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

**G. Vaccari¹, M. Preti², M. Bariselli³, L. Fagioli⁴, S. Civolani⁵, M. G. Tommasini⁶,
M. Golfarelli⁷, E. Gallinucci⁷, C. Forresi⁷, L. Maistrello⁸**

¹ Consorzio Fitosanitario Provinciale di Modena, ² ASTRA Innovazione e Sviluppo, ³ Servizio Fitosanitario Regione Emilia-Romagna, ⁴ Consorzio Agrario di Ravenna, ⁵ University of Ferrara, ⁶ RI.NOVA, ⁷ University of Bologna, ⁸ University of Modena and Reggio Emilia
E-mail: giacomo.vaccari@regione.emilia-romagna.it

INTRODUCTION

The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae) (Fig. 1), 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. Current management strategies are ineffective and are based on environmentally unsustainable products (e.g., broad-spectrum neurotoxic insecticides). Management of BMSB is challenging, due to its high mobility and extreme polyphagy which make it very difficult to predict attacks and damage, especially in tree crops. Monitoring performed by means of a pyramid trap baited with aggregation pheromones proved to be the most effective in attracting and capturing BMSB. Using pheromone traps along with visual sampling and tree beating are a very useful way to monitor BMSB farm-wide. However, these are time-consuming practices and it is not easy for farmers to identify the actual level of risk. To facilitate the management of the BMSB for farmers, a territorial monitoring project called "CIMICE.NET" has been activated in Emilia-Romagna since 2020.



Figure 1. Adult of *H. halys* hidden between two pears

MATERIALS AND METHODS

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 (Fig. 2). On average 140 sites have been monitored weekly using pyramid traps (Dead-Inn Pyramid Trap™) (Fig. 3) baited 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>.



Figure 3. Dead-Inn Pyramid Trap™ installed between orchard and hedge at one of the monitoring sites

