociétés de Sciences Naturelles*, Paris, 509 pp + 8 pls.
- HORVÁTH, G. 1886. A magyarországi kéregpoloskák. [Hungarian flat bugs]. *Rovartani lapok* 3(8): 153–159.
- HORVÁTH, G. 1897. Ordo Hemiptera. Pp. 5–72. In: PASZLAWSZKY, J. (ed.): *A Magyar birodalom állatvilága. A Magyar Birodalomból eddig ismert állatok rendszeres lajstroma. Fauna Regni Hungariae. Animalium Hungariae hucusque cognitorum*

- enumeratio systematica. A Királyi Magyar Természettudományi Társulat [= Royal Hungarian Natural History Society], Budapest, 72 pp.
- KIRITSHENKO, A. N. 1951. Nastoyashchie poluzhestkokrylye Evropeyskoy chasti SSSR (Hemiptera). Operedelitel' i bibliografiya. [True bugs of the European part of USSR (Hemiptera). Key and bibliography]. Izdatel'stvo Akademii Nauk SSSR [= Publishing of the USSR Academy of Sciences], Moscow & Leningrad [= St. Petersburg], 423 pp.
- KIS, B. 1975. Heteroptera. Pp. 81–90. In: IONESCU, M. (ed.): Fauna. Grupul de cercetări complexe „Porțile de Fier“. Seria Monografică. [Fauna. „Porțile de Fier“ complex research group. Monographic series]. Editura Academiei Republicii Socialiste România, București [= Bucharest], 316 pp.
- KMENT, P., BRYJA, J., JINDRA, Z., HRADIL, K., BAŇAŘ, P. 2003. New and interesting records of true bugs (Heteroptera) from the Czech Republic and Slovakia II. Klapalekiana 39: 257–306.
- KMENT, P., VILÍMOVÁ, J. 2006. Heteroptera (ploštice). Pp. 139–146. In: FARKAČ, J., KRÁL, D., ŠKORPÍK, M. (eds): Červený seznam ohrožených druhů České republiky. Bezobratlí. Red list of threatened species in the Czech Republic. Invertebrates. Agentura ochrany přírody a krajiny ČR, Praha (2005), 760 pp.
- KMENT, P., HRADIL, K., STRAKA, M., SYCHRA, J. 2017. Heteroptera (ploštice). Pp. 137–147. In: HEJDA, R., FARKAČ, J., CHOBOT, K. (eds): Červený seznam ohrožených druhů České republiky. Bezobratlí. [Red List of threatened species of the Czech Republic. Invertebrates]. Příroda 36: 1–612.
- KOTULA, B. 1890. Spis pluskiew z okolic Przemyśla (i po części Lwowa). [List of the true bugs from the area of Przemyśl (and partly of Lwów)]. Sprawozdanie Komisji Fizyograficznej 25: 131–140.
- KRASUCKI, A. 1923. Einige Bemerkungen in Bezug auf F. Schumacher's Publikation „Mezira tremulae (Germar), ein Naturdenkmal aus dem Urwalde von Bialowies in Polen“. Polskie Pismo Entomologiczne 2(4): 199–201.
- KUBISZ, D. 1992. Materiały do rozszedlenia Aradidae (Heteroptera) w Polsce. [Materials to the distribution of Aradidae (Heteroptera) in Poland]. Wiadomości entomologiczne 11(1): 7–11.
- LIS, J. A. 1990. Flat-bugs (Heteroptera, Aradidae) of Poland – a faunistic review. Polskie Pismo Entomologiczne 59: 511–525.
- LIS, J. A. 1991. New data on the Polish flat bugs (Heteroptera, Aradidae). Annals of the Upper Silesian Museum – Entomology 2: 161–164.
- LIS, J. A. 1993. Nowe stanowiska kilku rzadkich w Polsce gatunków pluskwiaków różnoskrzydłych (Heteroptera). [New localities of several rare species of true bugs (Heteroptera) in Poland]. Acta Entomologica Silesiana 1(1): 12–13.
- NOVÁK, I. 1989. Seznam lokalit a jejich kódů pro síťové mapování entomofauny Československa. [List of localities and their grid codes used in faunistic mapping in Czechoslovakia]. Zprávy Československé Společnosti Entomologické při ČSAV 25: 3–84.
- ØDEGAARD, F., ENDRESTØL, A., HÅGVAR, S., ROTH, S. 2010. Nebbmunner. Hemiptera. Pp. 241–250. In: KÅLÅS, J. A., VIKEN, Å., HENRIKSEN, S., SKJELSETH, S. (eds): Norsk rødliste for arter 2010. The 2010 Norwegian Red List for species. Norwegian Biodiversity Information Centre, Trondheim, 480 pp.
- PUTSHKOV, V. G. 1974. Fauna Ukrainy. Tom 21. Vypusk 4. Beritidi, chervonoklopi, piezmatidi, pidkorniki i tingidi. [Fauna of Ukraine. Volume 21. Issue 4. Berytidae,

