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A TERRITORIAL MONITORING SYSTEM FOR *HALYOMORPHA HALYS* IN EMILIA-ROMAGNA REGION

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Abstract: The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae), is an invasive phytophagous species of Asian origin. Nowadays, BMSB is widespread in Italy and southern Europe, where it has become the main key pest of several agricultural crops causing severe economic losses (Maistrello et al., 2017). Current management strategies are ineffective and are based on environmentally sustainable products (e.g., broad-spectrum neurotoxic insecticides). The difficulties management of the BMSB are linked to the high mobility of this pest and to its extreme polyphagy, which make it very difficult to predict the attacks and damage, especially in tree fruit crops (Leskey & Nielsen, 2018). The monitoring carried out by means of a pyramid trap baited with aggregation pheromones proved to be more effective in attracting and capturing BMSB, and in particular the model Dead-Inn Pyramid Trap™ (AgBio®) with the Pherocon® BMSB Dual lure (Trécé Inc.®). The use of pheromone traps along with visual sampling and tree-beating are a very useful way to monitor BMSB at the farm level. However, these are very time-consuming practices and it is not easy for farmers to identify the actual risk level. Furthermore, the presence of unmanaged arboreal and shrub vegetation, the presence of buildings or other structures used by BMSB during the overwintering phase, the type and phenological phase of the cultivated plant species which can vary considerably even between farms located in the same geographical area make pest monitoring and risk detection complex. To facilitate the management of BMSB to farmers, a territorial monitoring project called 'CIMICE.NET' has been activated in Emilia-Romagna since 2020. This project provides, in real time and on-line, information on the dynamics and consistency of BMSB populations in the regional territory and in particular in the areas with the highest fruit growing vocation. On average 140 sites have been monitored weekly using pyramid traps (Dead-Inn Pyramid Trap™) triggered with aggregation pheromones (Pherocon® BMSB Dual lure). The information obtained from this monitoring network are uploaded online to the following open access website: <https://big.csr.unibo.it/projects/cimice/monitoring.php>. The platform collects monitoring data, processes, analyses and displays information in real time on the presence and abundance of BMSB populations in the different areas of the region, providing timely and reliable monitoring information capable of constantly supporting pest control advisors and farmers for a more rational management of the BMSB in Emilia-Romagna. Although to date there are no damage thresholds for the BMSB in Italy, thanks to the information available in the CIMICE.NET database it is possible to compare the weekly catches with those recorded in the same period of the previous years (2020 and 2021, considering the actual data collected in 2022) on average or on a specific territory. In addition, by interacting with the graphs it is possible to follow the trend of the populations and identify the presence peaks and the dynamics of the various instars of the insect over time (Fig. 1 and 2).

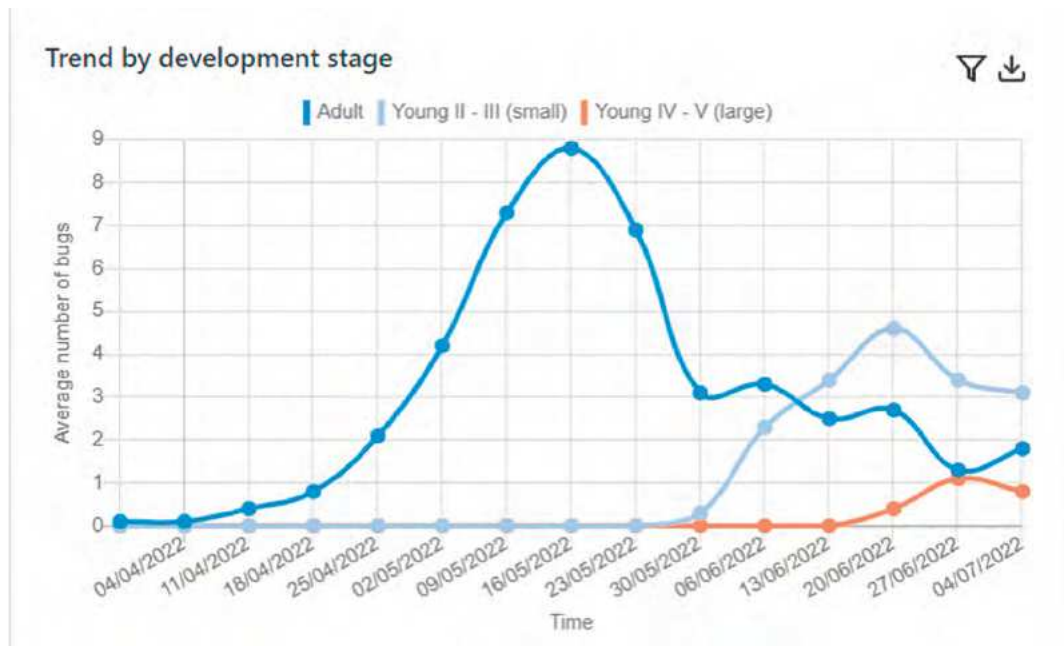


Fig. 1 - Trend of the average captures per trap in 2022 by development stage of BMSB.

