



Global Biodiversity Information Facility

Dag Endresen - GBIF Norway

University of Oslo, Natural History Museum



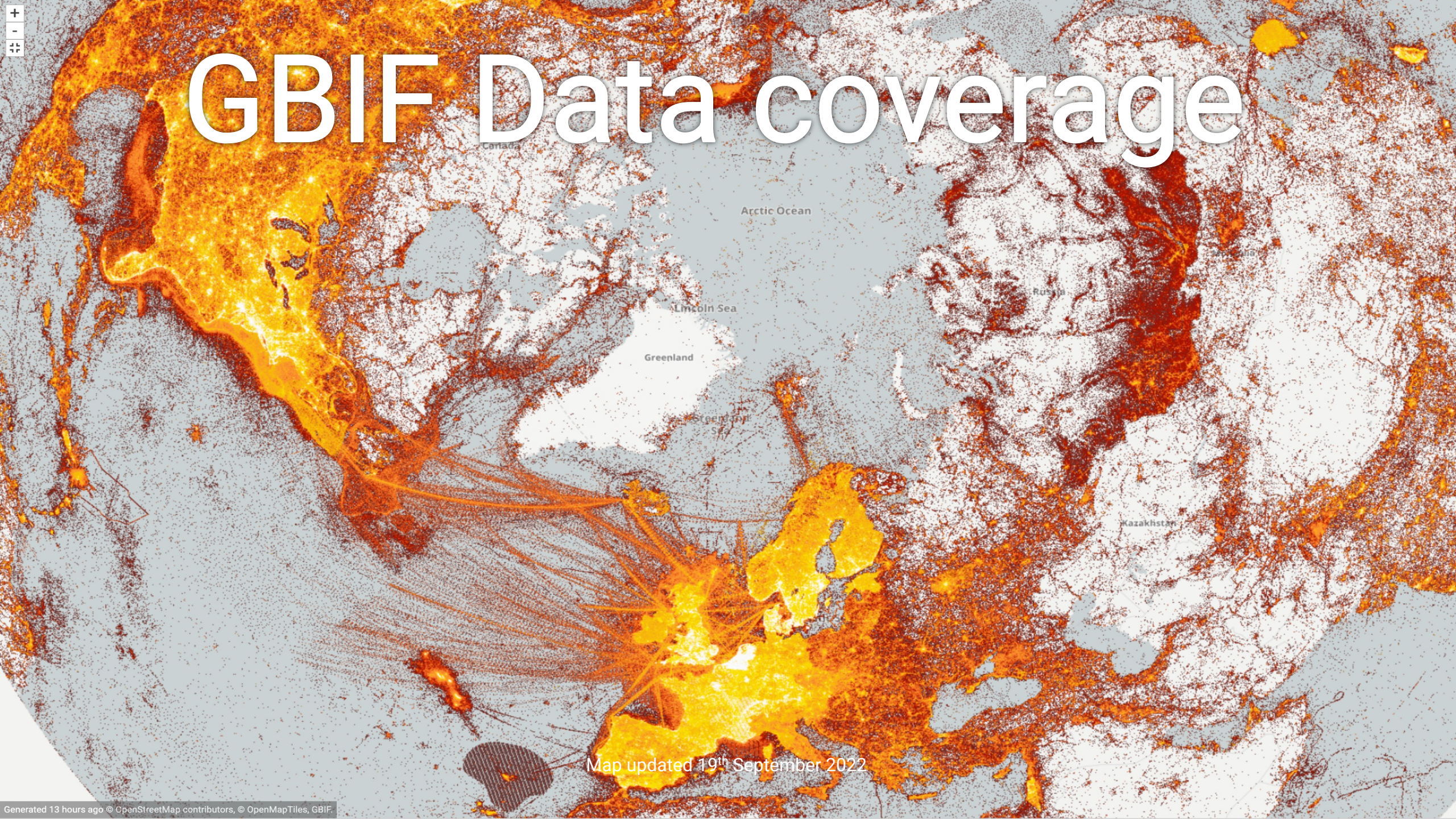
GBIF

Global Biodiversity
Information Facility

