Zootaxa 3780 (1): 194–200
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3780.1.8
http://zoobank.org/urn:lsid:zoobank.org:pub:5E6D995E-BC62-4E67-9BE2-63D2FC84DDAC

First record of the brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Heteroptera: Pentatomidae), in Hungary, with description of the genitalia of both sexes

GÁBOR VÉTEK[1], VERONIKA PAPP[1], ATTILA HALTRICH[1] & DÁVID RÉDEI[2,3,4]

[1]*Department of Entomology, Faculty of Horticultural Science, Corvinus University of Budapest, Villányi út 29–43, H-1118 Budapest, Hungary*
[2]*Institute of Entomology, Faculty of Life Sciences, Nankai University, Weijin Road 94, 300071 Tianjin, China*
[3]*Department of Zoology, Hungarian Natural History Museum, Baross u. 13, H-1088 Budapest, Hungary*
[4]*Corresponding author. E-mail: david.redei@gmail.com*

Abstract

The brown marmorated stink bug, *Halyomorpha halys* (Stål, 1855) (Hemiptera: Heteroptera: Pentatomidae) is recorded for the first time from Hungary. The circumstances of finding this species and a detailed description of both male and female genitalia are given. The currently known distribution, biology and significance of the species are briefly reviewed.

Key words: Hemiptera, Heteroptera, *Halyomorpha halys*, Hungary, invasive species, genitalia

Introduction

The number of new records per year of arthropod species alien to Europe has significantly increased since the middle of the 20th century. A total of 1590 species of arthropods alien to Europe have already established on the continent. These species are dispersed across 33 taxonomic orders; however, insects largely dominate. The order Hemiptera accounts for 20% of the total species number (Roques 2010).

Forty-two alien species of Heteroptera have already established in Europe, 12 of which originated outside the continent (Rabitsch 2008). More than half of the alien true bugs are phytophagous. However, the total number of alien Heteroptera of Europe has already increased since the first attempt of a comprehensive survey by Rabitsch (2008), and reached forty-eight within a very short period (Rabitsch 2010). The family Pentatomidae is represented by only one phytophagous species alien to Europe, which is the brown marmorated stink bug, *Halyomorpha halys* (Stål, 1855) (Rabitsch 2010).

A pentatomid nymph of 'unusual appearance' was noticed during a visit to Péterimajor, Budapest (19.ix.2013). A few weeks later (11.x.2013) an adult stink bug, identified as *H. halys*, was intercepted inside a building in the territory of the Buda Arboretum, Budapest, which called the authors' attention to the species and made them decide to visit the locality at Péterimajor again (30.x.2013). Targeted beat sampling in a coppice close to an apple orchard at Péterimajor resulted in the capture of several additional adults and a nymph (30.x.2013). These captures represent the first records of *H. halys* in Hungary (cf. Kondorosy 1999, 2012), significantly extending the known European range of the species.

Given the fact that the species looks markedly different from most North American and European pentatomids (Hoebeke & Carter 2003, Wyniger & Kment 2010), the identification of the species is easy. However, *Halyomorpha* is a species-rich genus currently containing nearly 40 species (Wyniger & Kment 2010), roughly half of them distributed in the Afrotropical, the rest in the Oriental Region, with one species described from New Caledonia. Although Josifov & Kerzhner (1978) elucidated taxonomic and nomenclatural problems about the East Asian species, the majority of the Oriental fauna is badly in need of a revision. For facilitating work on the Asian species, detailed figures of genitalia of both sexes of *H. halys* are provided in the present paper.

 Accepted by D. Rider: 13 Feb. 2014; published: 20 Mar. 2014

In Europe, *H. halys* was first reported based on specimens captured in Zürich, Switzerland, in 2007 (Wermelinger *et al.* 2008), but in fact a specimen was already found in a light trap in Liechtenstein as early as 2004 (Arnold 2009). Later it was observed in Germany (Konstanz) in 2011 (Heckmann 2012), in France (Strasbourg, Alsace region) in 2012 (Callot & Brua 2013) and also in Italy (Magreta di Formigine, Emilia-Romagna region) in the same year (EPPO 2013). The specimens reported here represent the first record of the species in Hungary.

Bionomics, pest status. *Halyomorpha halys* is highly polyphagous and has been documented feeding on economically important plants, e.g. fruit trees, legumes, deciduous hardwoods and ornamentals, but the species was found also on weeds (Bernon 2004, Wermelinger *et al.* 2008, Nielsen & Hamilton 2009, Leskey *et al.* 2012). At Péterimajor, Budapest, specimens were collected on *A. negundo*, *E. europaeus* and *S. japonica*. In late October specimens usually do not feed but rather move to hibernation refugia, therefore host plant relationship with these plants could not be demonstrated.

Holtz & Kamminga (2010) note, however, that *H. halys* may feed on plants that are not true hosts, viz. they cannot support development of consecutive nymphal stages for multiple years. The bionomics and life history of the species in Japan was studied by Kawada & Kitamura (1983) and others, in China by Zhang *et al.* (1993) and Chu & Zhou (1997), and in the US by Nielsen & Hamilton (2009).