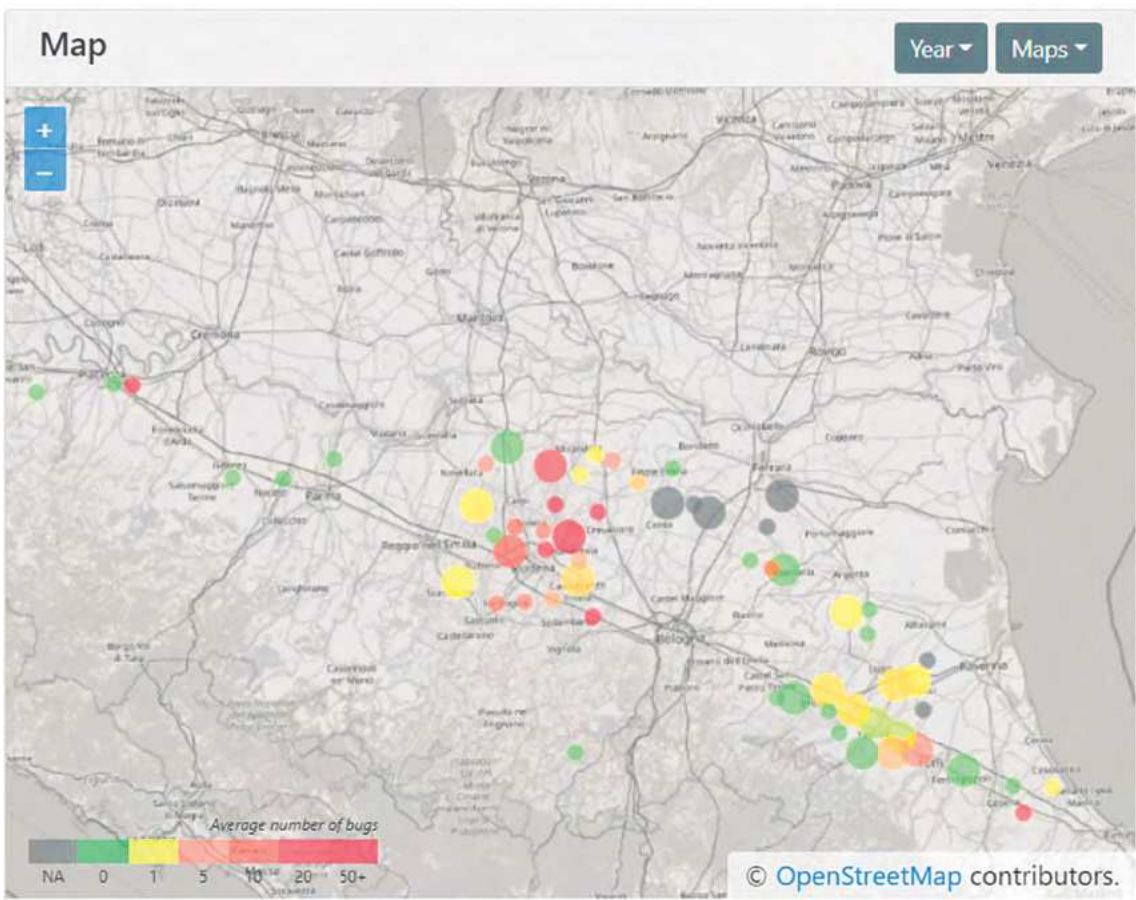


Fig. 2 - Map of the captures of BMSB in the week of June 27, 2022; size indicates the number of traps, color indicates the number of captures (grey=none, green=low, red=high).



These data, collected over three years, are continuously integrated and correlated with the open meteorological data of the Regional Agency for Environmental Protection (ARPAE) and with the data of the Emilia-Romagna Channel (CER) consortium, providing information on water basins and active crops in the region. This integration makes it possible to identify biotic or abiotic environmental factors that can influence the presence of BMSB and its harmfulness in a specific territory, thus facilitating the definition of intervention strategies also at the territorial level.

Key words: brown marmorated stink bug, insect pest monitoring, on-line platform, traps network.

Acknowledgements: This study was funded by the Emilia-Romagna region within the Rural Development Plan 2014-2020 Op. 16.1.01 – GO EIP-Agri - FA 4B, Pr. “Cimice-Net” and coordinated by RI.NOVA.

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