Justification Statement

Article title: Towards Essential Biodiversity Variables data products for monitoring alien invasive species.

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Special issue: Focus collection on Environmental Research Infrastructures: New Scientific Capabilities to Address Global Challenges. Guest editors: Francisco Bonet-García, Hank Loescher, et al.

How the article satisfies the publication criteria for Environmental Research Letters:

This article is submitted to the "Focus collection on Environmental Research Infrastructures: New Scientific Capabilities to Address Global Challenges". It reports a cooperative and interdisciplinary contribution addressing the operationalization of 'essential variables' (specifically, Essential Biodiversity Variables) in mature research infrastructures, and is at the intersection of environmental sciences (biodiversity science and ecology), computing/informatics, and infrastructure provision/policy. It will interest a wide spectrum audience of biodiversity and invasive species scientists and managers, informaticians, technologists, research (e-/cyber)infrastructure providers and users, and those with a social/political policy interest to support and fund infrastructures for biodiversity science and ecological research and decision-making.

What are the new results or developments reported in your article?

The article investigates the readiness of two mature research infrastructures, the Global Biodiversity Information Facility (GBIF) and the Atlas of Living Australia (ALA) to support practical operationalization of the Essential Biodiversity Variables (EBV) concept [1].

It posits that, given the significant investment needed in data preparation and the many steps involved, automated workflows hold significant promise for delivering precise and maintainable EBV related data products. It proposes and actions a specific practical, workable workflow for verifiably and consistently producing EBV data products, showing with the aid of an alien invasive species case study how such a data product can be used to reveal and interpret invasion trends.

In what way are these new results or developments timely?

It is now 5 years since the concept of EBVs was first proposed [1] and the present focus of attention, for example in Group on Earth Observations Biodiversity Observation Network (GEO BON) is today about practical implementation and operationalization of EBVs in the context of biodiversity observation and monitoring networks being established worldwide. Environmental sciences, with essential variables adopted elsewhere (climate, ocean, for example) will benefit with the emergence of viable EBVs as another component towards enabling better understanding of earth system processes and interactions. Policy initiatives, such the International Panel of Biodiversity and Ecosystem Services (IPBES), the Convention on Biological Diversity (CBD), and other responses addressing societal challenges will come, eventually to rely on EBVs as quantifiable measures as the basis for decision-making, from which composite indicators can be synthesised, etc. Thus, it is prudent today to be investigating and reporting on practicalities of preparing them.

Why are these new results or developments significant?

The work reveals – in the present state-of-the-art - the difficulties of practically executing workflows for reliably and repeatedly preparing and updating EBV related data products. This is due to the complexities of individual steps, the interplay of automation and expert human judgement needed, structural differences between different research infrastructures, differences in underlying data models, and the lack of automation to assist with mitigating errors, speeding the work and accurately recording what was done. The article concludes while infrastructures like GBIF and ALA are providing a wealth of relevant data, there are limitations. Addressing the infrastructural challenges is critical to realising the vision of global EBVs and infrastructure providers, scientists and technologists must work closely together to bring this about.

List of papers the work extends

[1]   Pereira H M, Ferrier S, et al. (2013). Essential biodiversity variables. Science 339 277–8.
        Online: http://www.sciencemag.org/content/339/6117/277.short

[2]   Brummitt N, Regan E C, et al. (2017). Taking stock of nature: Essential biodiversity variables
        explained. Biol. Conserv. 213 252–5.
        Online: http://www.sciencedirect.com/science/article/pii/S0006320716303652

[3]   Kissling W D, Ahumada J A, et al. (2018). Building essential biodiversity variables (EBVs) of species
        distribution and abundance at a global scale. Biol. Rev. 93 600–25.
        Online: http://doi.wiley.com/10.1111/brv.12359

[4]   Kissling W D, Hardisty A, et al. (2015) Towards global interoperability for supporting biodiversity
        research on essential biodiversity variables (EBVs). Biodiversity 16 99–107.
        Online: http://www.tandfonline.com/doi/full/10.1080/14888386.2015.1068709

[5]   Latombe G, Pyšek P, et al. (2017). A vision for global monitoring of biological invasions. Biol.
        Conserv. 213 295–308.
        Online: https://www-sciencedirect-com.abc.cardiff.ac.uk/science/article/pii/S0006320716302373?via%3Dihub

[6]   Navarro L M, Fernández N, et al. (2017) Monitoring biodiversity change through effective global
        coordination Curr. Opin. Environ. Sustain. 29 158–69.
        Online: https://www.sciencedirect.com/science/article/pii/S1877343517301665