

DYNAMICS OF USEFUL ARTHROPODS IN TWO CEREAL AGROECOSYSTEMS FROM TRANSYLVANIA PLAIN

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INTRODUCTION

Wheat is a staple crop that plays a crucial role in global food security, being one of the most cultivated cereal crops in the world (Bajwa et al., 2020). However, the impact of high temperatures but also of droughts that are increasingly frequent, pose significant challenges for wheat production (Duvnjak et al., 2023). Agroforestry, the integration of trees and shrubs in culture systems, has been shown to provide various benefits, including the regulation of microclimate, the conservation of soil moisture, and the reduction of wind speed, all of which can enhance the resilience of wheat crops to high temperatures and drought conditions. In addition to the multiple benefits that agroforestry curtains offer, they also provide favorable habitats for beneficial arthropods, which can have a direct impact on the wheat crop (Zhang et al., 2021).

Crop protection has played a crucial role in ensuring food security, preserving crop productivity, and rising yields, with more recent emphasis on integrated pest management approaches (Iqbal et al., 2021). One approach to enhance natural regulation of crop pests is through the use of agroforestry systems, which can boost ecosystem services such as biological control by increasing functional biodiversity (Bajwa et al., 2020). A meta-analysis has found that arthropod-based pest management services are increased in agroforestry systems compared to monocultures (Sow et al., 2020). This is because many arthropod species require access to both crops and semi-natural habitats for food and refuge, and agroforestry provides this landscape complexity (Zhao et al., 2015).

MATERIAL AND METHODS

Given the importance of the useful arthropod fauna in limiting wheat pests, during 2022-2023, its monitoring was carried out at the autumn wheat culture, in two locations, within the Agricultural Research and Development Station (ARDS) Turda. Consequently, the research was conducted in two agroecosystems: at Turda in open field conditions and at Bolduț in fields with agroforestry shelterbelts, for the wheat culture. The research was organized in two variants. In the first experimental variant, no insecticides were applied, while in the second variant, insecticides were applied at two specific moments: at the end of tillering concurrent with herbicide application, and in the phenophase from the appearance of the boot until the emergence of the ear.

The collection of useful insects was carried out every ten days using an entomological net through one hundred double sweeps for each sample, starting from the spring months until harvest, depending on climatic conditions.