Illustration: GBIF data portal

Nansen Legacy, Tromsø | 20th September 2022

GBIF Data coverage



Map updated 19th September 2022

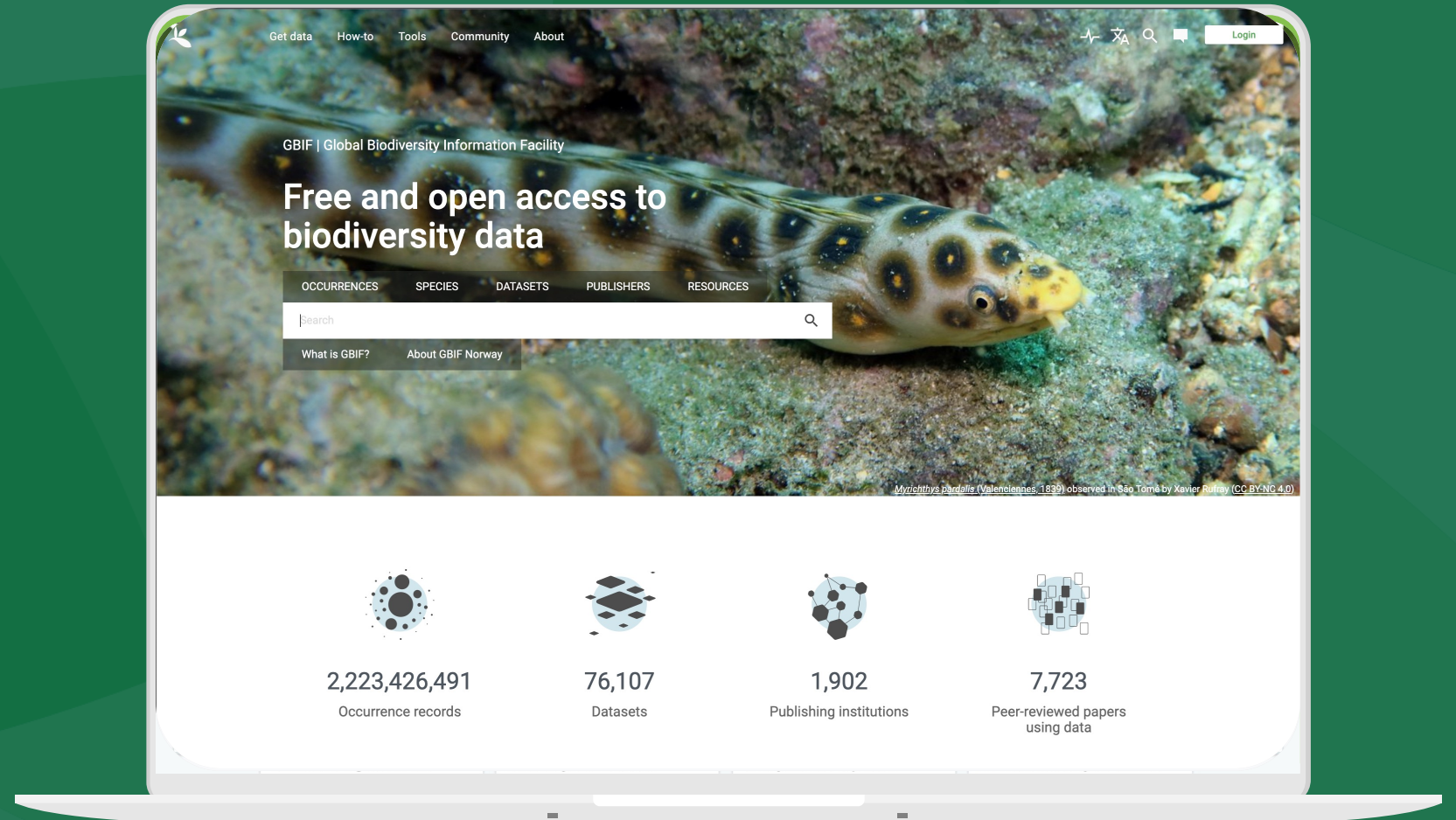
WHAT IS GBIF?

