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March 3rd – March 7th
Officine Cantelmo, Lecce IT

Open Science and Data citation

#CiteTheDOI

Dag Endresen – GBIF Norway, University of Oslo



Funded by
the European Union

Dag Endresen
University of Oslo
GBIF Norway

March 2025



BioDT winter school, Lecce, Italy| 4th March 2025

- 🔥 Open science
- 🔥 Data citation
- 🔥 Metadata
- 🔥 Data papers
- 🔥 GBIF #CiteTheDOI
- 🔥 GBIF data API



- We are in the middle of an **ongoing paradigm shift** in scientific practice (and impact metrics).
- Young scientists will (already today) need **different skills**, than was needed previously – to succeed in academia.



- **Open science** is the movement to make scientific research (*including publications, data, physical samples, and software*) and its dissemination accessible to all levels of an inquiring society, amateur or professional (Woelfle *et al.* 2011).
- **Open science** is transparent and accessible knowledge that is shared and developed through *collaborative networks* (Vicente-Saez *et al.* 2018).
- **Open Science** can be seen as a *continuation of*, rather than a revolution in, practices begun in the 17th century with the advent of the *academic journal* (David 2004).



- Woelfle, M.; Olliaro, P.; Todd, M. H. (2011). "Open science is a research accelerator". *Nature Chemistry*. 3 (10): 745–748. doi:10.1038/nchem.1149
- Vicente-Saez, Ruben; Martinez-Fuentes, Clara (2018). "Open Science now: A systematic literature review for an integrated definition". *Journal of Business Research*. 88: 428–436. doi:10.1016/j.jbusres.2017.12.043
- David, P. A. (2004). "Understanding the emergence of 'open science' institutions: Functionalist economics in historical context". *Industrial and Corporate Change*. 13 (4): 571–589. doi:10.1093/icc/dth023
- https://en.wikipedia.org/wiki/Open_science



1. Data to be legitimate **citable** products of research.
2. Data citations giving **scholarly credit** and attribution.
3. In scholarly literature, whenever claims are based on data, **data should always be cited**.
4. Persistent method for **identification of data**, that is machine actionable, globally unique, universal.
5. Data citation facilitate **access to data** or at least to **metadata**.
6. **Unique identifiers** that persist even beyond the lifespan of the data.
7. Data citation identify and access the specific data that **support verification** of the claim (provenance, time-slice, version).
8. Flexible, but attention to **interoperability** of practices across communities.

*To incentivize the sharing of useful data, the scientific enterprise needs a well-defined **system that links individuals with reuse of data sets they generate***

Pierce *et al.* Credit data generators for data reuse,
Nature 6 June 2019



- Data produced using **public funds** should be regarded as a common good, and should be made available for inspection, interpretation and re-use by third parties.
- Needless **duplication** of data-collecting **efforts and costs** will be reduced.
- Open data increases transparency and overall **quality of research**.
- Published data can be re-analysed, verified, and **improved by others**.
- Data publication increase **recognition and opportunities** for collaboration.
- Published data can be **cited and re-used**, either alone or in combination with other data.
- Data owners and collection managers can **trace data use and citation**.
- Data creators, their institutions and funding agencies can be credited.
- Data can be integrated with other datasets across space and time.
- Open data increases potential for interdisciplinary research and re-use in **new contexts not envisioned by the data creator**.

- **Peer-reviewed scholarly papers** in high impact journals still maintain considerable weight for impact metrics.
- A **movement** is under way to **build similar status** for open data, open metadata, open material samples, and other **open access scientific research products**...



- DORA recognizes the need to improve the ways in which the outputs of scholarly research are evaluated.
 - Worldwide movement covering all scholarly disciplines and all key stakeholders including funders, publishers, professional societies, institutions (universities), and researchers.
-
- Developed in 2012 in San Francisco
 - To date, 22 518 individuals and 3 433 organizations in 166 countries have signed DORA.
 - The Research Council of Norway (RCN) signed DORA in May 2018 [\[link\]](#)