Figure 1. Experimental field Turda



Figure 2. Experimental field Bolduț

RESULTS AND DISCUSSION

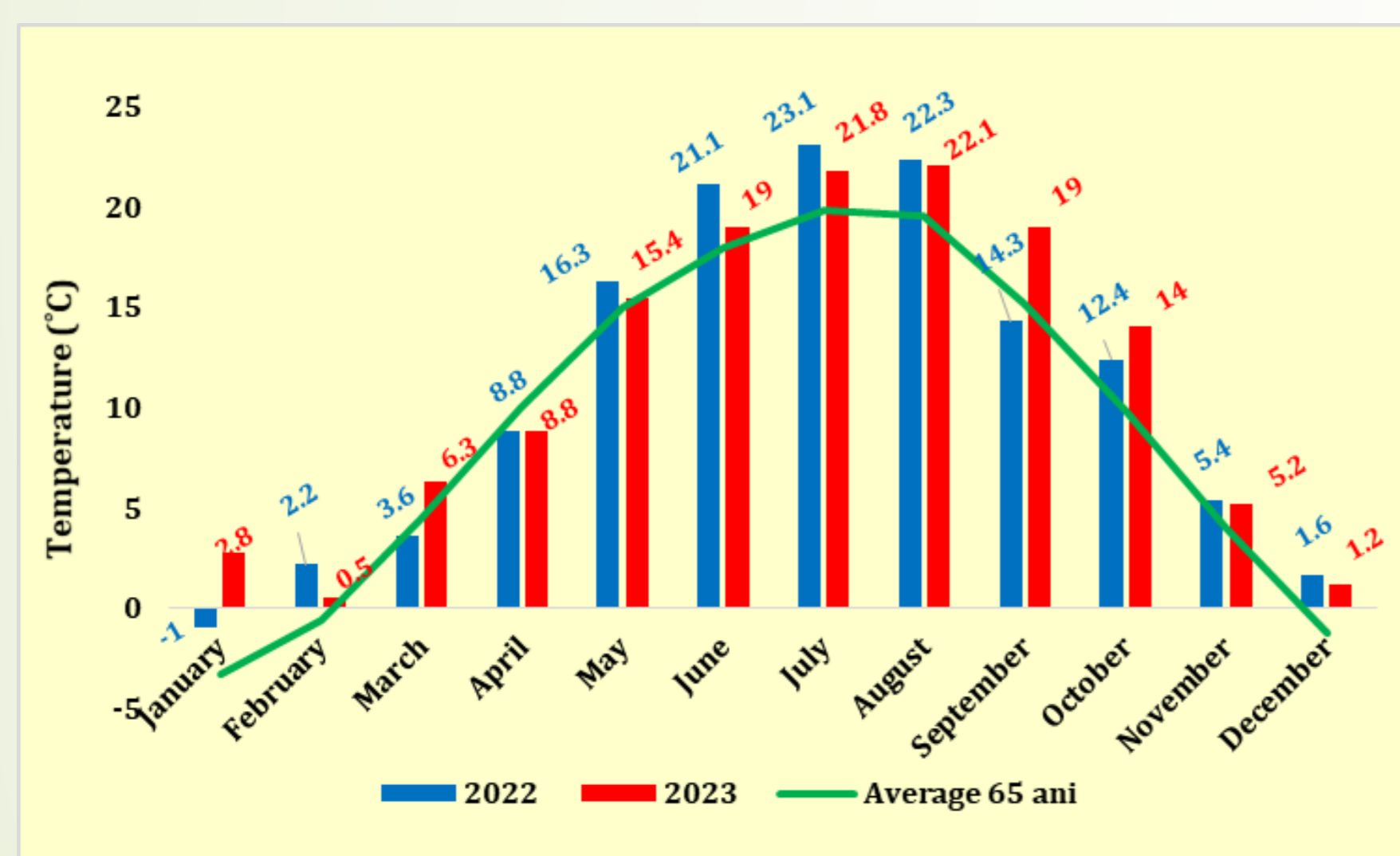


Figure 3. The thermal regime, ARDS Turda, 2022-2023