Intergovernmental network and research infrastructure

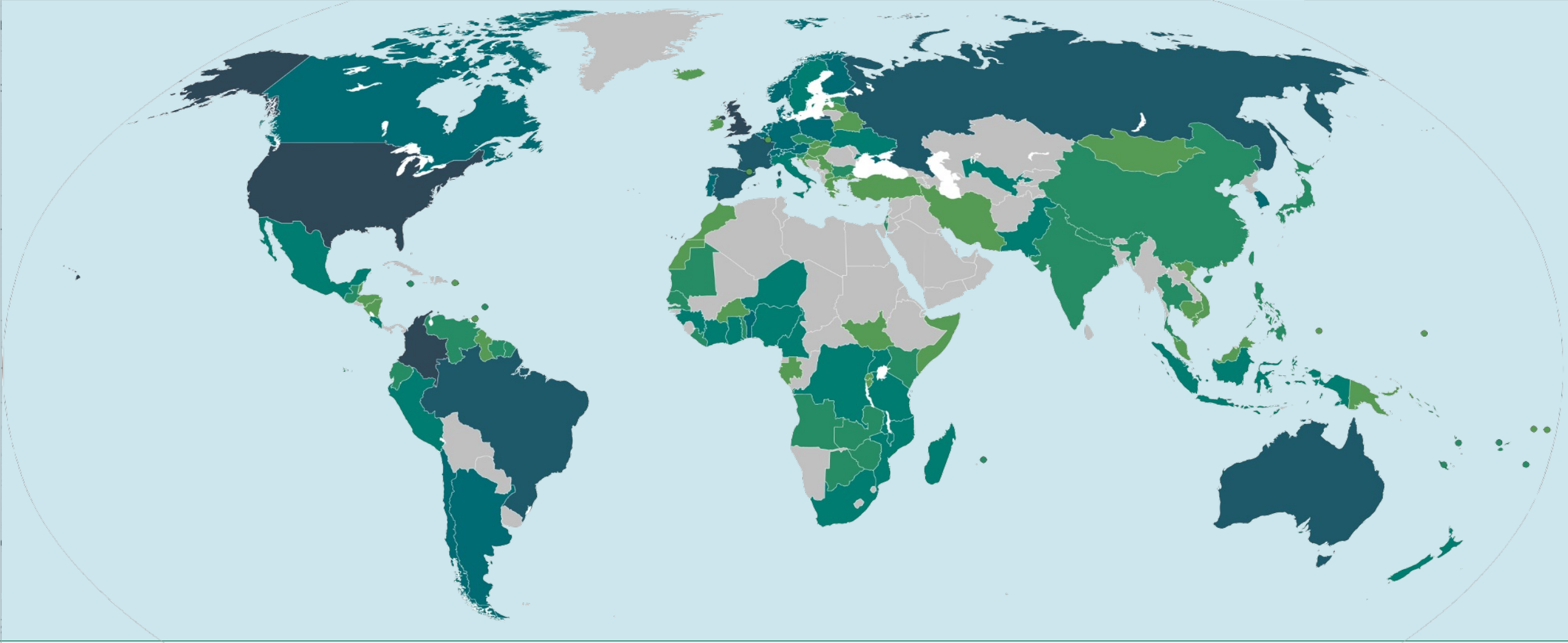
Provides anyone, anywhere, **free and open access to data** about all types of life on Earth

Voluntary collaboration through Memorandum of Understanding (MoU)

Participant nodes, Secretariat in Copenhagen, Denmark



THE GBIF DATA PUBLISHER NETWORK



1961 data publishers; <https://www.gbif.org/publisher/search>

Species occurrence records



2 223 426 491

Country
Participants

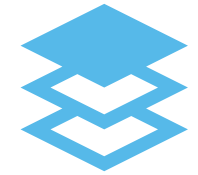
64

Organizational
Participants

43

Datasets

76 107



Publishers

1 961

Peer-review papers
using data

7 723



Average records downloaded per month

23.6 billion

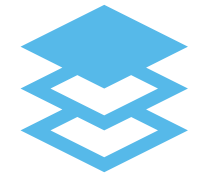


Species occurrence records (*published from*)



48 019 512

Datasets (*published from*)