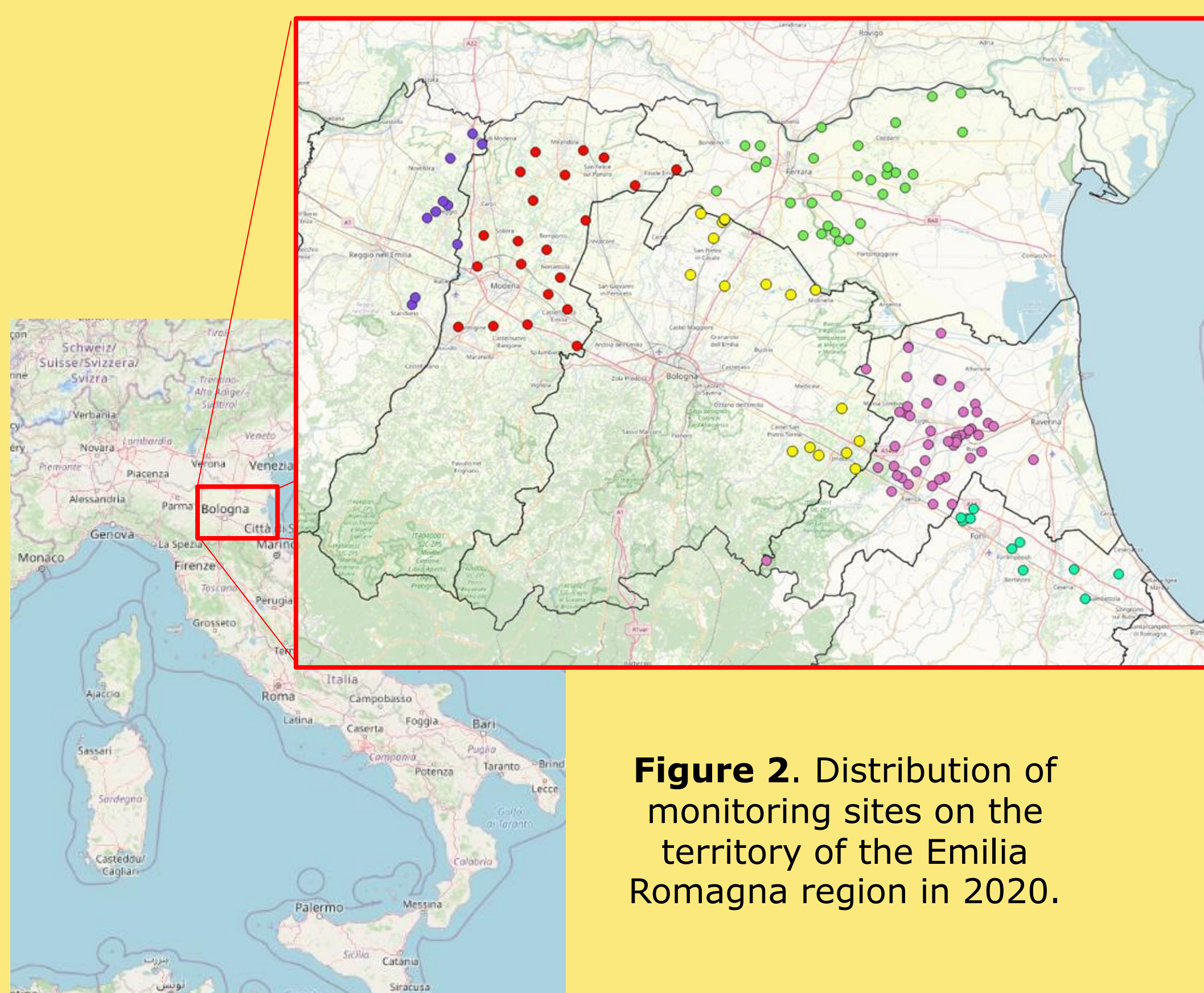


Figure 2. Distribution of monitoring sites on the territory of the Emilia Romagna region in 2020.

	2020	2021	2022
N° of sites monitored	139	165	102
Installation of traps	29 June-5 July	8-14 March	21-27 March
Last inspection of traps	12-19 October	18-25 October	still in progress

RESULTS AND CONCLUSION

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. 4 and 5). 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.

Trend of catches over the years

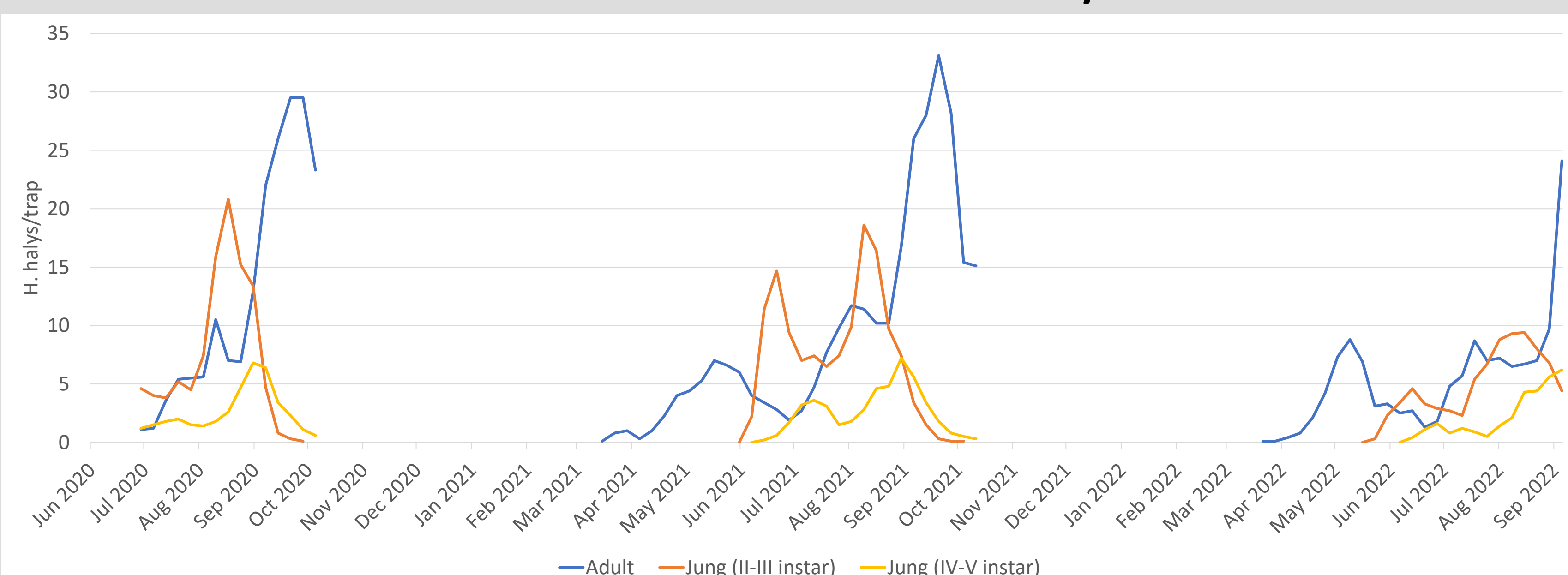


Figure 4. Trend of the average captures per trap in 2020, 2021 and 2022 by development stage of BMSB.