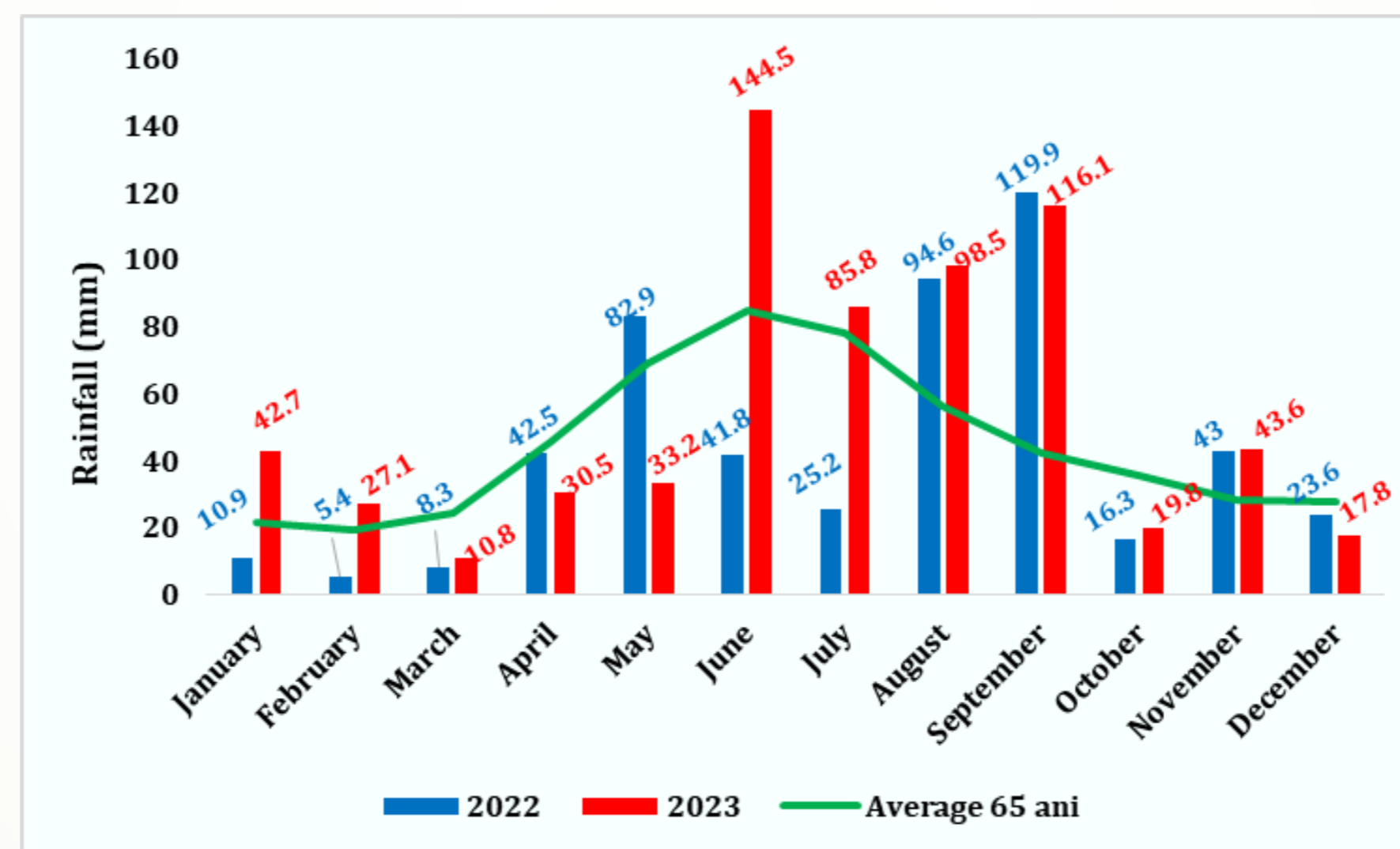


Figure 4. The pluviometric regime, ARDS Turda, 2022-2023



Figure 5. Organizing the captured insects by species

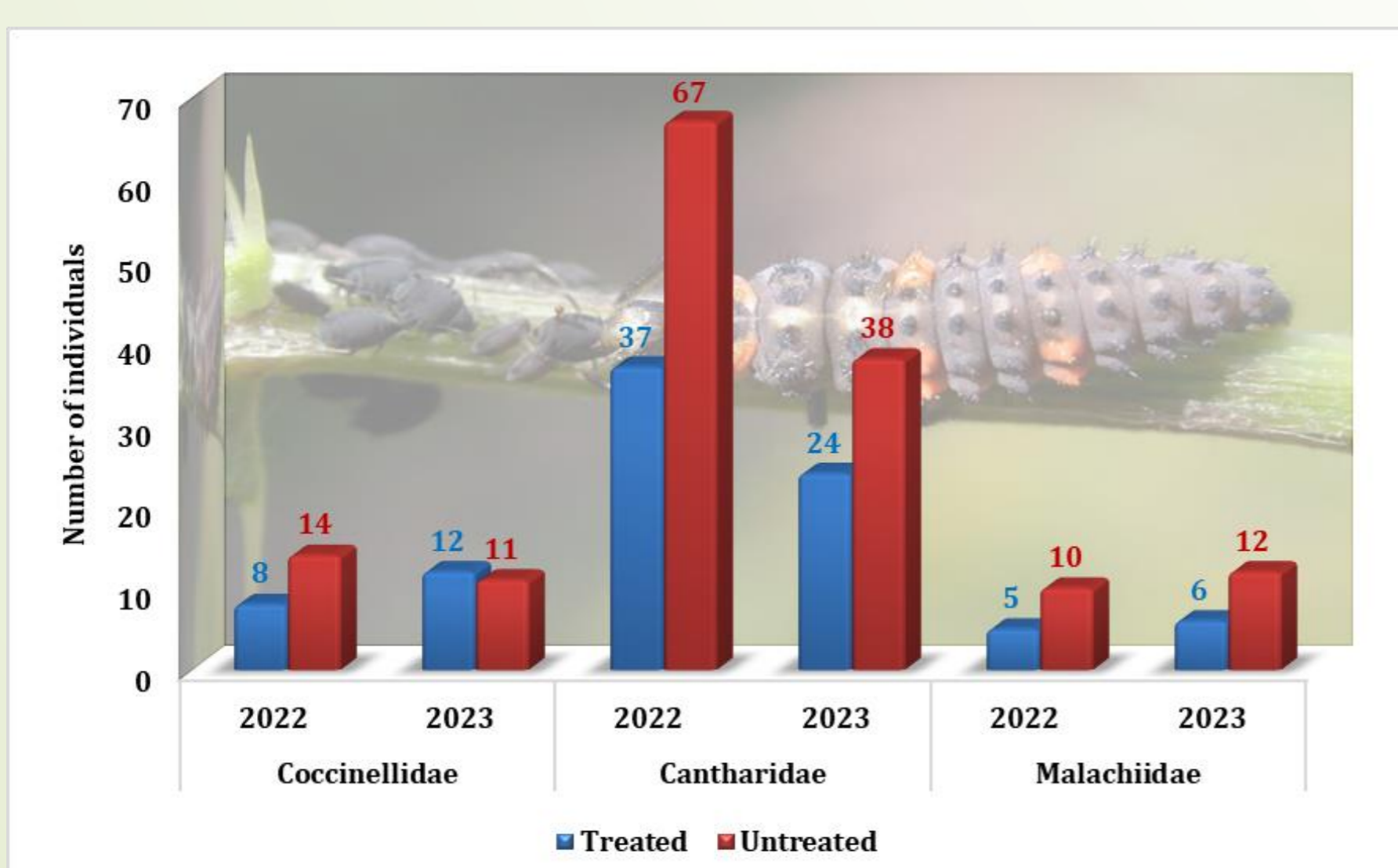


Figure 6. Dynamics of captured