352

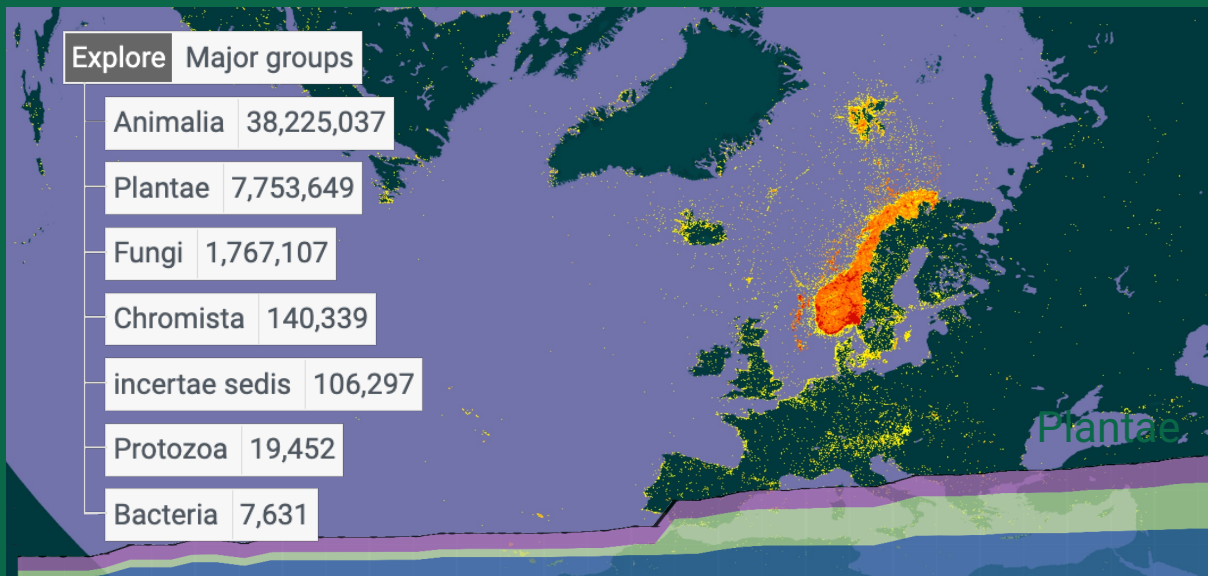
Peer-review papers
using data (co-author
from Norway)

193



Publishers
(from Norway)