Severe damage and significant yield loss of peach, apple, tomato, pepper, sweet corn and soybean caused by *H. halys* in the US have already been reported (Leskey *et al.* 2012). The species is a vector of the phytoplasma responsible for paulownia witches' broom (PaWB) in China (Sun *et al.* 1999) and Japan (Nakano *et al.* 1997). Moreover, *H. halys* is considered a nuisance pest, because adults aggregate in high numbers on outer surfaces of homes and indoors when seeking overwintering sites, and omit a noxious scent if disturbed (Hoebeke & Carter 2003, Bernon 2004, Nielsen & Hamilton 2009, Rabitsch 2010, Inkley 2012, Leskey *et al.* 2012). The species can also induce significant allergic sensitization (Mertz *et al.* 2012).

Based on the facts described above and definition given by the NISC (2006), *H. halys* can be considered an invasive species.

Migration, populations in Hungary. The way of arrival of *H. halys* to Hungary is unknown. Being active fliers and highly mobile (Fogain & Graff 2011, Zhang *et al.* 1993), specimens might have reached the country by natural dispersal from the west. Because the species has not been reported from any of the neighbouring countries so far, this possibility is rather unlikely, but it may not be excluded. Assuming this mode of dispersal, scattered populations might be present in the region between Hungary and those Central European countries where *H. halys* has already been recorded. Nevertheless, since Budapest is a node of national and international transportation, it is more probable that specimens may have also been introduced passively by human activity, as it has been confirmed on a number of occasions in other countries (Harris 2010, Fogain & Graff 2011). The occurrence of specimens at two localities of about 12 km distance suggests that small, isolated populations might already exist in Budapest. A single 5th instar captured at Péterimajor in late October indicates that reproductive individuals were present in the area at least in the middle or end of the summer of the same year.

Monitoring the distribution and survey on the biology of *H. halys* in agricultural, forest and urban areas in Europe are needed because of the potential threat of the pest in the continent.

Acknowledgements

We are grateful to Jing-Fu Tsai (Hokkaido University, Sapporo) for his comments on the morphology and homologies of the male genitalia and to two anonymous reviewers for helpful suggestions.

References

Arnold, K. (2009) *Halyomorpha halys* (Stål, 1855), eine für die europäische Fauna neu nachgewiesene Wanzenart (Insecta: Heteroptera, Pentatomidae, Pentatominae, Cappaeini). *Mitteilungen des Thüringer Entomologenverbandes e. V.*, 16 (1), 19.

Bernon, G. (2004) Biology of *Halyomorpha halys*, the Brown Marmorated Stink Bug (BMSB). *Final Report – USDA APHIS CPHST 2004*, 17 pp.

Callot, H. & Brua, C. (2013) *Halyomorpha halys* (Stål, 1855), la Punaise diabolique, nouvelle espèce pour la faune de France (Heteroptera Pentatomidae). *L'Entomologiste*, 69 (2), 69–71.

Chu, F.J. & Zhou, Z.F. (1997) Study on control and observation of the bionomics characteristics of *Halyomorpha picus* Fabricias [sic]. *Journal of Agricultural University of Hebei*, 20 (2), 12–17. [in Chinese, English summary]

EPPO [European and Mediterranean Plant Protection Organization] (2013) First report of *Halyomorpha halys* in Italy. *EPPO Reporting Service*, 5, 2013/108.

Fogain, R. & Graff, S. (2011) First records of the invasive pest, *Halyomorpha halys* (Hemiptera: Pentatomidae), in Ontario and Quebec. *Journal of the Entomological Society of Ontario*, 142, 45–48.

Harris, A.C. (2010) *Halyomorpha halys* (Hemiptera: Pentatomidae) and *Protaetia brevitarsis* (Coleoptera: Scarabaeidae: Cetoniinae) intercepted in Dunedin. *The Weta*, 40, 42–44.

Heckmann, R. (2012) Erster Nachweis von *Halyomorpha halys* (Stål, 1855) (Heteroptera: Pentatomidae) für Deutschland. *Heteropteron*, 36, 17–18.

Hoebeke, E.R. & Carter, M.E. (2003) *Halyomorpha halys* (Stål) (Heteroptera: Pentatomidae): a polyphagous plant pest from Asia newly detected in North America. *Proceedings of the Entomological Society of Washington*, 105, 225–237.

Holtz, T. & Kamminga, K. (2010) Qualitative analysis of the pest risk potential of the brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), in the United States. *USDA APHIS PPQ*, 33 pp.

Inkley, D.B. (2012) Characteristics of home invasion by the brown marmorated stink bug (Hemiptera: Pentatomidae). *Journal of Entomological Science*, 47, 125–130.