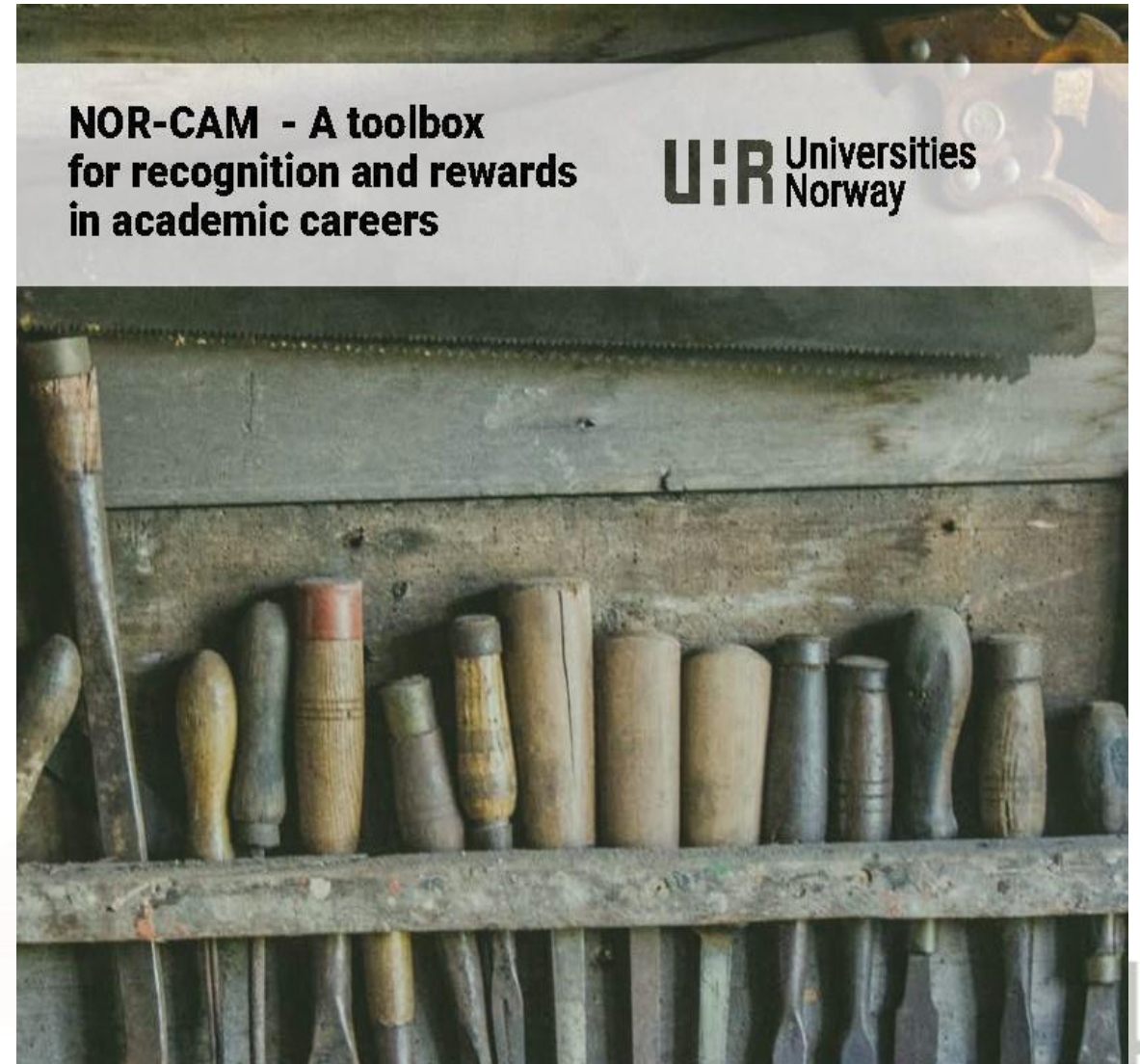


Guiding principles for the assessment and evaluation of research(ers) in light of the transition to Open Science. Proposes a more holistic framework for recognition and rewards in academic research assessment.

Academic institutions when recruiting academic and scientific staff; in processes related to promotion from one scientific career stage to the next; career guidance of employees by department and research leaders

Funders when assessing project managers and participants in connection with research applications.

National authorities when evaluating of Norwegian research and education.



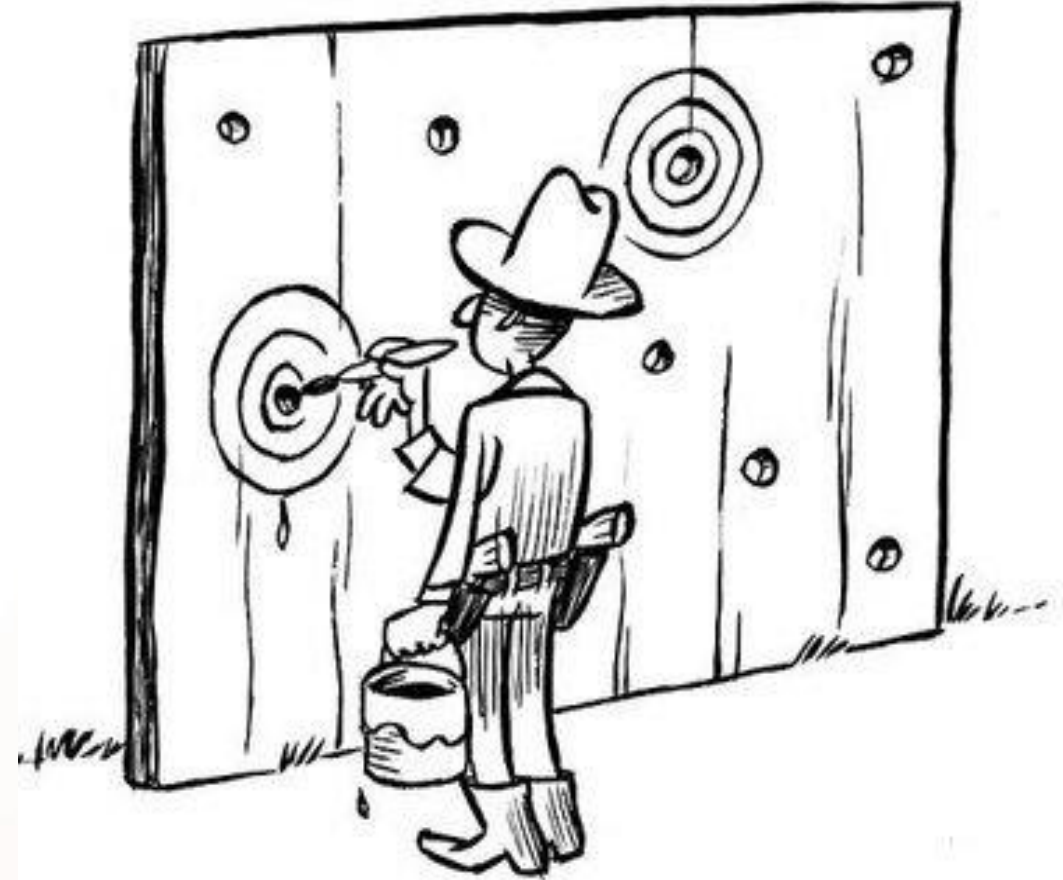
"Scientific irreproducibility — the inability to repeat others' experiments and reach the same conclusion" (Nature 2016)

Baker (2016) 1,500 scientists lift the lid on reproducibility. Nature. doi:10.1038/533452a



- Recent studies indicates that **p-hacking** ^[1] is a significant problem – sometimes even without the scientist even being aware of doing so (Ioannidis 2005; Head *et al.* 2015)
- **Pre-registered (open) data** provides a good insurance against suspicion of both data dredging (and plain data falsification).

[1] “p-hacking,” (data dredging, data fishing, ...) occurs when researchers collect or select data or statistical analyses until nonsignificant results become significant.



Ioannidis (2005). "Why Most Published Research Findings Are False". PLoS Medicine. doi:10.1371/journal.pmed.0020124.
Head *et al.* (2015) The Extent and Consequences of P-Hacking in Science. PLoS Biol. doi:10.1371/journal.pbio.1002106



Meta-
data

Why metadata?

In general, metadata should allow a prospective end user of data to:

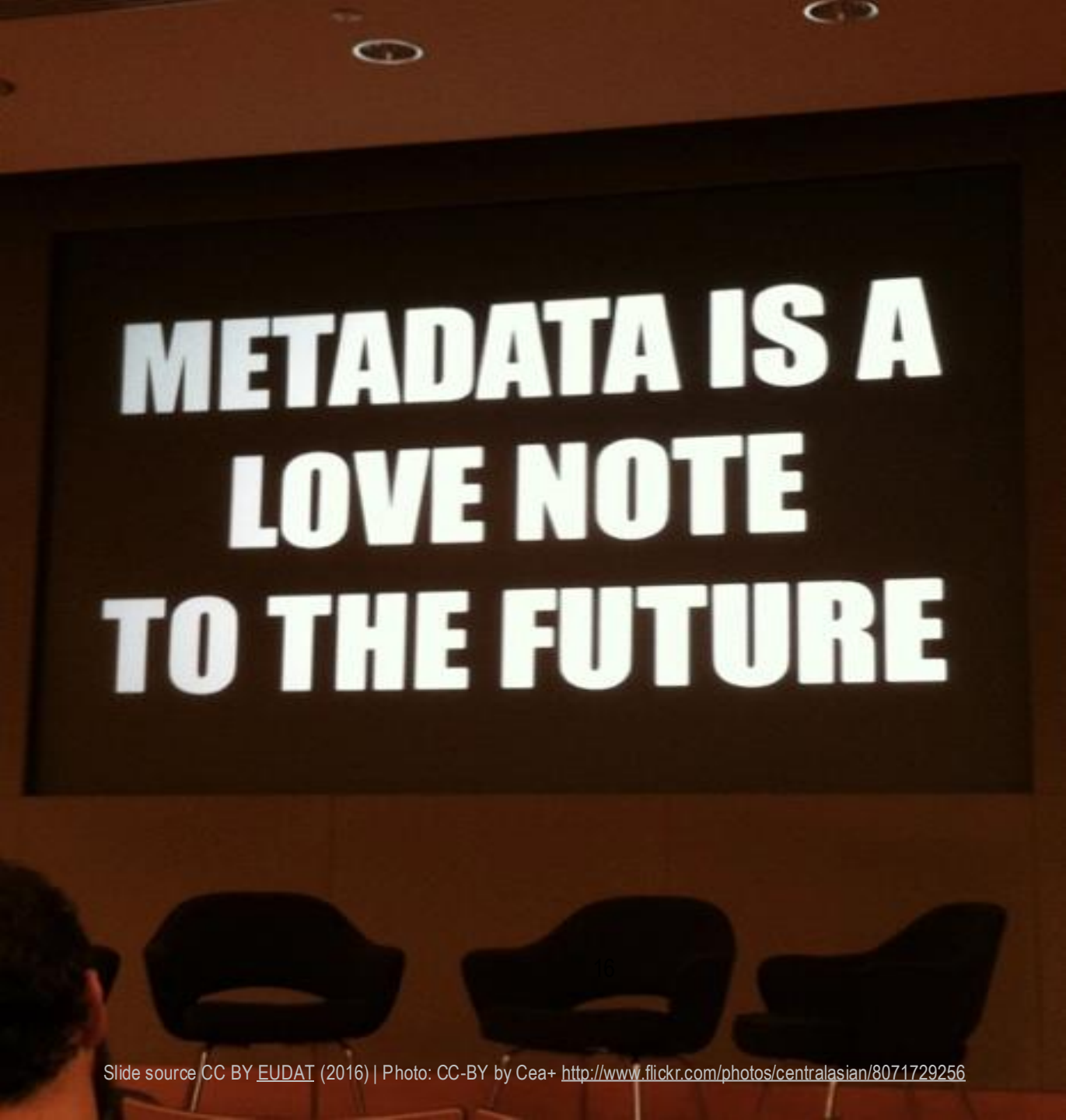
1. identify/discover its existence,
2. learn how to access or acquire the data,
3. understand its fitness-for-use,
4. learn how to transfer (obtain a copy of) the data, and
5. learn how the data should be used.

Photo CC BY-SA [Jennifer Fagan-Fry \(NOAA\)](#) | GBIF Metadata Profile (2011) <https://github.com/gbif/ipt/wiki/GMPHowToGuide>

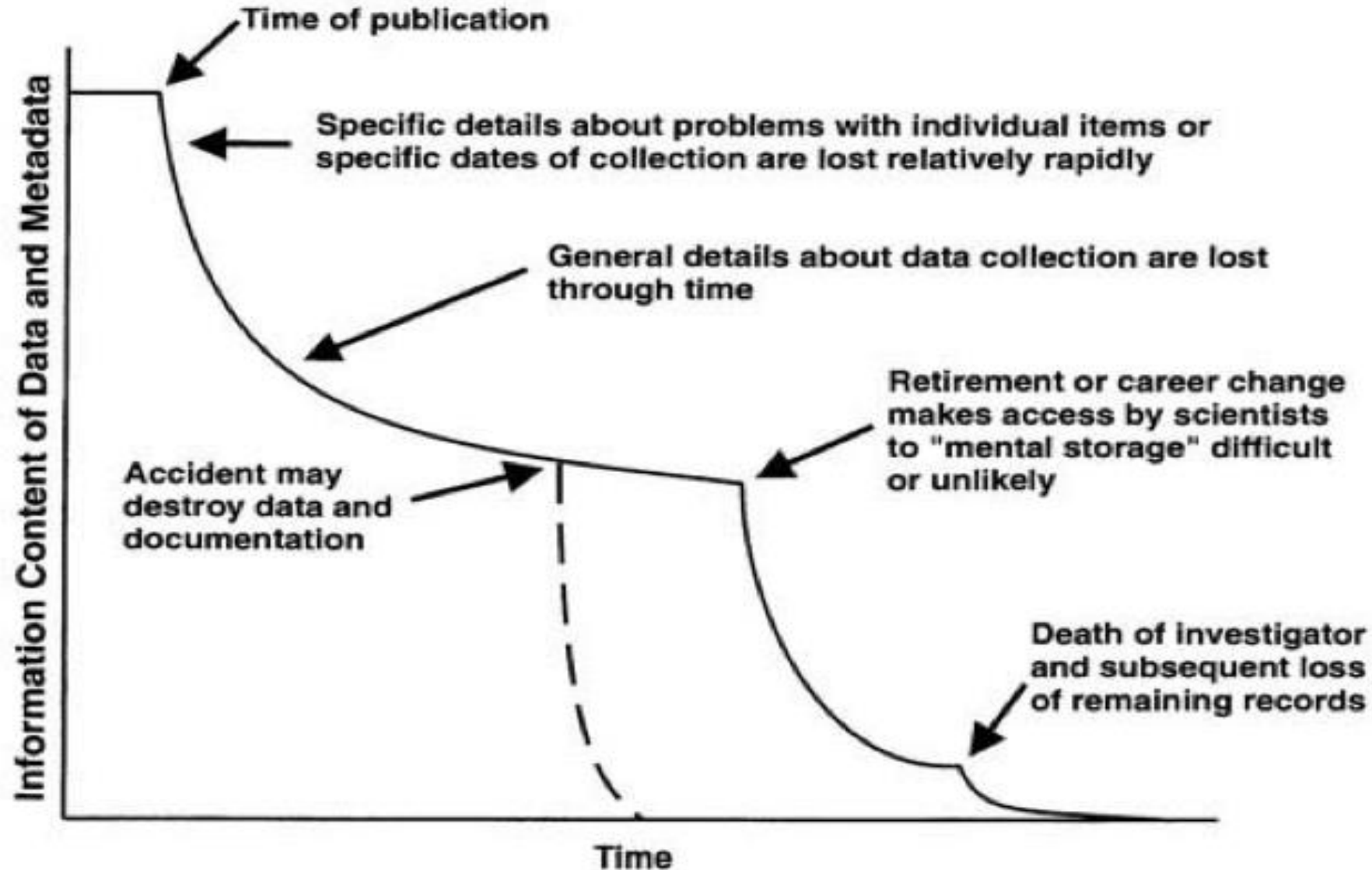


What is Metadata?