species from the order Coleoptera in Turda agroecosystem

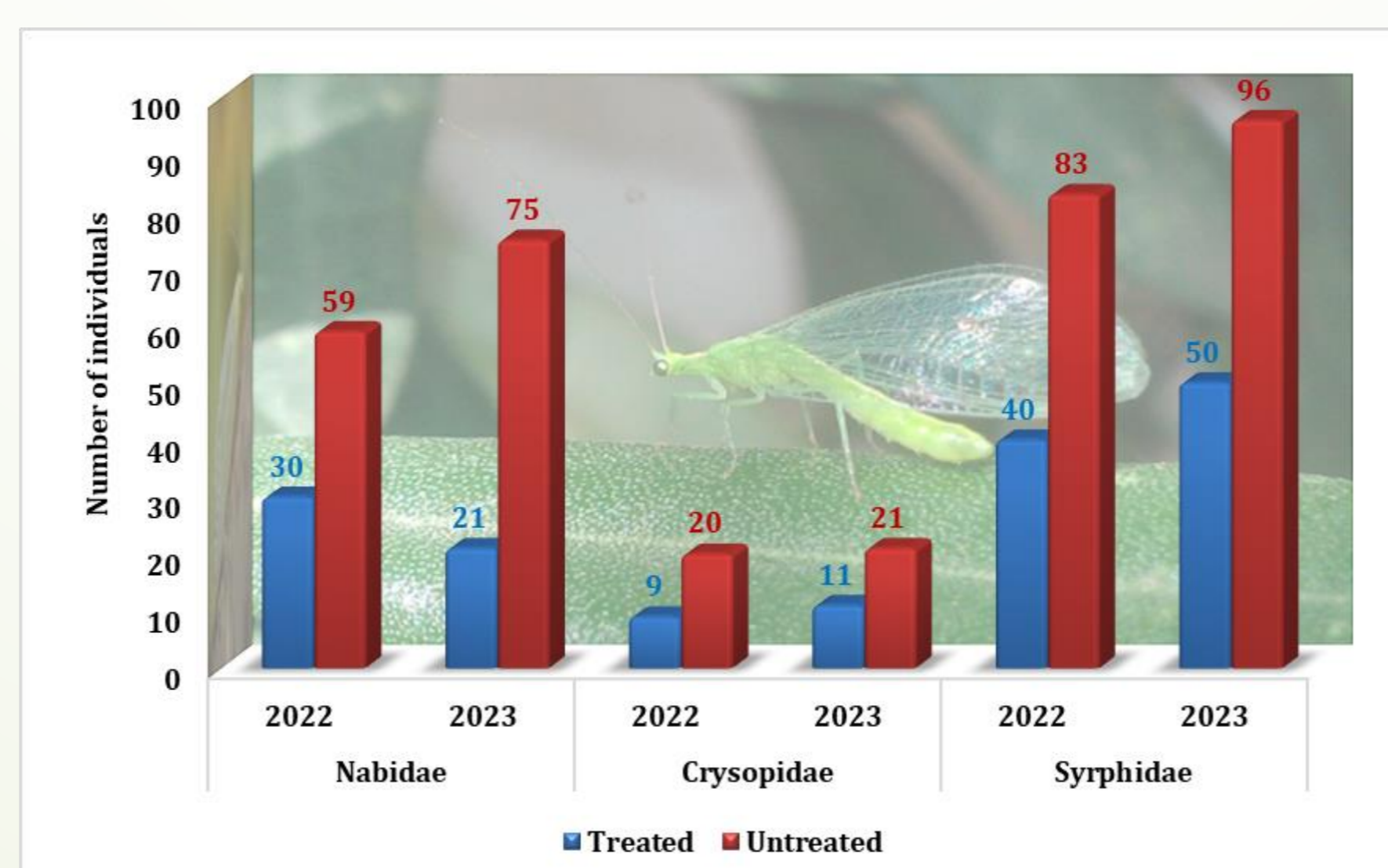


Figure 7. Dynamics of captured species from the families Nabidae, Crysopidae and Syrphidae in Turda agroecosystem

