

The distribution of brown marmorated stink bug (*Halyomorpha halys* (Stål, 1855); Hemiptera: Pentatomidae) in the Northeast part of the Carpathian Lowland (West Ukraine)

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SUMMARY

Halyomorpha halys (Stål, 1855) spread rapidly during the last five years and became common and abundant in Central Europe, especially in the urban environment. In the Carpathian basin, the West Ukrainian Transcarpathia county was the last region where this species has not been found yet. The first specimens of this invasive pest were sampled in Velyka Dobron' in 2018 and in 2019 it was found in another neighbouring village and cities of Chop, Berehove and Uzhhorod. The data provided here is the first for West Ukraine and the second for the country following the published record from Odessa (SE Ukraine). Although *H. halys* is still less abundant and occupied mainly urban habitats, it will certainly cause nuisance for peoples and damages for farmers in the near future.

Keywords: invasive pest, spread, urban environment, Transcarpathia

INTRODUCTION

The invasive brown marmorated stink bug (*Halyomorpha halys* (Stål, 1855)) is native in south Asia (in China, Japan, Korea and Taiwan; Rider et al., 2002), where cause damage mainly on fruit trees (apple, pear, apricot, peach etc.) and soy (Funayama, 1996; Hoebeke & Carter, 2003; Véték & Korányi, 2017). Both adults and larvae of this polyphagous insect feed also on green parts of hardwoods and trees of Rosaceae and Fabaceae families (Hoebeke & Charter, 2003; Bernon, 2004). Nilsen & Hamilton (2009) mentioned empress tree (*Paulownia tomentosa*), white or american ash (*Fraxinus americana*), sweetgum (*Liquidambar styraciflua*) and Asian pear (*Pyrus pyrifolia*) as further preferred host plants. In addition to consuming plant parts, cannibalism of the *H. halys* species has also been described (Kóbor, 2022).

In Central Europe the *H. halys* has two generation per year. During autumn many adults look for shelters for overwintering and appears in different buildings causing nuisance mainly to inhabitants of larger cities (Kobayashi & Kimura, 1969), while in natural habitats they overwinter under bark (Qin, 1990; Watanabe et al., 1994; Xin et al., 2007; Lee et al., 2014). Factors affecting the overwintering success are insufficiently known, for example in case of effect of winter climate there are inconsistent results (e.g. Oda et al., 1982; Kiritani, 2007).

Out of their native area *H. halys* was first detected in Pennsylvania in the 1990's (Hamilton & Shearer, 2003; Hoebeke & Charter, 2003), then in the early 2010's it was already distributed in the other parts of the United States and also in Canada, where it was found on poplar timber (Fogain & Graff, 2011). In

South America it was first found in Chile in 2017 (Leskey & Nielsen, 2018). In 2004 it appeared in Zürich (Switzerland) and then it spread through many European countries: Germany (2012), France (2013), Greece (2014), Italy (2016), Spain (2016), Russia (2016) (Wermelinger et al., 2008; Leskey & Nielsen, 2018). In Central Europe MSB first appeared in Hungary in 2013 (Véték et al., 2014) then it was found in Austria (Rabitsch & Griebe, 2015), Serbia (Šeat, 2015) and Romania (Macavei et al., 2015) in 2015, in Slovakia (Hemala & Kment, 2017), Croatia (Šapina & Šerić, 2018) and Slovenia (Eppo, 2020) in 2017 and finally in the Czech Republic (Kment & Brezikova, 2019) and Ukraine (Claerebout et al., 2019) in 2018. Although in latter case the known area is restricted to the seaport city of Odessa (near the Black Sea) but based on their bioclimatic requirements their further appearance can be predicted in other parts of the country: the coastal part of the Black Sea and Sea of Azov and Ukrainian part of the Carpathian Basin in west Ukraine (Tytar & Kizonenko, 2020). By these days it was found and published from all part of the Carpathian Basin expect this latter Ukrainian county named Transcarpathia. Here we provide data on the distribution of brown marmorated stink bug in Transcarpathia, the north-eastern part of the Carpathian Basin belonging to Ukraine.