Metadata, literally “*data about data*” are an essential component of a data management system, describing such aspects as the “what, where, when, who and how” pertaining to a resource.



**METADATA IS A
LOVE NOTE
TO THE FUTURE**





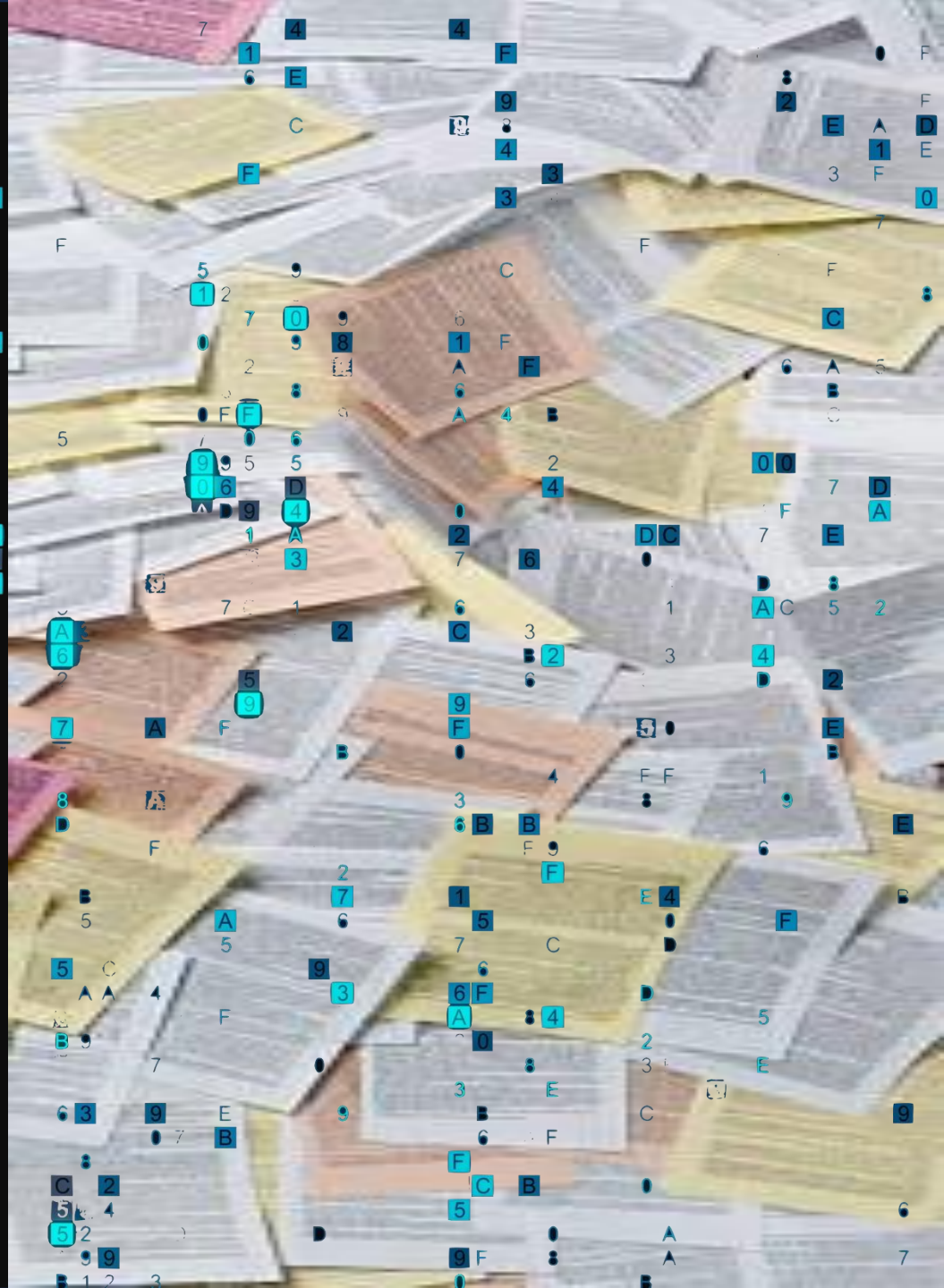
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Data papers

Data Paper



What is a «*data paper*»?

A data paper is a peer reviewed document **describing a dataset**, published in a peer reviewed journal. It takes effort to prepare, curate and describe data. Data papers **provide recognition** for this effort by means of a scholarly article.

- Getting **scholarly recognition** for your datasets.
- Promote and improve the **fitness for reuse** of your research data.

<https://www.gbif.org/data-papers>



Data papers explained

A data paper is a metadata document, describing a particular dataset or a group of datasets, published in the form of a peer-reviewed article in a scholarly journal.

Unlike a conventional research article, the primary purpose of a data paper is to **describe data** and the circumstances of their collection, rather than to report hypotheses and conclusions.

GBIF has been working with partners in academic publishing to promote the data paper as a means of bringing **credit and recognition** to all those involved in data publication.

<https://www.gbif.org/data-papers>



Why publish data papers?

Authoring clear, informative **metadata** is an essential step if biodiversity data are going to be discovered and used to inform research and decisions. **This involves extra work, and data publishers need incentives to do it.** In the absence of such incentives, too many datasets are published with poorly-documented metadata or, worse still, no metadata at all.

Data papers help to overcome barriers to **authoring of metadata** by **providing clear acknowledgement of all those involved** in the collection, management, curation and publishing of biodiversity data.



By publishing a data paper

Receive credit through indexing and **citation of the published paper**, in the same way as with any conventional scholarly publication, offering benefits to authors in terms of recognition and career building.

Increase the visibility, usability and credibility of the data resources you publish.

Track more effectively the **usage** and **citations** of the data you publish.