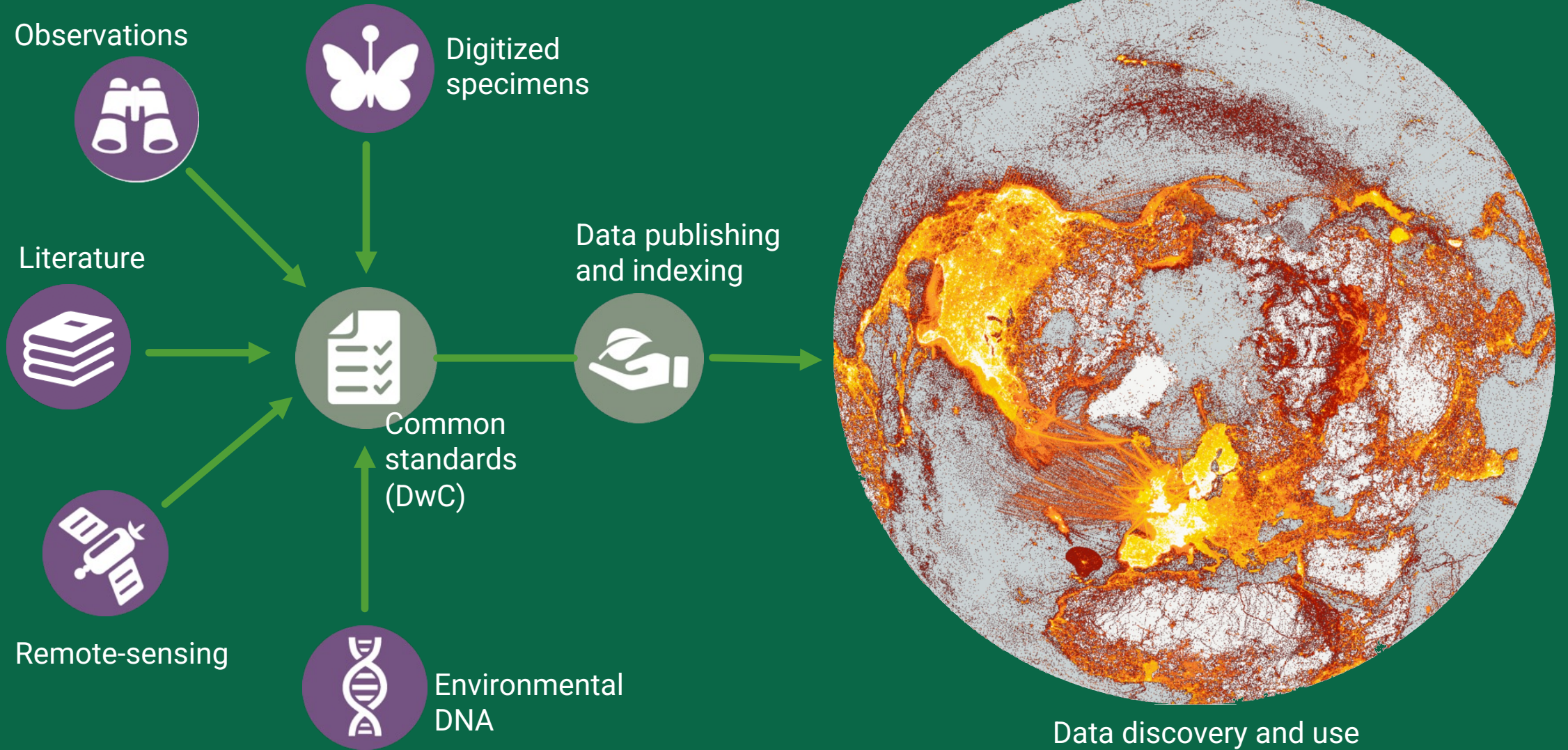
35





biodiversity data types

A WINDOW ON EVIDENCE ABOUT WHERE SPECIES HAVE LIVED, AND WHEN



DATA RICHNESS LEVELS
SUPPORTED BY GBIF

FULL TITLE
BOS Arthropod Collection of University of Oviedo (S

*Dataset description,
taxonomic/geographic/temporal scope*



Dataset metadata

FLORA EUROPAEA FLORA EUROPAEA FLORA

*List of taxa
regional or thematic (e.g. invasive, medicinal)*



Species checklists

*Species occurrences
dates, coordinates, basis of record*



Occurrence-only data

*Species occurrences and sampling events
dates, coordinates, sampling effort / protocol, abundance*