MATERIALS AND METHODS

Occurrence of *Halyomorpha halys* (Stål, 1855) was studied at 9 sampling sites of 5 cities and villages of Transcarpathia county (West Ukraine). Geographically this area belongs to the Carpathian Basin and sampling sites were all located in the Berehove and Uzhhorod

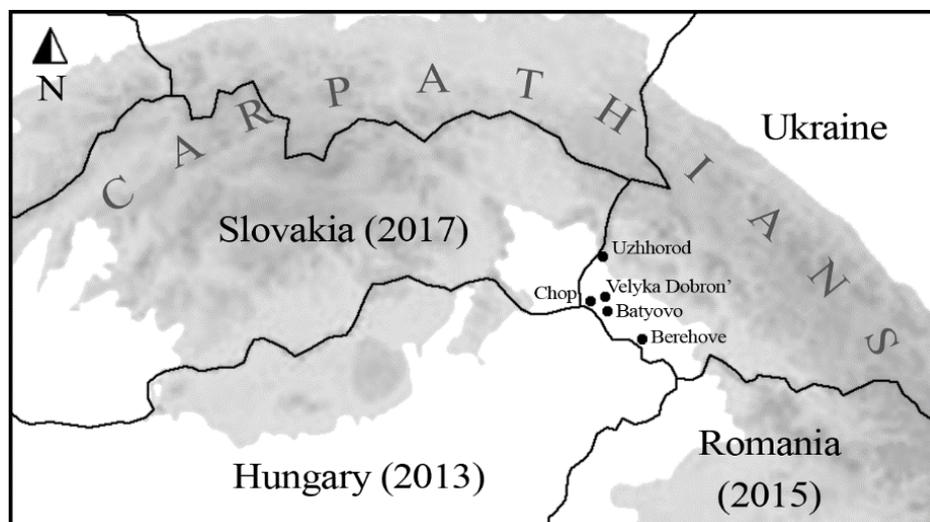
Regions. Mostly secondary artificial habitats were studied considering the climatic requirement and known distribution of the species in the Carpathian lowland (Vétek, 2019). Only one natural habitat was sampled where the species could be found (Table 1, Figure 1).

Sampling was made by direct search of adults and larvae in different urban and suburban environments. Here we show sites only where the species could be found in 2018 and 2019.

Table 1: Location and main characteristics of the sampling sites in the Ukrainian part of the Bereg Lowland (West Ukraine) with total number of sampled individuals (N_{total}), and date of the sampling

	Township	Coordinates		Date	Habitat	Ntotal
		N	E			
1	Velyka Dobron'	48o25'26"	22o23'28"	17. 10. 2018	window-frame of the High School of Velyka Dobron'	3
2	Velyka Dobron'	48o26'40"	22o24'20"	24. 08. 2019	apple trees in a farmstead	5
3	Velyka Dobron'	48o26'50"	22o23'35"	24. 08. 2019	non-heated bodega on the shore of a fishpond	7
4	Velyka Dobron'	48o25'34"	22o25'40"	28. 07. 2019	edge of a hardwood gallery forest with blackberry shrubs	4
5	Velyka Dobron'	48o25'35"	22o23'48"	24. 03. 2020	window-frame of a house with garden	12
6	Berehove	48o12'21"	22o38'40"	21. 08. 2019	wall of a building in a city park	1
7	Uzhhorod	48o38'06"	22o17'27"	03. 11. 2019	building of the Uzhhorod National University	2
8	Chop	48o25'55"	22o12'26"	09. 10. 2019	building of the railway station of Chop	1
9	Batyovo	48o22'09"	22o23'42"	08. 10. 2019	grapevine in a village garden	3

Figure 1: Distribution of the *Halyomorpha halys* (Stål, 1855) in Transcarpathia county of Ukraine and date of its appearance in the neighbouring countries in the Carpathian Basin



RESULTS AND DISCUSSION

The *H. halys* was first recorded in autumn of 2018 in West Ukraine (Table 1). In the other parts of the Carpathian Lowland it was already spread and rich high abundances especially in the larger cities during the last years (Vétek, 2019). After that in 2019 it was found in Velyka Dobron' again both in the village and in semi-natural habitats of its surroundings. Beyond that *H. halys* also appeared in an other small village Batyovo

and three larger towns (Chop, Uzhhorod and Berehove) of Transcarpathia county.

Considering the known distribution and abundance in the Carpathian Lowland and the climatic requirements of the species, its occurrence could be predicted in the studied area (Leskey & Nielsen, 2018; Vétek, 2019; Tytar & Kizonenko, 2020). The newly discovered populations certainly arrived from the inner part of the Carpathian Lowland where the species already appeared in 2013 (Vétek et al., 2014) and

became common and abundant, since the Carpathian Mountains constitutes barrier to their spread.

The *H. halys* could be found in different urban habitats and its surroundings mainly on buildings and in some cases on host plants (grape and apple). Although only small abundances were detected but based on population dynamic recorded in the neighbouring countries (e.g. northeast Hungary) the species become abundant soon and cause both nuisance for inhabitants and damage for farmers in the near future.

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