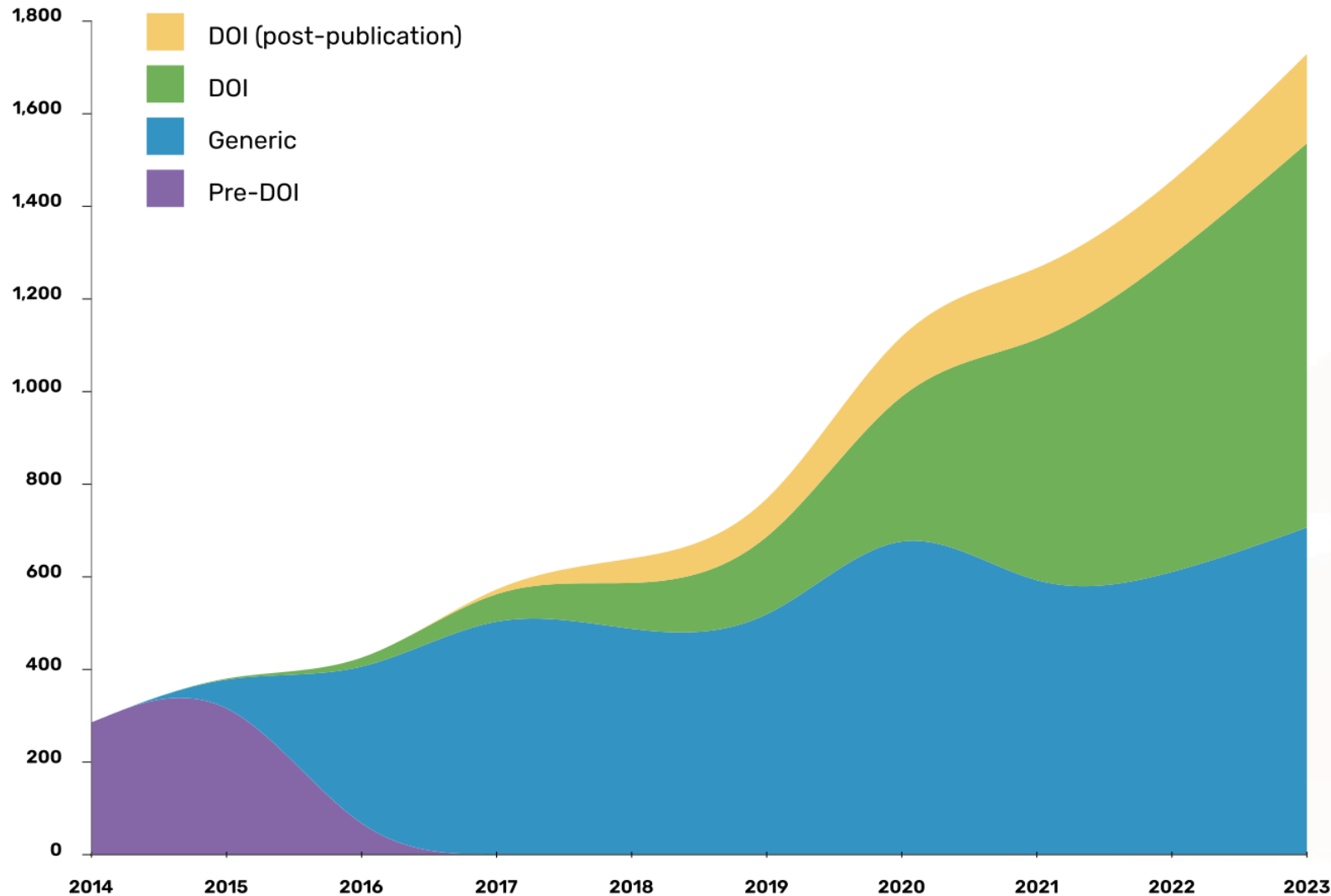


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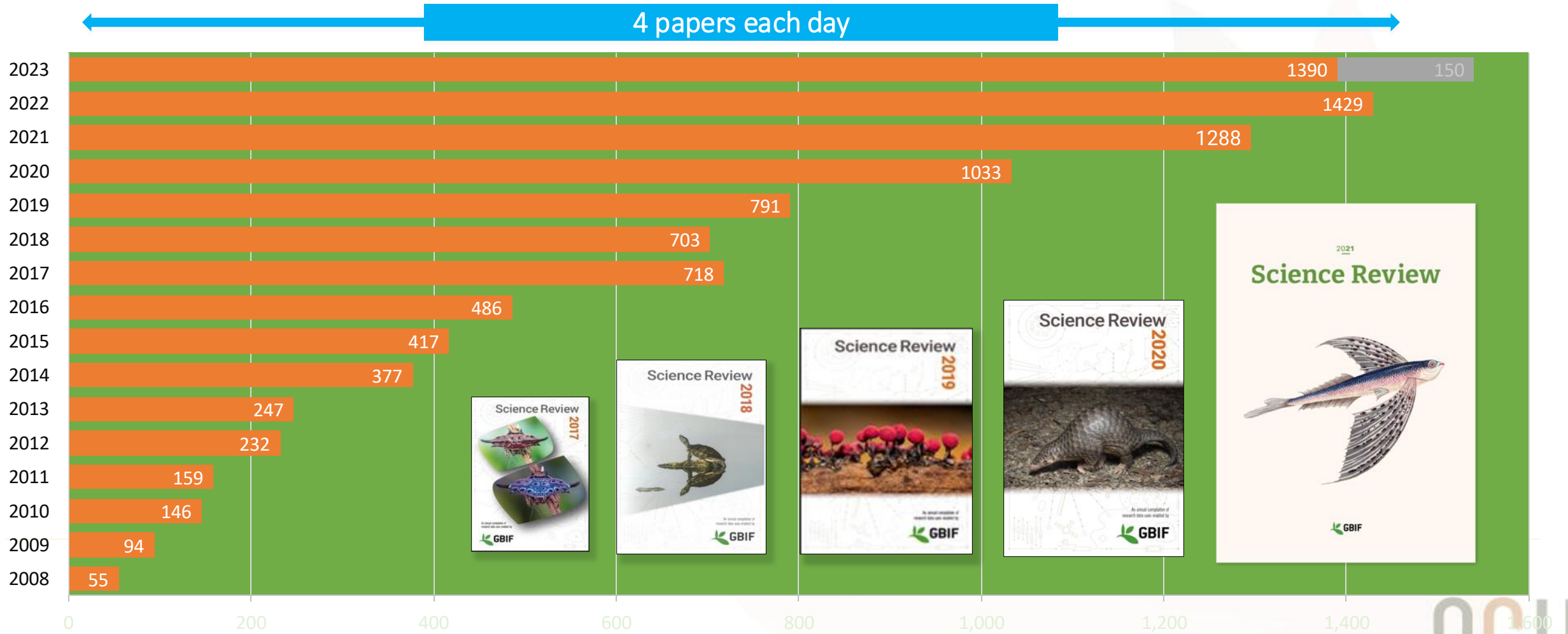


