

TIM ADRIAENS, INVASION BIOLOGIST AT THE RESEARCH INSTITUTE FOR NATURE AND FOREST, MET WITH PEN TO DISCUSS DATA COLLECTION AND VALIDATION WITH REGARD TO CITIZEN SCIENCE

Sharing for success

The Research Institute for Nature and Forest (INBO) is the Flemish research and knowledge centre for Nature and its sustainable management and use. It supplies knowledge to all those who prepare or make the policies, or those interested in them. INBO works primarily for the Flemish government but also supplies information for international reporting and deals with questions from local authorities. INBO supports organisations in Nature management, forestry, agriculture, hunting and fisheries. INBO is a member of international and European research networks such as COST and Alternet.

Pan European Networks met with one of INBO's research associates, Tim Adriaens, in Brussels at the 'Citizen Science and Open Data: a model for Invasive Alien Species in Europe' JRC-COST joint workshop – which focused on strategies for collecting and sharing data gathered by citizens, with the aim to support a European early warning and rapid information system – to discuss issues such as data collection and validation when it comes to citizen science.

What do you think is the best way to ensure the effective sharing of and access to data?

Reducing the barriers to data sharing will improve our ability to respond to the growing issue of biological invasions. The best way to do this is by being as open as possible with our data. When designing a project, we should think about how to maximise the use of data during and after the

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project – in this case, data collected by citizens. Drafting a data management plan is always a good idea.

We now have fantastic data aggregators in Europe, where people can access data in a standardised format, harvest them through web services and include them in their own tools and websites. To include data in such repositories is a perfect way of ensuring sustainable storage and maximising the use of citizen data. To this end, standards for data and metadata are important to consider when deciding on data collection. Data licensing should be as permissive as possible, while making sure providers are credited by citation.

As scientists we should be more open with our data ourselves, publishing and analysing them using transparent and repeatable workflows. This is a first step towards collaborative citizen science. In Belgium we recently launched the TrIAS (Tracking Invasive Alien Species – <https://osf.io/7dpgr/>) open science project which provides an example of good practice of such an approach for invasive alien species.

What do you think will be the best approach to take when it comes to the validation of citizens' contributions on invasive alien species?

The best way is to provide feedback on their contribution and to credit them for it. Volunteers record alien species because recording is fun, but they also want to feel their data are used for the greater good: conservation and research. So we should provide them with metrics on how often their data are used and to what purpose. Citizen science projects should invest in volunteer management and interaction, and communicate to users why their records are useful and how they are used.



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Social media can play an important role in providing feedback on survey campaigns and control actions.

To credit citizens' contributions, datasets should get digital object identifiers so they can be referenced and contributors should be acknowledged through citation. Data papers describing data collection and providing metadata are good ways of doing this. More and more data papers simply include all contributors to that dataset in the authorship.

What do you think will be the best approach to take when it comes to the quality assurance of invasive alien species data from citizen science?

There are several answers to that question. First, the level of validation required depends on what you're planning to do with the data. If you need to develop a rapid response to eradicate a grey squirrel that popped up in a new location within an EU member state, then it is crucial that that record is correct. Because of the legal rapid response obligation, government officials will want to go out in the field and check that record as well. To ensure information flow and easy

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access to the data, we should make sure that citizen science initiatives complement official government surveillance systems.

For scientific purposes, such as the drafting of invasion risk maps through distribution modelling, research shows that citizen science data can perform equally as well as that of professional scientists. Here, the trade-off between the amount and quality of the data comes into play. Nonetheless, data quality is of course an important issue for scientific purposes as well. Therefore, validation is key, and several mechanisms exist to ensure data quality. Pictures and other media files are important to the validation process and automated validation procedures can be built in to detect dubious records. Peer validation has the benefit of a big community of potential validators, but most systems use either scientists or trained volunteers that have a responsibility to validate certain taxa on those websites.

What is the best way to incentivise the sharing of data, and do you anticipate cross-border issues?

Incentivising the sharing of data is an important matter. From my experience, a lot of the big citizen science communities are run by conservation NGOs, which are incredibly busy; they have to manage Nature reserves, write policy briefs, and so on. Running a recording website is demanding in terms of human resources, so we should think about sustainable funding mechanisms for such initiatives.

Observation.org, for example, yields tens of thousands of records of species of EU concern, and only a small part of their data is openly accessible on data aggregators, often at low spatial accuracy. I think the reason for that



is twofold: first, they have limited funding to run the volunteer network. We should not be paying for biodiversity data; that is environmental information and should be open to all in the public domain. But we should be investing so that people can engage with those who collect and record them, to provide feedback and acknowledge them for their contributions.

Second, I think there is often a lack of technical capacity to map data onto standardised formats such as, for instance, the Darwin Core Archive that the Global Biodiversity Information Facility (GBIF – <http://www.gbif.org/>) uses. They have their hands full with engaging with the volunteers and the recorders, and often they just lack the technical capacity to put their data on to an open platform. That is where we can do a better job in liaising with those initiatives, incentivising them and reducing the barriers to share data, for example, by providing documentation of standards, training and user-friendly data publishing tools.

Is there enough motivation for citizens to take part in invasive alien species monitoring and early warning procedures? How could this be boosted?

To understand the target audience is key to any citizen science project. This is also true for invasive alien species programmes. We should try to get a good view on recorder needs and motivations. Getting outdoors is important to most of them, but people also want to feel like they are part of something and want to know their records are used. To characterise the volunteers, examining their environmental attitudes, motivations and satisfaction can be done through questionnaires. Actively recruiting specific volunteer profiles could be a way of retaining citizen scientists' engagement in the long run.

Early warning implies there could be a management action that follows. Indeed, the fact that invasive species are managed to the benefit of biodiversity using their records is an incentive for people to record things and be open with their data. However, there have been some cases where people withhold data because they don't agree with the management objectives or methods used. In general, I feel this is perhaps not a significant

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issue if you can involve a critical mass of people that record – and it should not prevent us from developing rapid response procedures for invasives. Regardless, it is important to tell people what is going to happen with their data; to be as open and as honest as possible. We should also generally increase the level of awareness in the EU about the invasive species issue, so people will become more open to having their records used in management programmes.

Where could future research priorities lie?

As a scientist, it is nice to study invasion processes, the drivers of invasions and so on. Yet, there is perhaps a need to move more towards the applied side of things and to get a better understanding of how we can do a better job managing certain invasive species. In my line of work, I have learned an enormous amount about managing invasives from engaging with practitioners. Quite often, we have to realise that we are not doing the right research for them.

There is still a gap between science and practitioners that we have to close. We can do this by engaging both scientists and practitioners in communities of practice, where we discuss with people on the ground what the research priorities should be. That is really also what participative citizen science should be about. The new global invasive species initiative INVASIVESNET (http://www.reabic.net/journals/mbi/2016/2/MBI_2016_Lucy_et_al.pdf) wants to exchange knowledge and data on invasive species as openly as possible. It wants to boost and support citizen science initiatives, as public engagement contributes to greater awareness of invasive alien species across society. Scientists, policy makers, practitioners and stakeholders alike should embrace such initiatives and get involved.

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