Josifov, M.V. & Kerzhner, I.M. (1978) Heteroptera aus Korea. II. Teil (Aradidae, Berytidae, Lygaeidae, Pyrrhocoridae, Rhopalidae, Alydidae, Coreidae, Urostylidae, Acanthosomatidae, Scutelleridae, Pentatomidae, Cydnidae, Plataspidae). *Fragmenta Faunistica*, 23 (9), 137–196.

Kawada, H. & Kitamura, C. (1983) Bionomics of the Brown Malmorated [sic] Stink Bug, *Halyomorpha mista*. *Japanese Journal of Applied Entomology and Zoology*, 27, 304–306. [in Japanese]

Kondorosy, E. (1999) Checklist of the Hungarian bug fauna (Heteroptera). *Folia Entomologica Hungarica*, 60, 125–152.

Kondorosy, E. (2012) Adventív poloskafajok Magyarországon. [Invasive alien bug (Heteroptera) species in Hungary.] *Növényvédelem*, 48 (3), 97–104. [in Hungarian, English summary]

Leskey, T.C., Hamilton, G.C., Nielsen, A.L., Polk, D.F., Rodriguez-Saona, C., Bergh, J.C., Herbert, D.A., Kuhar, T.P., Pfeiffer, D., Dively, G.P., Hooks, C.R.R., Raupp, M.J., Shrewsbury, P.M., Krawczyk, G., Shearer, P.W., Whalen, J., Koplinka-Loehr, C., Myers, E., Inkley, D., Hoelmer, K.A., Lee, D.H., & Wright, S.E. (2012) Pest status of the Brown Marmorated Stink Bug, *Halyomorpha halys* in the USA. *Outlooks on Pest Management*, 23 (5), 218–226. http://dx.doi.org/10.1564/23oct07

Mertz, T.L., Jacobs, S.B., Craig, T.J. & Ishmael, F.T. (2012) The brown marmorated stinkbug as a new aeroallergen. *Journal of Allergy and Clinical Immunology*, 130 (4), 999–1001. http://dx.doi.org/10.1016/j.jaci.2012.06.016

Nakano, Y., Goto, T., Natsuaki, T. & Okuda, S. (1997) 16S rDNAs of Paulownia witches' broom phytoplasma transmitted by *Halyomorpha mista*. *Annals of the Phytopathological Society of Japan*, 63 (6), 502. [in Japanese]

Nielsen, A.L. & Hamilton, G.C. (2009) Life history of the invasive species *Halyomorpha halys* (Hemiptera: Pentatomidae) in northeastern United States. *Annals of the Entomological Society of America*, 102 (4), 608–616. http://dx.doi.org/10.1603/008.102.0405

NISC [National Invasive Species Council] (2006) *Invasive species definition clarification and guidance white paper*, California Invasive Species Advisory Committee, 11 pp.

Rabitsch, W. (2008) Alien true bugs of Europe (Insecta: Hemiptera: Heteroptera). *Zootaxa*, 1827, 1–44.

Rabitsch, W. (2010) True bugs (Hemiptera, Heteroptera). Chapter 9.1. *In*: Roques, A., Kenis, M., Lees, D., Lopez-Vaamonde, C., Rabitsch, W., Rasplus, J.Y. & Roy, D.B. (Eds.), Alien terrestrial arthropods of Europe. *BioRisk*, 4 (1), 407–433.

Rider, D.A., Zheng, L.Y. & Kerzhner, I.M. (2002) Checklist and nomenclatural notes on the Chinese Pentatomidae (Heteroptera). II. Pentatominae. *Zoosystematica Rossica*, 11 (1), 135–153.

Roques, A. (2010) Taxonomy, time and geographic patterns. Chapter 2. *In*: Roques, A., Kenis, M., Lees, D., Lopez-Vaamonde, C., Rabitsch, W., Rasplus, J.-Y. & Roy, D.B. (Eds.), Alien terrestrial arthropods of Europe. *BioRisk*, 4 (1), 11–26.

Sun, Z.Q., Fu, J.M., Qiao, J., Yan, Z.S., Du, K.Y. & Dong, S.Q. (1999) Capacity of *Halyomorpha picus* transmitting phytoplasma associated with Paulownia witches' broom. *Forest Research*, 12 (6), 606–611. [in Chinese, English summary]

Wermelinger, B., Wyniger, D. & Forster, B. (2008) First records of an invasive bug in Europe: *Halyomorpha halys* Stål (Heteroptera: Pentatomidae), a new pest on woody ornamentals and fruit trees? *Mitteilungen der Schweizerischen entomologischen Gesellschaft*, 81, 1–8.

Wyniger, D. & Kment, P. (2010) Key for the separation of *Halyomorpha halys* (Stål) from similar-appearing pentatomids (Insecta: Heteroptera: Pentatomidae) occurring in Central Europe, with new Swiss records. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 83, 261–270.

Zhang, C.T., Li, D.L., Su, H.F. & Xu, G.L. (1993) A study on the biological characteristics of *Halyomorpha picus* and *Erthesina fullo*. *Forest Research*, 6 (3), 271–275. [in Chinese, English summary]