Sampling-event data

SPECIES OCCURRENCE RECORDS WITH MULTIMEDIA EVIDENCE

Status 19th September 2022

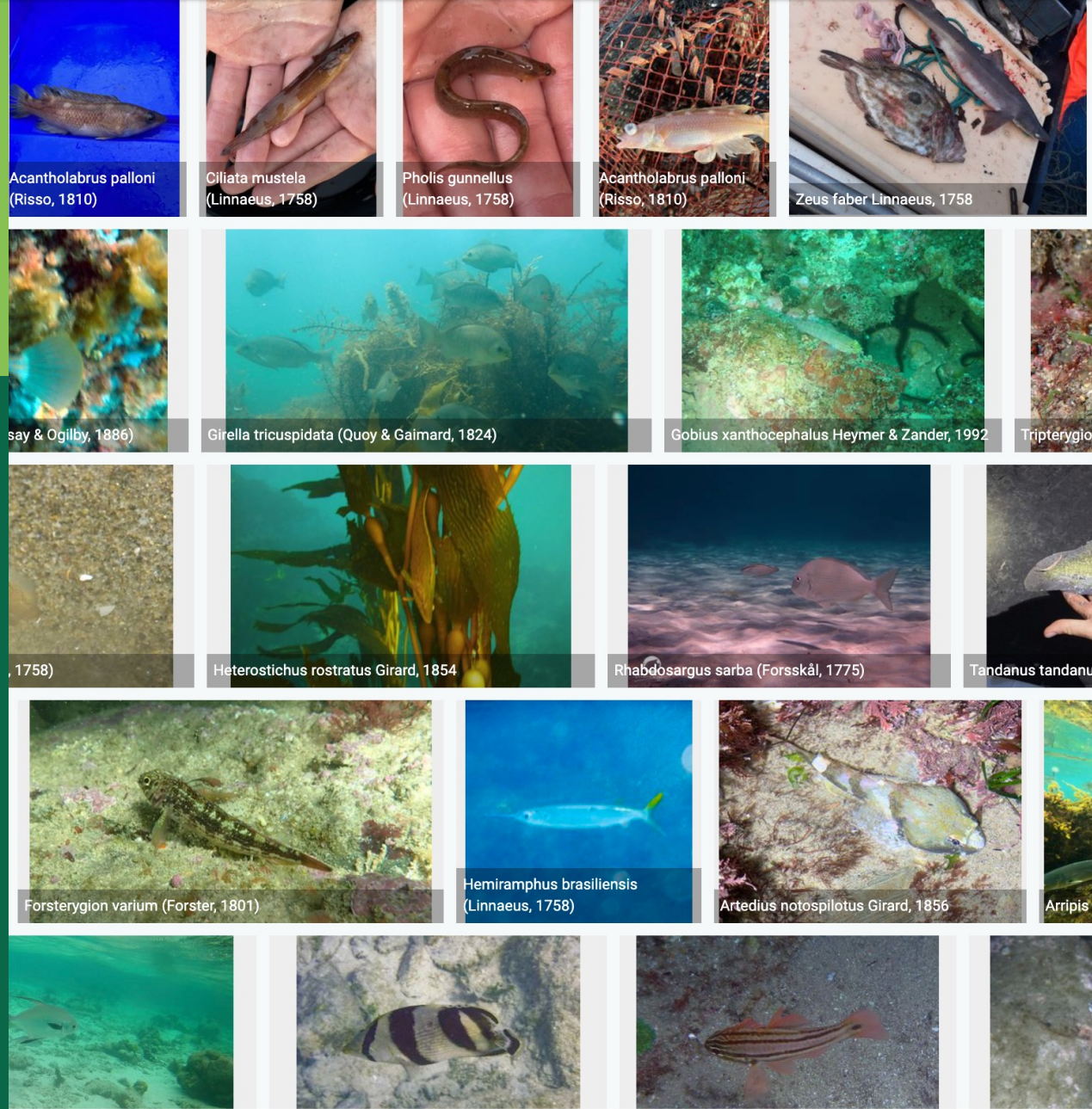


122 million records with taxonomically identified images

954 267 audio files

3 555 video files

- 48 million specimens (with multimedia)
- 69 million human observations



SOURCES OF DATA IN GBIF: CITIZEN SCIENCE OBSERVATIONS

eBird

OCURRENCE DATASET | REGISTERED SEPTEMBER 16, 2010

EOD - eBird Observation Data

Published by [Cornell Lab of Ornithology](#)
Tim Leavitch • Shawn Ligocki • Jeff Gerbracht

705,008,469 Occurrences

100% With taxon match

99.9% With coordinates

704,979,091 GEOREFERENCED RECORDS

Generated 2 days ago | © OpenStreetMap contributors, © OpenMapTiles, © Mapbox

Any year 1800 - 2019

DESCRIPTION

eBird is a collective enterprise that takes a novel approach to citizen science by developing cooperative partnerships among experts in a wide range of fields: population ecologists, conservation biologists, quantitative ecologists, statisticians, computer scientists, GIS and informatics specialists, application developers, and data administrators. Managed by the Cornell Lab of Ornithology eBird's goal is to increase data quantity through participant recruitment and engagement globally, but also to quantify and control for data quality issues such as observer variability, imperfect detection of species, and both spatial and temporal bias in data collection. eBird data are openly available and used by a broad spectrum of students, teachers, scientists, NGOs, government agencies, land managers, and policy makers. The result is that eBird has become a major source of biodiversity data, increasing our knowledge of the dynamics of species distributions, and having a direct impact on the conservation of birds and their habitats.

