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Session 2 – New tools and approaches for detection and monitoring

CITIZEN SCIENCE PLATFORMS CAN EFFECTIVELY SUPPORT EARLY DETECTION OF INVASIVE ALIEN SPECIES ACCORDING TO SPECIES TRAITS

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Early detection and rapid response are essential to deal effectively with new introductions of invasive alien species (IAS). Citizen science (CS) platforms for opportunistic recording of species have the potential to harvest their data for early detection of IAS, but this has not been tested. We evaluated the effectiveness of CS platforms for early detection of IAS by obtaining data on 707 species x country combinations from Europe where there was both an official first record (i.e. published in scientific literature or by a government agency) and a record in a CS platform. We tested how the difference between the two (CS time lag) was related to species traits, popularity in CS platforms, public and research attention and regulatory status. We found that for 50% of species x country combinations the time lag was zero or with CS being earlier than the official record. Although we cannot determine causality (the first official record could have been from a CS platform, or contemporaneous with it), this demonstrates the relevance of CS platforms for early detection. The time lags were affected by species traits rather than the overall activity of citizen platforms per country. Compared to official records, vertebrates were more likely to have earlier records on CS platforms, than plants or invertebrates. Greater popularity of the IAS in CS platforms and its observation in neighbouring countries resulted in earlier CS reporting, while its inclusion in the EU priority list resulted in earlier official recording, reflecting the efficacy of targeted surveillance programmes. These findings demonstrate how CS platforms are a valuable source of information on early detection of IAS. However, there is still room for improvement to connect CS platforms with IAS surveillance including greater acknowledgement of the role of citizen scientists and a better data flow from CS into global databases.

Session 2 – New tools and approaches for detection and monitoring

THE FDEMIC PROJECT – TRACKING THE ROLE OF ALIEN AND INVASIVE SPECIES IN THE TRANSMISSION CYCLE OF FLAVESCENCE DORÉE (FD) PHYTOPLASMA IN SERBIA

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Flavescence dorée (FD) is a quarantine disease of grapevine caused by FD phytoplasma (FDp). This quarantine disease severely impacts both vineyard productivity and landscape management in Europe's key viticultural regions. While the pathogen itself is native to Europe, its transmission cycle is associated with several wild host plants, both native and alien, and a number of native and alien insect vectors. In addition to native plant species (*Alnus glutinosa*, *A. incana*, *Salix* spp., *Clematis vitalba* and *Corylus avellana*), alien plants (*Ailanthus altissima* and *Vitis riparia*) also act as constituents of the epidemiological cycle, forming part of the transmission route as plant reservoirs carrying FDp genotypes in riparian areas. Similarly, native and alien insect vector species constitute the routes of transmission inducing FDp outbreaks, as part of specific pathosystems. An alien leafhopper of Nearctic origin, *Scaphoideus titanus*, is well-known to be the main vector of FDp. Additionally, another alien leafhopper of Asian origin, *Orientalus ishidae* (the mosaic leafhopper), has been identified as a potential vector spreading FDp genotypes, thus posing an additional risk to European vineyards. The presence of established populations of *O. ishidae* have recently been confirmed in Serbia, where it was found in riparian areas in association with an invasive plant *V. riparia*. Consequently, the primary goal of this project will be to focus on natural riparian habitats and transmission cycles between and among native and exotic plants and planthopper/leafhopper species to understand how they interact with the vineyard agroecosystem and lead to FD outbreaks. Moreover, given that the Balkans is tentatively considered as the area of emergence of the FD3 genotypes inducing FDp epidemics, by studying its natural sources and reservoirs, we also aim to shed light on the monotypic epidemic of FD3 in the vineyards of Serbia.

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Session 2 – New tools and approaches for detection and monitoring

A HORIZON SCAN OF EMERGING TECHNOLOGIES FOR ALIEN SPECIES CITIZEN SCIENCE

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Citizen Science (CS) significantly contributes to the study and management of biological invasions. Technological developments such as social media, internet scraping, eDNA, apps, sensors, search engines and predictive analytics can foster projects and increase the reach of CS. The list of tech is long and their potential for alien species CS is unclear. To help research funders and project initiators we performed a horizon scan on the value of emerging technologies for alien species CS.

A network of 44 experts from the COST Action Alien-CSI identified and assessed 39 technologies. Assessors rated their usefulness on a 5-point Likert scale with respect to their potential to attract new audiences, improve inclusivity, applicability in daily life, ability to increase engagement, provide feedback, improve data quality and gather new data.

The results of the scoring were discussed at a consensus workshop. Consistency among ratings was explored using inter-rater reliability metrics and ordination techniques. Experts were asked to explain and discuss the reasons for inconsistent rating across technologies or criteria, focusing on the evidence used or differences in interpretation of criteria. After this, one new round of individual re-evaluation of technologies followed. The discussions resulted in increased consensus on the potential of the different technologies.

Mobile-based data collection platforms and social media (both their use to interact with CS participants as well as their potential for scraping new occurrence records) were the top-ranking technologies for IAS CS, followed by machine learning techniques, the application of AI and collective intelligence. Technologies differed considerably in their potential when different criteria were individually considered. For instance, DNA-based technologies ranked high on acquiring new data, open data technologies scored high on their potential to improve the quality of collected data. Virtual reality and gamification scored high on their potential to increase engagement in IAS CS.