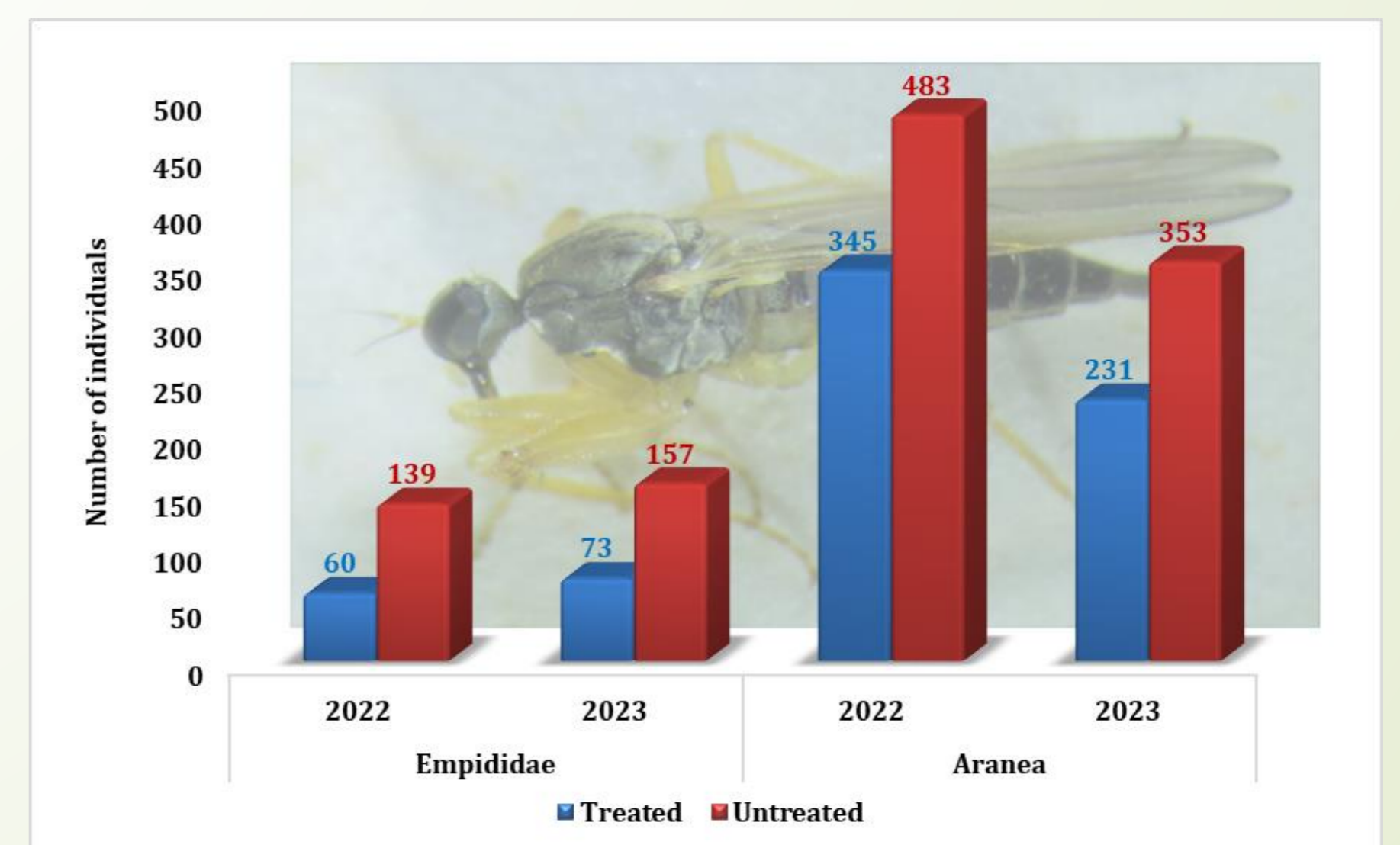


Figure 8. Dynamics of captured species from the family Empididae and Aeneae order in Turda agroecosystem