- Pyrrhocoridae, Piesmatidae, Aradidae and Tingidae]. Akademiya nauk Ukrain's'koi RSR, Institut zoologii [= Ukrainian SSR Academy of Sciences, Zoological Institute], Kyiv [= Kiev], 332 pp.
- 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, 108 pp.
- ROSHKO, G. M. 1955. K izuchenyu nastoyashchikh poluzhestkokryl'ykh Zakarpat'ya. [On the knowledge of recent true bugs of the Zakarpat'ye region]. Nauchnye Zapiski, Biologiya 11: 93–104.
- ROSHKO, G. M. 1967. Pro pidkornykiv (Aradidae, Hemiptera [sic!]) ukrains'kykh Karpat. [About flat bugs (Aradidae, Hemiptera) of the Ukrainian Carpathians]. Materialy XXI Naukovoї Konferencii Uzhgorods'kogo Derzhavnogo Universytetu, Serii Biologichna ta Medichna: 60–62.
- SCHUMACHER, F. 1919. Mezira tremulae (Germar), ein Naturdenkmal aus dem Urwalde von Bialowies in Polen. Deutsche Entomologische Zeitschrift 5(3/4): 285–288.
- STEHLÍK, J. L., HEISS, E. 2001. Results of the investigations on Heteroptera in Slovakia made by the Moravian museum (Aradidae, Pyrrhocoridae). Acta Musei Moraviae, Scientiae biologicae 86: 177–194.
- ŠTEPANOVIČOVÁ, O., BIANCHI, Z. 2001. Červený (ekosozologický) zoznam bzdôch (Heteroptera) Slovenska. [Red (ecosoziological) list of Heteroptera of Slovakia]. Pp. 105–106. In: BALÁŽ, D., MARHOLD, K., URBAN, P. (eds): Červený zoznam rastlín a živočíchov Slovenska. [Red list of plants and animals of Slovakia]. Ochrana prírody 20(Supplement): 1–160.
- STICHEL, W. 1962. Illustrierte Bestimmungstabellen der Wanzen. II. Europa (Hemiptera-Heteroptera Europae). Volumen 4. Wolfgang Stichel, Berlin-Hermsdorf, 838 pp.
- STOBIECKI, S. 1915. Pluskwiaki (Rhynchota) Podola galicyjskiego i północnej Bukowiny. Sprawozdanie z badań przyrodniczych we wschodniej Galicyi i północnej Bukowinie, Część I. [Half-winged insects (Rhynchota) of Galician Podolia and northern Bukovina. Report from the researches of nature in eastern Galicia and northern Bukovina, Part I.]. Sprawozdanie Komisji Fizyograficznej 49: 1–91.
- STRAWIŃSKI, K. 1956. Owady z rzędu Heteroptera w biocenozie Puszczy Białowieskiej. [Insects of the order Heteroptera in biocoenosis of the Białowieża Forest]. Roczniki Nauk Leśnych 14: 1–123.
- TATUR-DYTKOWSKI, J. 2014. Mezira tremulae (Germar, 1822) – nowy dla Niziny Mazowieckiej gatunek pluskwiaka (Hemiptera: Heteroptera: Aradidae). [Mezira tremulae (Germar, 1822) – true bug species new to the Nizina Mazowiecka Lowland (Hemiptera: Heteroptera: Aradidae)]. Heteroptera Poloniae – Acta Faunistica 8(1): 1–3.
- VÁSÁRHELYI, T. 1975. Új adatok hazánk kéregpoloska-faunájának (Heteroptera: Aradidae) ismeretéhez. [New data to the knowledge of the Hungarian flat bug fauna (Heteroptera: Aradidae)]. Folia Entomologica Hungarica (Series Nova) 28(1): 213–216.
- VÁSÁRHELYI, T. 1978. Poloskák V. – Heteroptera V. Magyarország állatvilága. Fauna Hungariae. XVII. kötet [= Volume 17]. Heteroptera, Homoptera. 5. füzet [= Issue 5]. Akadémiai Kiadó, Budapest, 76 pp.
- VÁSÁRHELYI, T. 1982. A study on the relations of Mezira tremulae Germ. and two allied species (Heteroptera: Aradidae). Acta Zoologica Academiae Scientiarum Hungaricae 28(3/4): 389–402.
- WACHMANN, E., MELBER, A., DECKERT, J. 2007. Wanzen. Band 3. Pentatomomorpha I.

Die Tierwelt Deutschlands. 78. Teil. Verlag Goecke & Evers, Keltern, 272 pp.
WAGNER, E. 1966. Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebensweise. 54. Teil. Wanzen oder Heteropteren. I. Pentatomorpha [sic!]. VEB Gustav Fischer Verlag, Jena, 235 pp.

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