Map

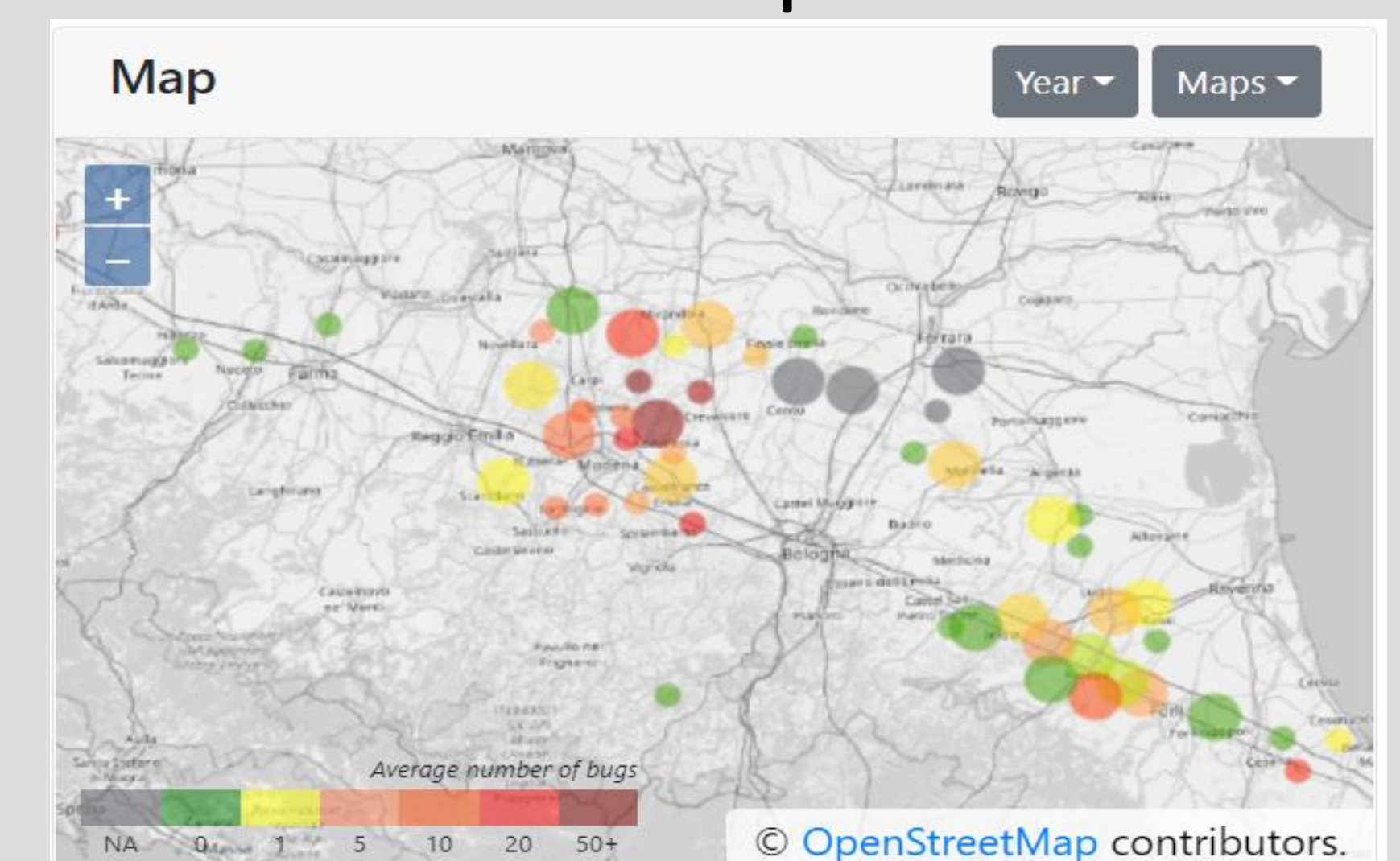


Figure 5. Map of the captures of BMSB in the week of June 27, 2022; size indicates the number of traps, color indicates the number of captures (grey=NA, green=none, red=high).

ACKNOWLEDGMENTS

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