



Collaborating to map ladybirds across Europe

Helen E. Roy¹, Jiří Skuhrovec², Tim Adriaens³, Peter M. J. Brown⁴, Alois Honěk², Alberto F. Inghilesi⁵, Karolis Kazlauskis¹, Oldřich Nedved^{6,7}, Gabriele Rondoni⁸, David B. Roy¹, António O. Soares⁹ and Sandra Viglasova¹⁰

¹Centre for Ecology & Hydrology, Oxfordshire, OX10 8BB 2, UK; ²Crop Research Institute, Prague 6, Ruzyně, Czech Republic; ³Research Institute for Nature & Forest (INBO), Brussels, Belgium; ⁴Anglia Ruskin University, Cambridge, CB1 5PT, UK; ⁵Department of Biology, University of Florence, via Romana 17, 50125 Firenze, Italy University of Perugia, Italy; ⁶Faculty of Science, University of South Bohemia České Budějovice, Czech Republic; ⁷Institute of Entomology, Biology Centre, České Budějovice, Czech Republic; ⁸University of Perugia, Italy; ⁹cE3c – ABG – Centre for Ecology, Evolution and Environmental Changes and Azorean Biodiversity Group, Faculty of Sciences and Technology, University of the Azores, 9501-801 Ponta Delgada, Portugal; ¹⁰Institute of Forest Ecology, Slovak Academy of Sciences, Zvolen, Slovakia

*Corresponding author: hele@ceh.ac.uk

Extended abstract: Recording of ladybirds by volunteers has a long history in a number of countries in Europe and other continents (Losey et al., 2007; Brown et al., 2008; Sæthre et al., 2010; Gardiner et al., 2012; Grez and Zaviezo, 2015; Pocock et al., 2015; Roy and Brown, 2015; Roy et al., 2015). However, there are inherent spatial, temporal and taxonomic biases within the data collated. Many European countries have not had involvement of volunteers through citizen science in recording. There are opportunities to increase the scope of ladybird recording across Europe. Here we present a new smartphone app for recording conspicuous ladybird across Europe which will ultimately underpin large-scale and long-term analysis of ladybird trends (simulated summer droughts). Through this app, we aim to answer the following questions: (1) How do these changes affect the distribution of species? (2) Is the distribution of ladybird species changing differentially across biogeographic zones? (3) Is there a replacement of key species and functional guilds of native ladybirds?

Acknowledgements

We thank the Biological Records Centre for supporting the development of this app.

References

- Brown, P. M. J., Adriaens, T., Bathon, H., Cuppen, J., Goldarazena, A., Hägg, T. Kenis, M., Klausnitzer, B. E. M., Kovář, I., Loomans, A. J. M., Majerus, M. E. N., Nedvěd, O., Pedersen, J., Rabitsch, W., Roy, H. E., Ternois, V., Zakharov, I. A. and Roy, D. B. 2008. *Harmonia axyridis* in Europe: spread and distribution of a non-native coccinellid. *Biocontrol* 53: 5-21.
- Gardiner, M. M., Allee, L. L., Brown, P. M. J., Losey, J. E., Roy, H. E. and Smyth, R. R. 2012. Lessons from lady beetles: accuracy of monitoring data from US and UK citizen-science programs. *Front. Ecol. Environ.* 10: 471-476.

- Grez, A. A. and Zaviezo, T. 2015. Chinita arlequín: *Harmonia axyridis* en Chile. [WWW document] <http://www.chinita-arlequin.uchile.cl>. Accessed 26 Feb. 2019.
- Losey, J. E., Perlman, J. E. and Hoebeke, E. R. 2007. Citizen scientist rediscovers rare nine-spotted lady beetle, *Coccinella novemnotata*, in eastern North America. *J. Insect Conserv.* 11: 415-417.
- Pocock, M. J., Roy, H. E., Preston, C. D. and Roy, D. B. 2015. The Biological Records Centre: a pioneer of citizen science. *Biol. J. Linn. Soc.* 115: 475-493.
- Roy, H. E. and Brown, P. M. J. 2015. Ten years of invasion: *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae) in Britain. *Ecol. Entomol.* 40: 336-348.
- Roy, H. E., Rorke, S. L., Beckmann, B., Booy, O., Botham, M. S., Brown, P. M. J., Harrower, C., Noble, D., Sewell, J. and Walker, K. 2015. The contribution of volunteer recorders to our understanding of biological invasions. *Biol. J. Linn. Soc.* 115: 678-689.
- Sæthre, M.-G., Staverløkk, A. and Hofsvang, T. 2010. The history of *Harmonia axyridis* (Pallas, 1773) in Norway. *IOBC-WPRS Bull.* 58: 97-104.