Bees monitoring in citizen science context

Aneta Sikora¹, Emil Mariusz Szymański², Paweł Michoła¹

¹"Natura i Człowiek" Association, Legnicka 65, Wrocław, Poland

²Górnośląskie Association of Beekeepers in Zgorzelec, Warszawska 9/1, Zgorzelec, Poland

Corresponding author: emil_szymanski@poczta.onet.pl

DOI: 10.31708/spi3.18/sikr.cns18

Introduction

Citizen science is based on volunteers involved in scientific surveys. In this innovative approach, we find a number of advantages, just to name couple like public education and the opportunity for volunteers to gain research experience. At the same time, using new tools and media, the science of species ecology can reach new, broader scale, which could not be achieved by scientists working by themselves (Dickinson et al., 2012). Therefore, citizen science can be treated as the common weal that extends the awareness of the valuable, surrounding nature. We are currently observing the trend of inflorescence of thermophilic species of insects (Durak, Wojton, Dampc, & Mołoń, 2018), like bees – i.e. *Xylocopa* (Pawlikowski, Olszewski, Sikora, & Przybylińska, 2018), which creates an excellent opportunity to involve the public in monitoring the emergence very characteristic species. The development of technology and universal access to telephones allows also to use the potential of mobile applications, like the "Bumblebee Detector" application. The aim of the work is to present citizen science solutions functioning in our country in monitoring endangered bees species.

Materials and Methods

Research with the involvement of volunteers is carried under two projects: 1. "The Violet Bee Monitoring" - observations of violet carpenter bee *Xylocopa*, conducted since 2016; 2. "Find the Bumble Bee" - a study on the distribution of bumble bees *Bombus* - a study started in 2018. The volunteers involved into these projects are apprised by information campaign, provided by the Facebook profile of the NiC Association, Upper Lusatian Beekeepers' Association in Zgorzelec, local press, radio and television. Volunteers send photos of encountered insects: in case of Project No. 1 using the email address and FB, and in the case of Project No. 2 using the free application "Bumblebee Detector" available on Google Store for Android devices. The application is connected to the cloud, where information containing an insect photo, date and location are stored. Researchers signify an insect to a specific species, thus completing the database. Submissions are marked on the map of Poland including the UTM grid with the accuracy of 10x10 km.

Results

In „The Violet Bee Monitoring” project, within three years (2016-2018), 48 correct submissions from 42 different locations throughout the country were received (Figure 1). Insects are signified as specimens of *Xylocopa* genus, due to the two species present in our country, in most cases they are impossible to distinguish on the basis of individual photographs. In the "Find the Bumble Bee" project in 2018, 543 correct applications were received in the preliminary assessment. 24 species of the *Bombus* genus have been identified, which is 65% of the polish bumblebee fauna. Amongst the submitted photos were specimens of rare species, threatened with extinction and included on the Red List (Banaszak, 2002) (Nieto et al., 2014). These species are: *Bombus confusus*, *B. humilis*, *B. jonellus*, *B. muscorum*, *B. pomorum*, *B. ruderatus*, *B. subterraneus* and *B. veteranus*.

Fig. 1. Current distribution of *Xylocopa* in Poland (A-present, B-not present).

Discussion

The use of citizen science is effective and sensible for bee species that are easily recognizable in their habitats and have a characteristic appearance, like carpenter bee *Xylocopa*. At the same time, the research confirmed the expanding of the range of these species towards north (Michoła, Kelm, Sikora, & Sikora, 2015). The data obtained as part of „The Violet Bee Monitoring” project confirm that *Xylocopa* even reached Pomerania, and such a long range was recorded thanks to volunteers' submissions (Pawlikowski et al., 2018). In United Kingdom, where citizen science is an extremely developed and popular, volunteers successfully provide data on bees nesting in the so-called hotels and cottages (Macnally, Goulson, & Fowler, 2018). Bumble bees are bee species used in large-scale citizen science, due to their progressing threat worldwide. Such projects are: „Bumble Bee Watch” research programs in the United States (www.bumblebeewatch.org), "BeeWalk" in United Kingdom (www.beewalk.org.uk) and "Find the Bumble Bee" in Poland (www.nic.org.pl). The inclusion of volunteers in the observation of these insects gives very positive effects, such as confirmation of the presence of 8 rare and endangered species in Poland in less than a few months after the introduction of the "Find the Bumble Bee" application.

Acknowledgements

naturaiczlowiek@gmail.com
konferencjapszczoly@gmail.com

References

- Banaszak, J. (2002). Apoidea Pszczoły. In Z. Głowaciński (Ed.), *Czerwona Lista Zwierząt Ginących i Zagrożonych w Polsce* (pp. 69–75). Polska Akademia Nauk Instytut Ochrony Przyrody.
- Dickinson, J. L., Shirk, J., Bonter, D., Bonney, R., Crain, R. L., Martin, J., ... Purcell, K. (2012). The current state of citizen science as a tool for ecological research and public engagement. *Frontiers in Ecology and the Environment*, 10(6), 291–297. <https://doi.org/10.1890/110236>
- Durak, R., Wojton, A., Dampc, J., & Mołoń, M. (2018). New data on the distribution of *Mantis religiosa* in south - eastern Poland. *Wiadomości Entomologiczne*, 37(1), 5–14. Retrieved from <http://pte.au.poznan.pl/we/2018/37-1-Durak-i-in.pdf>
- Macnally, X., Goulson, D., & Fowler, R. (2018). Air Bee n' Bee: a citizen science study of man-made solitary bee hotels as a conservation approach. In *5th European Congress of Conservation Biology*.
- Michoła, P., Kelm, M., Sikora, A., & Sikora, M. (2015). The confirmation of *Xylocopa violacea* (LINNAEUS, 1758) (Hymenoptera: Apiformes) presence in Wrocław city area. *Wiadomości Entomologiczne*, 34(4), 67–76. Retrieved from https://www.researchgate.net/publication/290156949_Stwierdzenie_obecnosci_Xylocopa_violacea_LINNAEUS_1758_Hymenoptera_Apiformes_na_obszarze_Wroclawia-The_confirmation_of_Xylocopa_violacea_LINNAEUS_1758_Hymenoptera_Apiformes_presence_in_Wroclaw_city_ar
- Nieto, A., Roberts, S. P. M., Kemp, J., Rasmont, P., Kuhlmann, M., Criado García, M., ... Michez, D. (2014). *European Red List of Bees*. Luxembourg.
- Pawlikowski, T., Olszewski, P., Sikora, A., & Przybylińska, M. (2018). Dyspersja pszczoły zadrzewnej fioletowej *Xylocopa violacea* (Hymenoptera: Apidea) w Polsce. *Chrońmy Przyrodę Ojczystą*, 74(3), 220–223.