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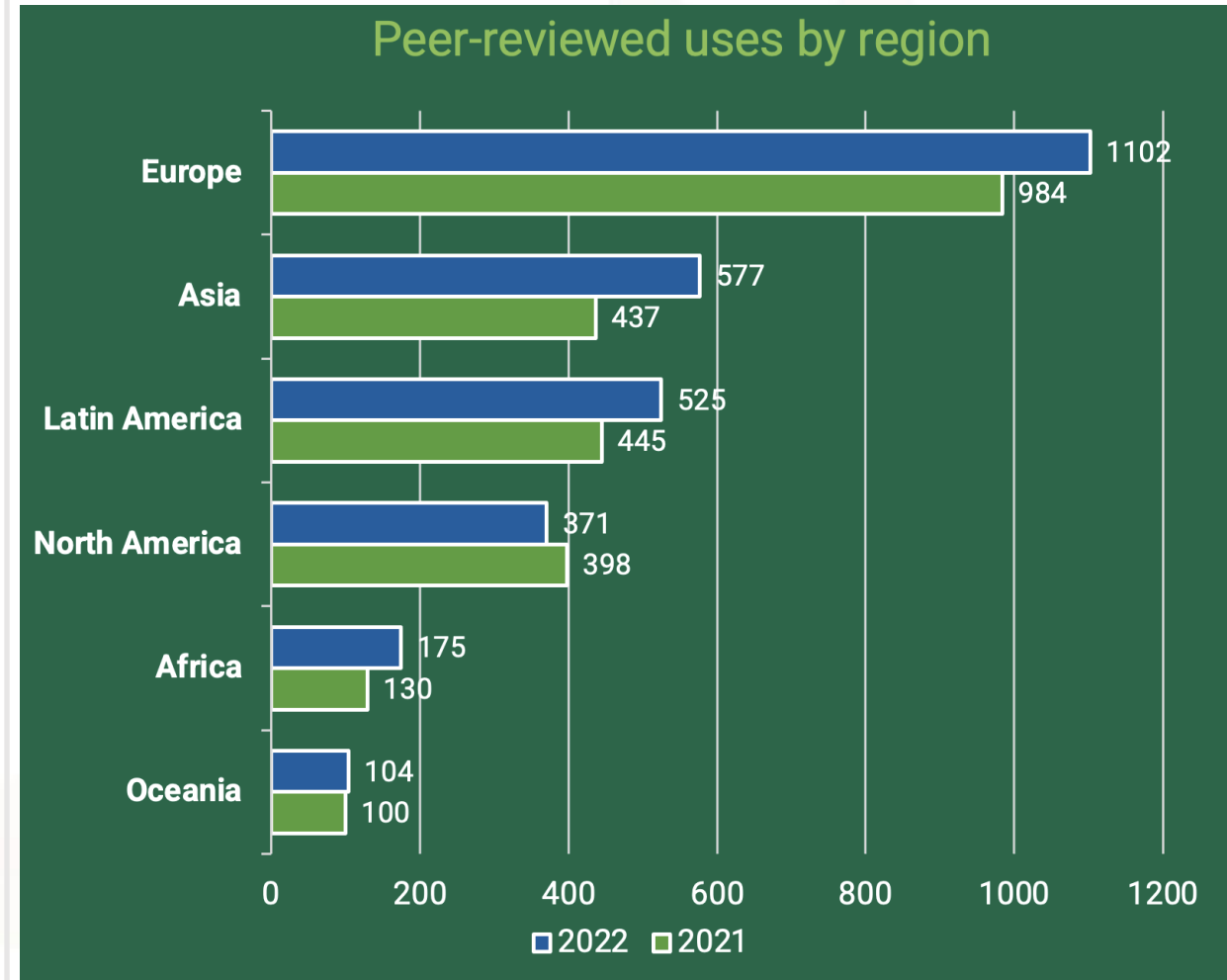


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1	United States	306	292	328
2	China	300	300	228
3	Brazil	145	152	147
4	United Kingdom	144	146	137
5	Germany	126	120	131
6	Mexico	105	131	134
7	Spain	95	100	103
8	France	88	75	75
9	Australia	80	78	69
10	India	61	62	35
-	Norway	30	41	37



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JSE Journal of Systematics and Evolution

Research Article | [Free Access](#)

Phylogenomics, biogeography, and evolution of the blue- or white-fruited dogwoods (*Cornus*)—Insights into morphological and ecological niche divergence following intercontinental geographic isolation

Kira Lindelof, Julieta A. Lindo, Wenbin Zhou, Xiang Ji, Qiu-Yun (Jenny) Xiang

First published: 27 August 2020 | <https://doi.org/10.1111/jse.12676> | Citations: 1

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Abstract

The eastern Asian (EA)—eastern North American (ENA) floristic disjunction represents a major pattern of phylogeography of the Northern Hemisphere. Despite 20 years of studies dedicated to identification of taxa that display this disjunct pattern, its origin and evolution remain an open question, especially regarding post-isolation evolution. The blue- or white-fruited dogwoods (BW) are the most species-rich among the four major clades of *Cornus* L., consisting of ~35 species divided into three subgenera (subg. *Yingqiania*, subg. *Mesomora*, and subg. *Kraniopsis*). The BW group provides an excellent example of the EA–ENA floristic disjunction for biogeographic study due to its diversity distribution centered in eastern Asia and eastern North America, yet its species relationships and delineation have remained poorly understood. In this study, we combined genome-wide markers from RAD-seq, morphology, fossils, and climate data to understand species relationships, biogeographic history, and ecological niche and morphological evolution. Our phylogenomic analyses with RAxML and MrBayes recovered a strongly supported and well-resolved phylogeny of the BW group with three intercontinental floristic clades in EA and ENA or Eurasia and North America, of which two are newly identified within subg. *Kraniopsis*. These analyses also recovered a

References

Adams DC, Berns CM, Kozak KH, Wiens JJ. 2009. Are rates of species diversification correlated with rates of morphological evolution? *Proceedings Biological Sciences* 276: 2729–2738. [Crossref](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

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High silicon concentrations in grasses are linked to environmental conditions and not associated with C4 photosynthesis

Brighly, H. Hartley, S. Osborne, C. Simpson, K. Strömberg, ... (2020) *Journal of Ecology*
The uptake and deposition of silicon (Si) as silica phytoliths in grasses among land-use
fractions. Among these, herbivore defecation has received little attention, particularly in
grasses. Grasses are well known for their high silica...

C4 photosynthesis • grass • grassland • herbivore • phytolith • silicon
Journal article | Peer-reviewed
Data referenced in study DOI: 10.15466/dl.heuwig

Temperature change in subtropical southeastern Africa during the past 790,000 yr

Zeveloff, M. Chazdon, L. Quirk, L. Dupont, L. Johnson, T. (2020) *Geology*
Across the geographic cycles of the late Pleistocene (~700 ky), temperature variability at low latitudes is often compared to variability in precipitation. However, a paucity of quantified temperature variability at low latitudes is a major gap in our understanding of climate change.

Journal article | Open access | Peer-reviewed
Data referenced in study DOI: 10.15466/dl.7g3yht DOI: 10.15466/dl.cfrzuz DOI: 10.15466/dl.h8ri1x
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DOI: 10.15466/dl.rdwzq DOI: 10.15466/dl.wamr

Landscape Analysis for the Specimen Data Refinement

Walton, S. Livermore, L. Bärnk, O. Cubey, R. Drinkwater, R. Englund, M. ... (2020) *Methods and Outcomes*
This report reviews the state-of-the-art applied approaches on automated tools and workflows for extracting information from images of natural history specimens and their labels. We consider the potential of repurposing existing tools, including workflow management systems; and, as...

collections digitization • data reconciliation • data refinement • digitisation • linked open data • machine learning • specimen data
Journal article | Open access | Peer-reviewed
Data referenced in study DOI: 10.15466/dl.8pg57z

Phylogenomics, biogeography, and evolution of the blue- or white-flowered woodwoods (Curnus) - insights into morphological and ecological niche divergence...