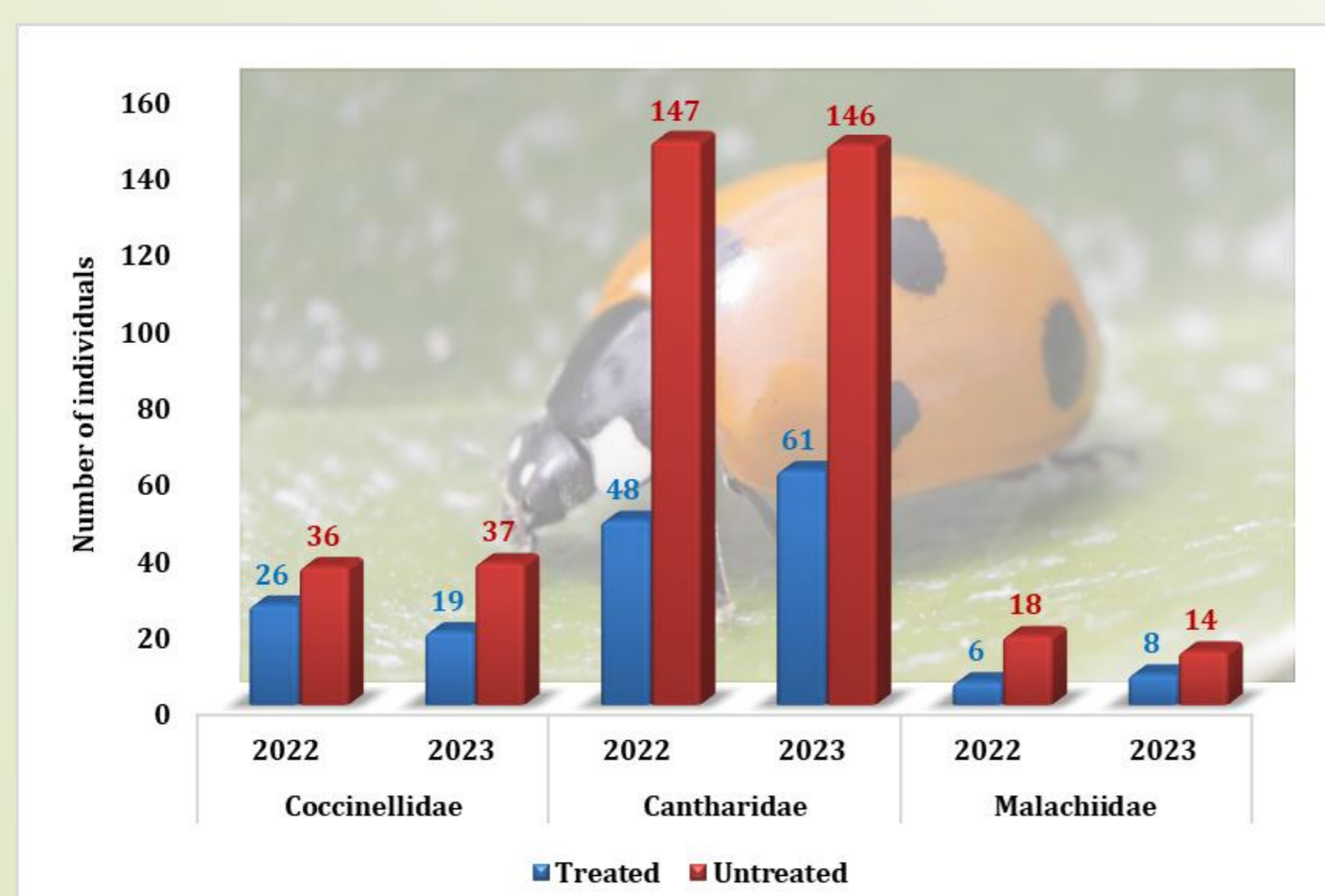


Figure 9. Dynamics of captured species from the order Coleoptera in Bolduț agroecosystem

