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Book review:

The messiness and orderliness of data-making in biodiversity citizen science

Ekström, B. (2024). Winding paths to species reports : Information practices in biodiversity citizen science. [Doctoral thesis (compilation)]. Department of Library and information science, University of Borås. Accessible in University of Borås' Digital Academic Archive (DiVA).

> If I go out to see what I can find, I always keep binoculars and a [magnifying] loupe around my neck. I have some tubes in my pockets with labels and alcohol. [...] But then I can stop at a spot and use my net as a beat net. I will beat around the vegetation among plants without seeing what is there. Then you will find quite a lot of insects and then you have to kneel and see what you have captured in the net (Adam). (Ekström, 2022a, p. 255)

Introduction

In *Winding paths to species reports*, Björn Ekström sets out to explore a key question in library and information science research. What do we uncover when we look beyond the surface of 'research data'—a principal currency in many contemporary domains, including academia and AI—and begin to untangle what data is, where it originates, and how the complexities of its making shape its interpretation and application in various epistemic pursuits?

Although also explored using alternate and at times competing conceptualizations, like information and documentation (cf. Frohmann, 2014), library and information studies (LIS) has demonstrated longstanding interest in research data, particularly in how research data comes to be (see e.g., Huvila et al., 2024). Under the broader information-studies umbrella, this interest spans also, for example, the extensive archival-studies literature on provenance (Lemieux, 2018). Several overarching findings emerge from this body of work on research data-making. A key insight is that research data-making is inherently bounded, as it is shaped by specific practices, material resources, and epistemic elements such as disciplinary horizons and intellectual traditions. Another important finding is while the making of research data is in this sense constrained, modes of data-making have the potential to evolve quickly and vary greatly across and within scholarly domains in a way that is difficult to quantify. Continuous and naturalistic inquiry into different areas of research data-making emerges as the primary approach to grasping the moving target of scholarly data work and, ultimately, what research data is and how it can be used to elicit insight about the workings of the world.

Björn Ekström's doctoral dissertation in LIS, fully titled *Winding paths to species reports: Information practices in biodiversity citizen science* (2024b; University of Borås) contributes to this line of research by addressing the understudied issue of how data is made in citizen science. Citizen science is a prevalent area of scholarly research, characterized by substantial volunteer ('citizen') participation and contribution. *Winding paths* focuses specifically on biodiversity citizen science—an area of data-making on flora and fauna in service of a wide range of research objectives related to climate and environment issues, including sustainability, biological variety, and climate change. Ekström's approach to studying how data is made within the sociomaterial and complex informational space of biodiversity citizen science is exemplified by the quote above. The quote highlights a common first step in biodiversity data-making: observations made in the field by volunteers conducting plant and animal inventories in a specific area. Through interviews, participant observation, and trace data analysis and visualization (see Figure 1) conducted in a Swedish context, *Winding paths* seeks to follow the trajectories and transformations of biodiversity citizen science data from initial field observations to published datasets accessible in repositories such as Artportalen and iNaturalist.

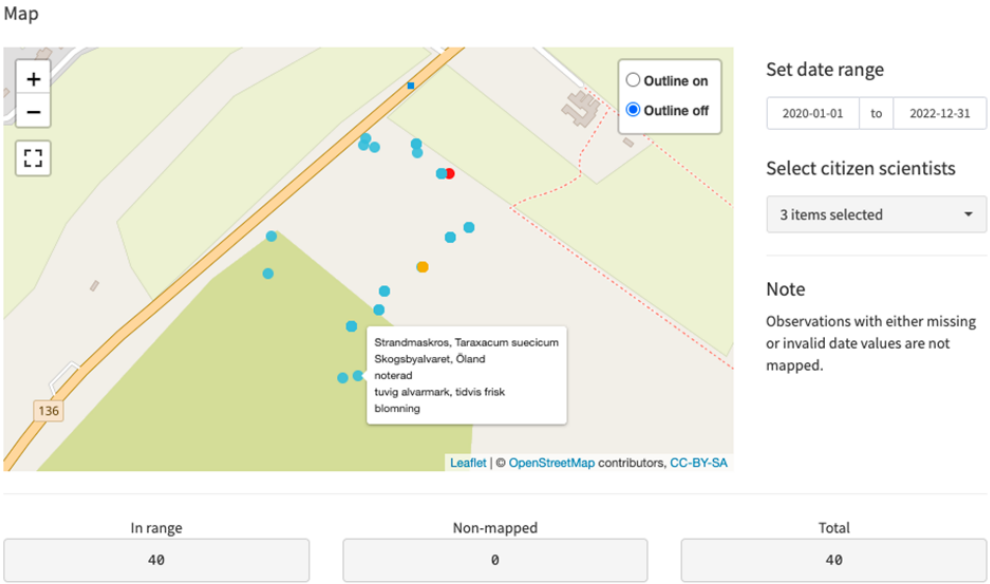

Figure 1. An example of how Ekström supplements his inquiries into data-making in biodiversity citizen science using a GIS-driven methodology based on participant observations and trace data analyses. (Ekström, 2024a, p. 12)

The path to *Winding paths*: theoretical and empirical underpinnings

Winding paths is based on four single-authored papers published in both LIS and science and technology studies (STS) outlets. The dissertation's theoretical foundation reflects this multidisciplinary approach: while the cornerstone of the framework for exploring citizen science data-making is practice theory—operationalized primarily through the concept of information practices—additional components are drawn from STS and STS-adjacent fields of research. These include, for example, boundary objects, epistemic objects, and theories addressing the interconnectedness social and material aspects in endeavors of humans (and things).