Lindner, J., Zhou, J., Zhou, W., Ji, X., Xiang, Q. (2020) *Journal of Systematics and Evolution*
The genus *Curnus* (EA) - eastern North American (ENA) floristic distribution represents a major pattern of phylogeography of the origin of the Neotropics. Despite 20 years of studies dedicated to identification of taxa that display this disjunct pattern, its original origin remains an open question, esp...

Curnus • RAD-seq • biogeography • eastern Asian-eastern North American disjunction • ecological niche and morphospace • phylogenomics
Journal article | Peer-reviewed
Data referenced in study DOI: 10.15466/dl.4tufvt DOI: 10.15466/dl.5u3ypp DOI: 10.15466/dl.63wryl
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DOI: 10.15466/dl.yp3my7

Expansion dynamics and marginal climates drive adaptation across geographic ranges

Bronrager, M. Usui, T. Lee-Yaw, J. Anstett, D. Branch, H. Hargreaves, A. ... (2020) *bioRxiv*
Every species experiences limits to its range edge. Some evolutionary models predict that populations at range edges are less well-adapted to their local environments due to drift, expansion load, or swamping gene flow from the range interior. Alternatively, populations near range edges...

Local adaptation • expansion load • geographic range limit • peripheral population • quantitative synthesis • transplant experiment
Working paper | Open access
Data referenced in study DOI: 10.15466/dl.0kmuse DOI: 10.15466/dl.20uzjg DOI: 10.15466/dl.2u06en
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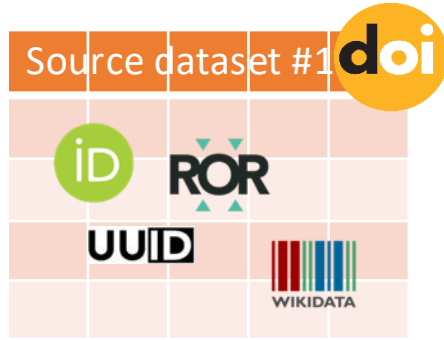
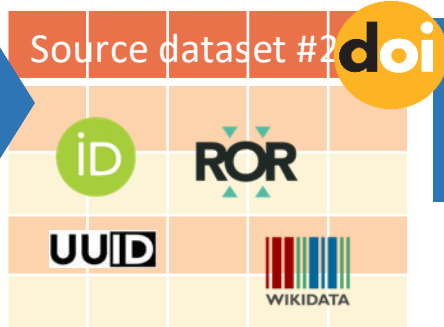
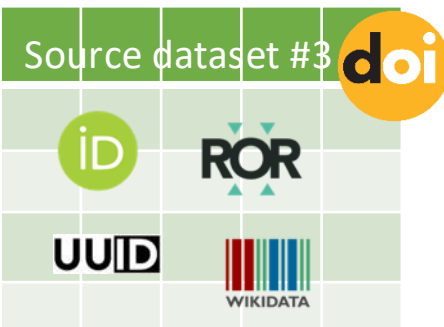
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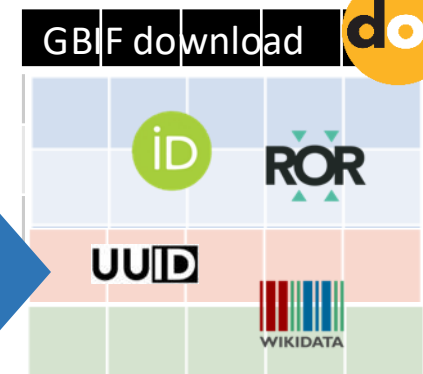


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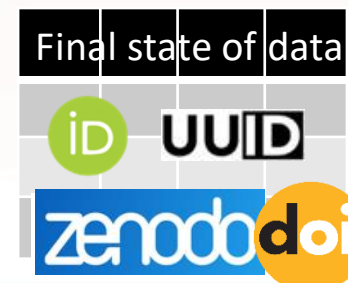