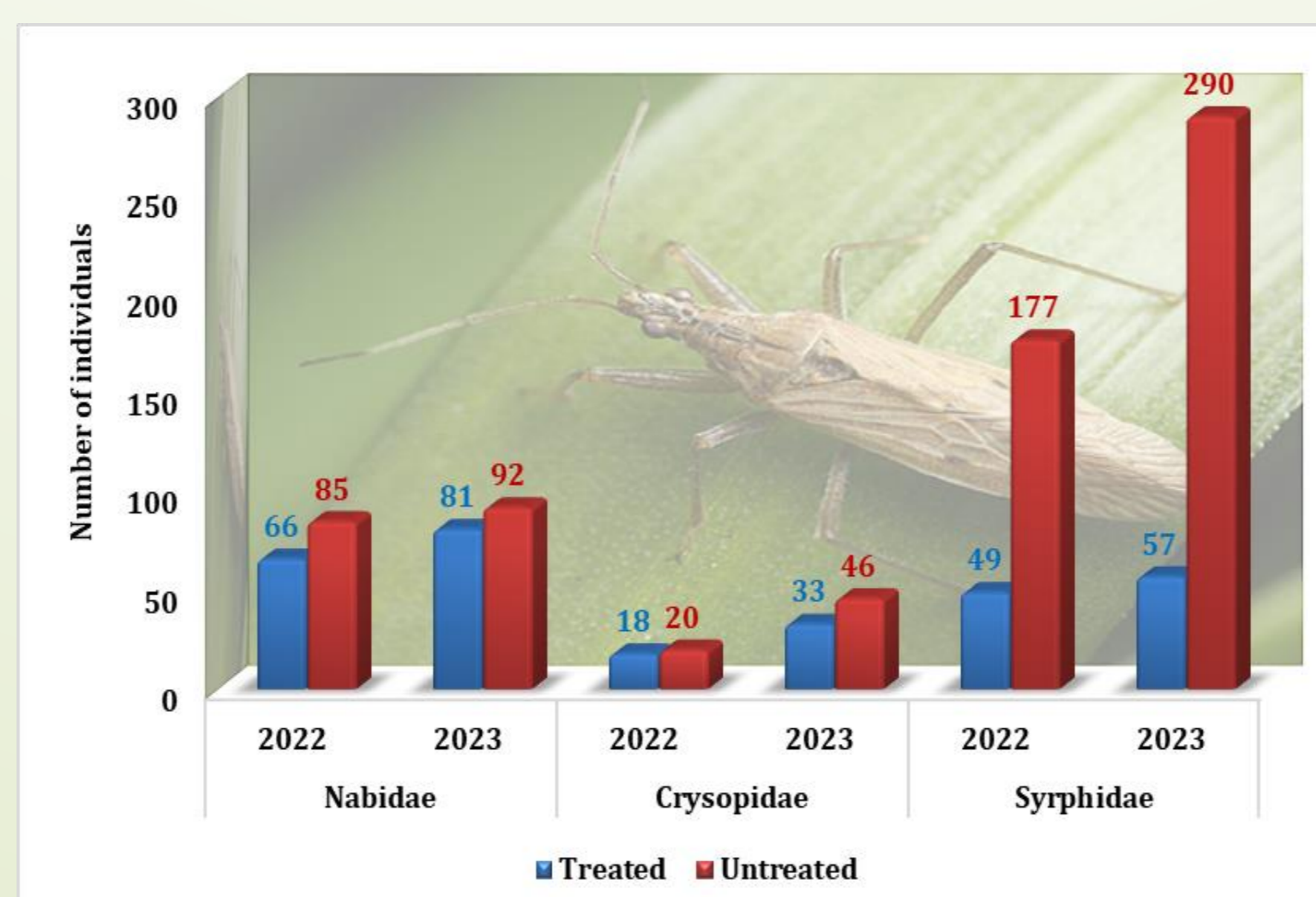


Figure 10. Dynamics of captured species from the families Nabidae, Crysopidae and Syrphidae in Bolduț agroecosystem