The dissertation's four papers demonstrate breadth and complexity in both conceptual and empirical work. The first paper (Ekström, 2022b) builds on a small interview study of biodiversity volunteers, supplemented with trace data analysis, to develop 'trace data visualization enquiry'. This visual method is designed to facilitate studying temporal and geographic aspects of information practices within scholarly settings. The second (Ekström, 2022a) and third (Ekström, 2023) papers report on a more comprehensive interview study of biodiversity volunteers. Together, these papers make two crucial contributions to the empirical findings of *Winding paths*: they offer a mapping of the nexus information practices enacted in biodiversity citizen science data-making and an analysis of how the fields' scholarly value base—specifically authority, credibility, and validity, to lesser degree quality and trustworthiness—arise from and throughout the same nexus of practices. Finally, the dissertation's fourth paper (Ekström, 2024a) applies Ekström's trace data visualization approach to, on the basis of participant observation of a field excursion, elucidate the opportunities and constraints offered by tools, repositories, and other material resources enacted in the information practices underpinning data-making in biodiversity citizen science.

Advancing trace analysis and the understanding of data trajectories

Ekström's *Winding paths* advances the state-of-the-art by showing how information practices of data-making unfold in biodiversity citizen science, convincingly highlighting the sociomaterial complexities inherent in these practices. A major finding in the dissertation is that data-making in this context is enacted through information practices such as observation, identification, reporting, collecting, and curating, validating, and making decisions based on species reports. These practices, as revealed through the dissertation's constitutive papers, emerge as interconnected, variable, messy, and constrained by the diverse sociomaterial realities at play. The identified information practices are shaped not only by the objects and information systems they involved but also by social dynamics. For instance, competition among volunteers is shown to impact the comprehensiveness of biodiversity data. Another important contribution of *Winding paths* is its analysis of the wide range of tools and resources—ranging from loupes to taxonomic features in data-reporting information systems—and their material qualities, which influence how biodiversity data-related information practices unfold through the mechanism of negotiation. These negotiations occur both in the field and during the critical data transitions, such as when species observations are transformed into observational data and when observational data is reported to repositories. Additionally, Ekström's dissertation contributes to a long line of studies (e.g., Faniel et al., 2016; Yakel et al., 2024) exploring how authority, credibility, and validity intersects with different modes of research-in-practice. While the manifestations and underpinnings of these values are relatively well documented in other collaborative settings, such as the wiki-domain and in other research environments (e.g., Rolland and Lee, 2013; Sköld, 2017), they remain comparably under-studied in the context of citizen science.

Ultimately, *Winding paths* addresses the questions it set out to explore and provokes new reflections and considerations. While trace-data analysis is not a new approach (cf. Geiger and Ribes, 2011; Schuurman, 2008; Sköld, 2013), it offers significant promise for understanding and

reconstructing the practices and processes of human-machine interactions in information systems. Despite its potential, this approach has seen relatively little research attention even as recent LIS studies have highlighted its great value (see e.g., Börjesson et al., 2022a; Börjesson et al., 2022b; Huvila et al., 2023). Ekström's contributions to trace methodology serves as a timely reminder of the many benefits that a more extensive use of trace data could bring to LIS inquiry. Equally important to discerning how varieties of trace data can be matched to different research objectives are the metatheoretical considerations raised by Ekström's contributions, particularly those underlined by the combination of trace data analyses with interviews and participant observations in this dissertation. Central to these considerations is the issue of how the often information-poor but quantitatively abundant characteristics of trace data can be combined with and support constructionist research ventures, where the research paradigm is frequently adapted to processing multifocal and 'rich' qualitative data.

Treading further down winding paths

> Through messy and entwined practices, streamlined and tidy species data are eventually formed. (Ekström, 2024b, p. iv)

Winding paths also emphasizes the need for continued inquiry into the machinery of scholarly knowledge production, particularly the interplay of human and non-human actors and the structures that they work through, in relation to, and sometimes against. Ekström concludes that the information practices of data-making in biodiversity citizen science are simultaneously messy and orderly. In other words, the doings and sayings comprising these the practices are carried out in local settings using various of means and yielding different outputs, yet they remain but ordered within the telefoaffective constraints of information practices they manifest. Questions remaining for future research ventures building on the path set by *Winding paths* might explore the extent to which the 'orderly' set of biodiversity information practices are indeed 'messy', and to look for order in the diverse minutiae of action and tool-use in the field, among the bushes, reeds, and swarms of insects. Expanding on this line of thought, the depiction in *Winding Paths* of how biodiversity data travels from not seldom app-based observation sheets to pre-processed and downloadable datasets presents a fairly ordered and stable sociomaterial and epistemic world. Further inquiry into citizen science data-making could offer new insights by turning the analytical searchlight to find and reflect on also conflict, processuality, and ambiguity across the many settings and sociomaterial actors present in volunteer-driven science.

In summary, Ekström's *Winding paths* makes a notable contribution to information-practice research in scholarly settings, offering a comprehensive analysis of data-making in an area of science with notable importance and weight. Additionally, the dissertation provides methodological advancements in trace data analysis, with potential applications across a wide range of areas and topics within LIS research.

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