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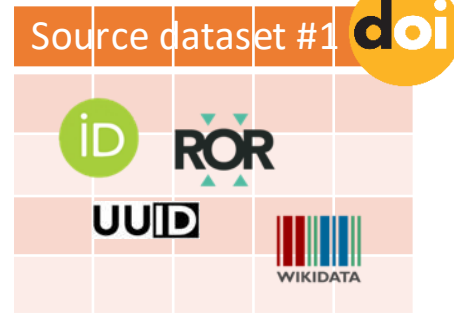
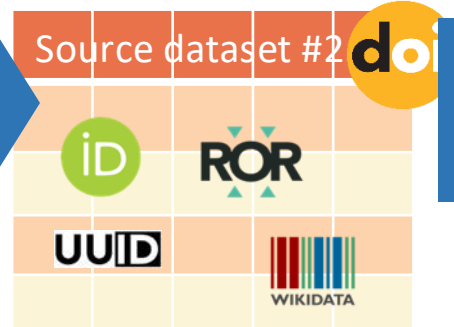
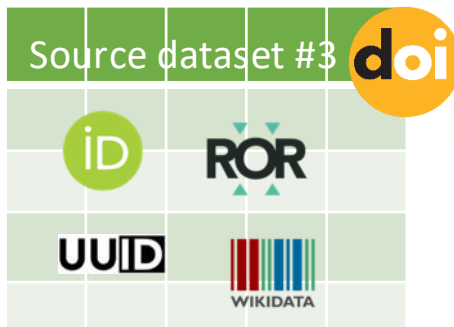
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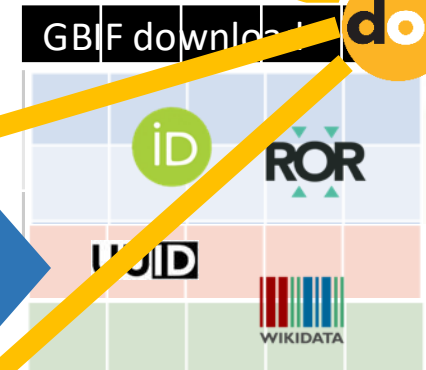
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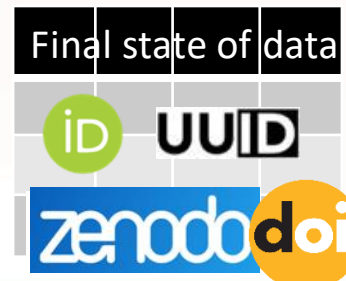
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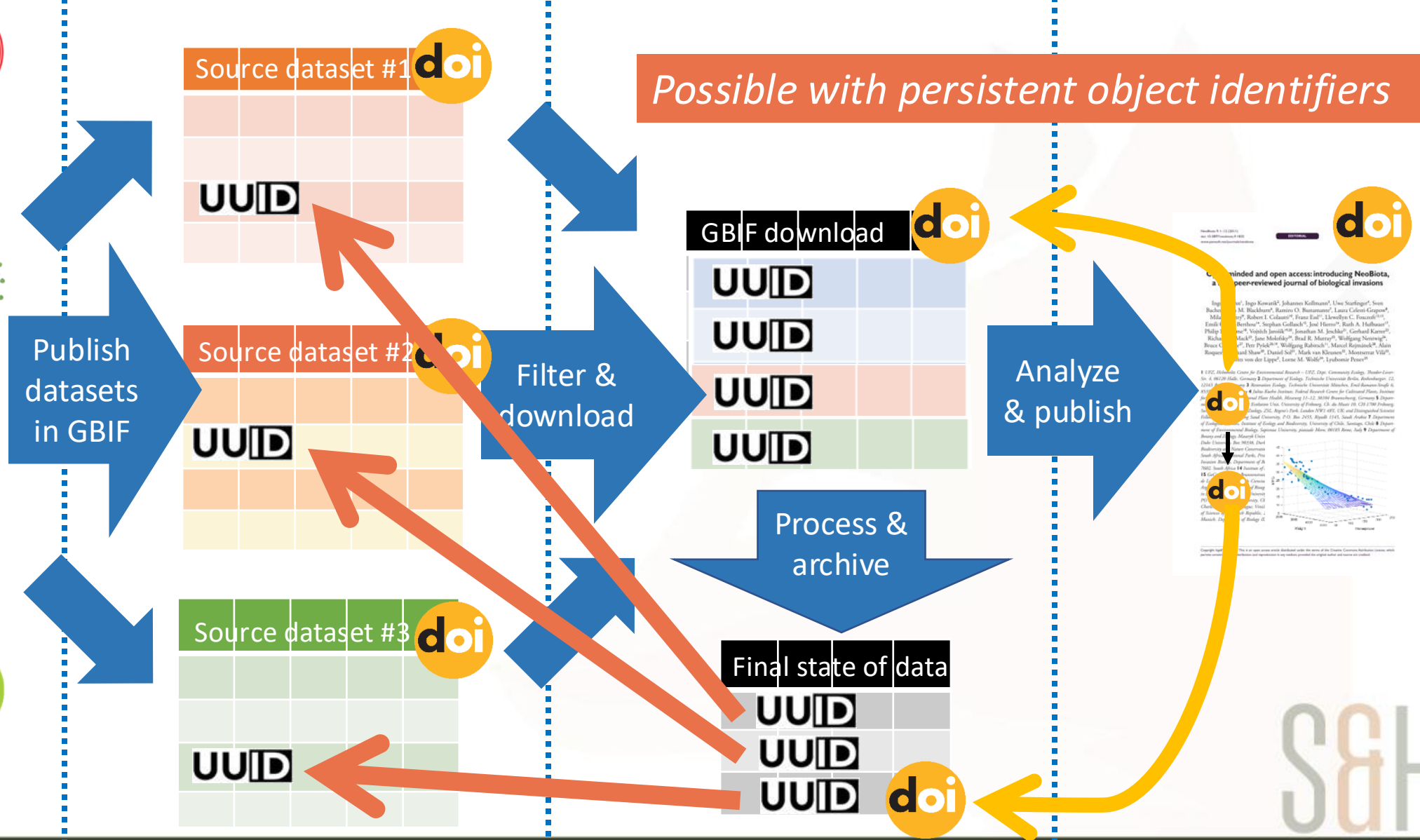
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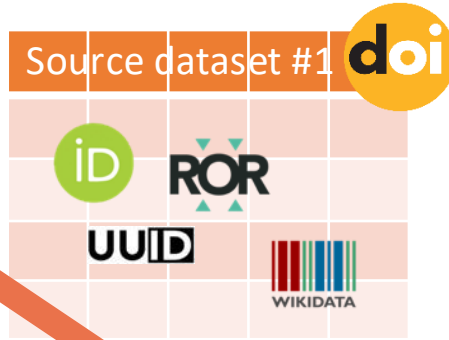
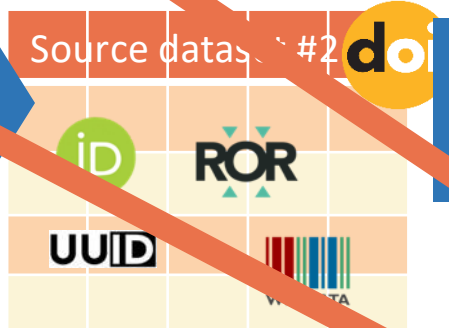
Data citation from the published paper



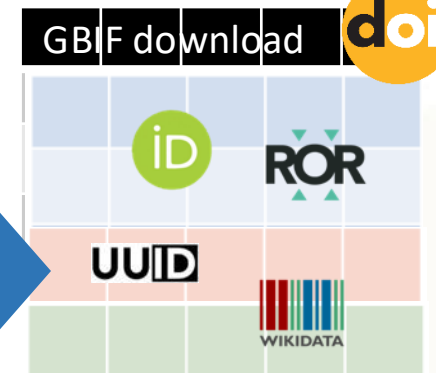
Dataset DOIs

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BioDT Data Citation Webinars

WEBINAR
SERIES6 November 2023
15:00 CET

Mastering Data Citation: Insights from GBIF



REGISTER NOW



Agenda

- A general introduction of the BioDT project – *Hanna Koivula (CSC)* [Slides](#)
- Data citation: the GBIF way – *Daniel Noesgaard (GBIF)* [Slides](#)

**WEBINAR
SERIES****20 November 2023**
15:00 CET

Mastering Data Citation: Insights from the BioDT Research Infrastructures

**REGISTER NOW**

Agenda

- welcome and main remarks from the GBIF data citation webinar - *Rita Giuffrida, Trust-IT*
- the data citation way in DISSCO - *Sharif Islam, DISSCO [Slides](#)*
- the data citation way in eLter - *Christoph Wohner, eLter [Slides](#)*
- the data citation way in LifeWatch - *Joaquin Lopez Lerida, LifeWatch [Slides](#)*

exercises

- 🔥 Identify 5 data journals and describe why you would choose one journal over the other for your data paper.
- 🔥 How is a data paper different from a normal research paper?
- 🔥 Review GBIF documentation and data use course at:
 - 🔥 <https://techdocs.gbif.org/en/openapi/>
 - 🔥 <https://techdocs.gbif.org/en/tools/#derived-datasets>
 - 🔥 <https://techdocs.gbif.org/en/data-use/>
 - 🔥 <https://docs.gbif.org/course-data-use/en/>

THANK YOU

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