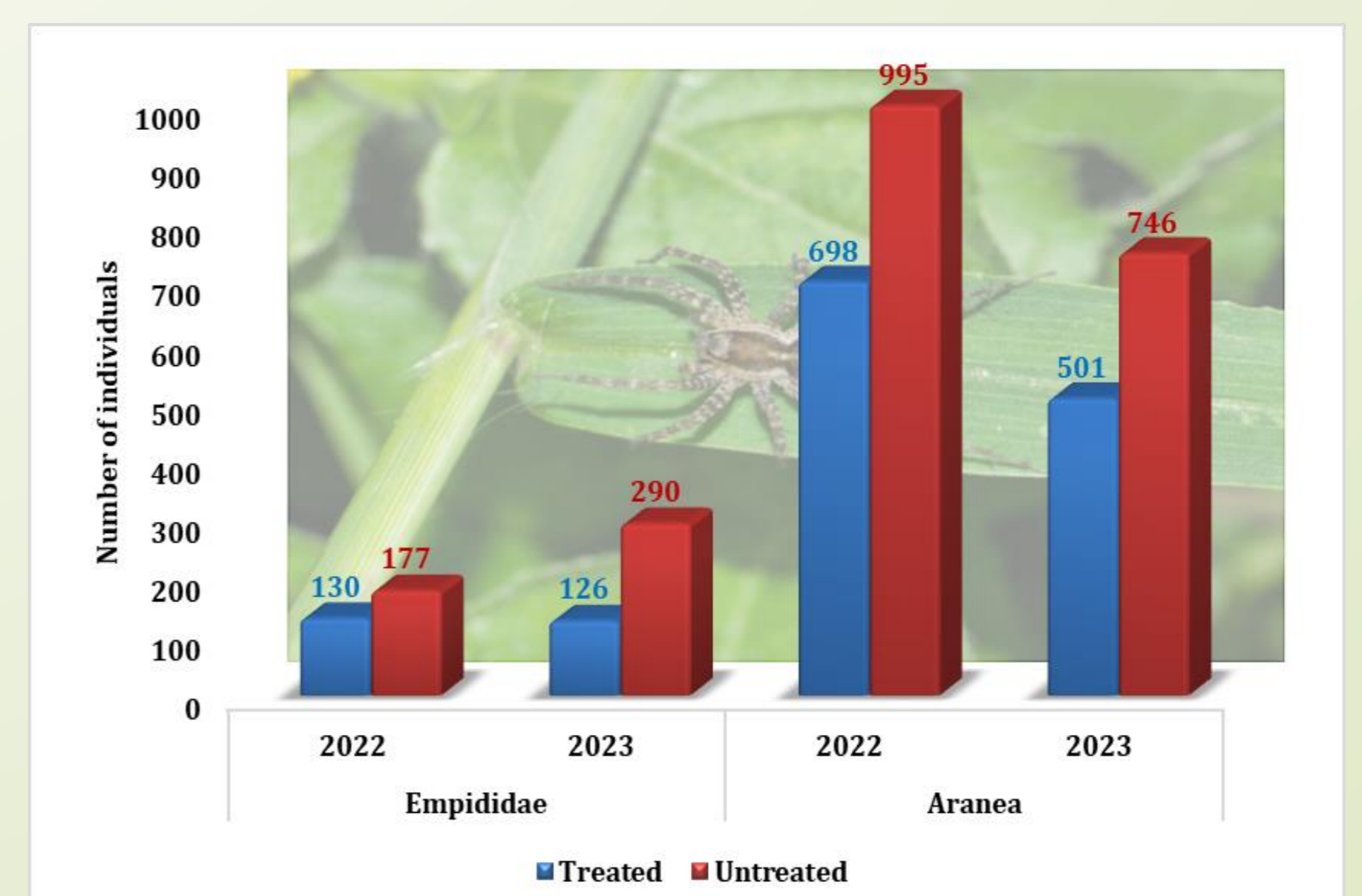


Figure 11. Dynamics of captured species from the family Empididae and Aeneae order in Bolduț agroecosystem

CONCLUSIONS

- The threading method demonstrated superior dynamics of captured beneficial arthropods compared to the Bolduț agroecosystem, across both variants and the two experimental years.
- The number of beneficial arthropods was highest in the two locations in 2022, with the Aranea order being the most abundant

ACKNOWLEDGEMENTS

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BIBLIOGRAFIE

- Bajwa, A. A., Farooq, M., Al-Sadi, A. M., Nawaz, A., Jabran, K., & Siddique, K. H. M. (2020). Impact of climate change on biology and management of wheat pests. *Crop Protection*, *137*, 105304.
- Duvnjak, J., Lončarić, A., Brkljačić, L., Samec, D., Šarčević, H., Salopek-Sondi, B., Španić, V. (2023). Morpho-Physiological and Hormonal Response of Winter Wheat Varieties to Drought Stress at Stem Elongation and Anthesis Stages. *Plants*, *12*(3), 418.
- Iqbal, T., Ahmed, N., Shahjeer, K., Ahmed, S., Al-Mutairi, K. A., Khater, H. F., Ali, R. F. (2021). Botanical Insecticides and Their Potential as Anti-Insect/Pests: Are They Successful against Insects and Pests? *Intech Open eBooks*.
- Sow, A., Seye, D., Faye, E., Benoit, L., Galan, M., Haran, J., Brévalet, T. (2020). Birds and bats contribute to natural regulation of the millet head miner in tree-crop agroforestry systems. *Crop Protection*, *132*, p. 105127.
- Zhao, Z., Hui, C., Dahan, H., Li, B. L. (2015). Effects of agricultural intensification on ability of natural enemies to control aphids. *Scientific Reports*, *Vol. 5*.
- Zhang, G., Chu, X., Zhu, H., Zou, D., Li, L., Du, L. (2021). The Response of Soil Nutrients and Microbial Community Structures in Long-Term Tea Plantations and Diverse Agroforestry Intercropping Systems. *Sustainability*, *13*(14), 2799.