International crowd-sourcing portals

iNaturalist

OCURRENCE DATASET | REGISTERED SEPTEMBER 16, 2010

iNaturalist

Search

Explore Your Observations Community

Places > Asia (Continent) >

Find a place

Search

North Atlantic Ocean

Spain Italy Turkey China South Korea Japan

Algeria Libya Egypt Iraq Iran Afghanistan Pakistan India Thailand

Map data ©2021 2000 km

Terms of Use

Pakistan Country

Species Observations Projects People About Pakistan

Embed place widget

1042 of 2103 confirmed

Search for Species Search Establishment Threatened

Serinus pusillus (Fire-fronted Serin)

Carpodacus erythrinus (Rosenfink)

Emberiza cia (Rock Bunting)

Carpodacus rhodochlamys (Red-mantled Rosefinch)

Aythya ferina (Taffeland)

Anas platyrhynchos (Stokkand)

ARTSDATABANKEN

OCURRENCE DATASET | REGISTERED AUGUST 6, 2012

Norwegian Species Observation Service

Published by [The Norwegian Biodiversity Information Centre \(NBIC\)](#)
The Norwegian Biodiversity Information Centre

23,674,790 Occurrences

99.9% With taxon match

99.9% With coordinates

23,674,776 GEOREFERENCED RECORDS

Generated 2 days ago | © OpenStreetMap contributors, © OpenMapTiles, © Mapbox

Any year 1715 - 2020

860,229 OCCURRENCES WITH IMAGES

SEE GALLERY

National crowd-sourcing portals

SOURCES OF DATA IN GBIF: DIGITIZED MUSEUM COLLECTION SPECIMENS

OCCURRENCE DATASET | REGISTERED JULY 30, 2012

Mycology herbarium, Oslo (O)

Published by [Natural History Museum, University of Oslo](#)

DATASET METRICS ACTIVITY DOWNLOAD HOME PAGE



215,107 OCCURRENCES 33 CITATIONS

Fungi in the Natural History Museum, University of Oslo

Metadata last modified: October 7, 2020
Hosted by: [GBIF.no](#)
License: [CC BY 4.0](#)
How to cite: [DOI: 10.15468/6sjrdn](#)

215,107 Occurrences
98% With year


193,748 GEOREFERENCED RECORDS



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Any year 1811 - 2020

4,098 OCCURRENCES WITH IMAGES



SEE GALLERY

OCCURRENCE DATASET | REGISTERED JULY 30, 2012

Vascular plant herbarium TRH, NTNU University Museum

Published by [NTNU University Museum](#)

Mika Bendiksby

DATASET METRICS ACTIVITY DOWNLOAD

231,447 OCCURRENCES 188 CITATIONS

This is the largest herbarium at NTNU University Museum, containing around 240 000 specimens from Norway and the Nordic countries. Most of the specimens were collected in Central Norway. The vascular plant herbarium also contains around 32 000 specimens from the rest of the world, most of which is not yet digitized. The arctic collection contains professor Olav Gjørevoll's material from Alaska and Canada - about 6 000 digitized specimens.

NTNU
Metadata last modified: October 7, 2020
Hosted by: [GBIF.no](#)
License: [CC BY 4.0](#)
How to cite: [DOI: 10.15468/zrlqok](#)

231,447 Occurrences
97% With year

197,938 GEOREFERENCED RECORDS



Generated 2 hours ago © OpenStreetMap contributors, CC-BY, Imagery © Mapbox, © OpenStreetMap contributors, CC-BY, Imagery © Mapbox

Any year 1762 - 2020

227,288 OCCURRENCES WITH IMAGES



SEE GALLERY

SOURCES OF DATA IN GBIF: TAXONOMIC LITERATURE, OLD AND NEW

OCCURRENCE DATASET | REGISTERED SEPTEMBER 18, 2014


All observations extracted from the Flora of Northumberland and Durham 1831

Published by [Botanic Garden Meise](#)
Quentin Groom • Quentin Groom

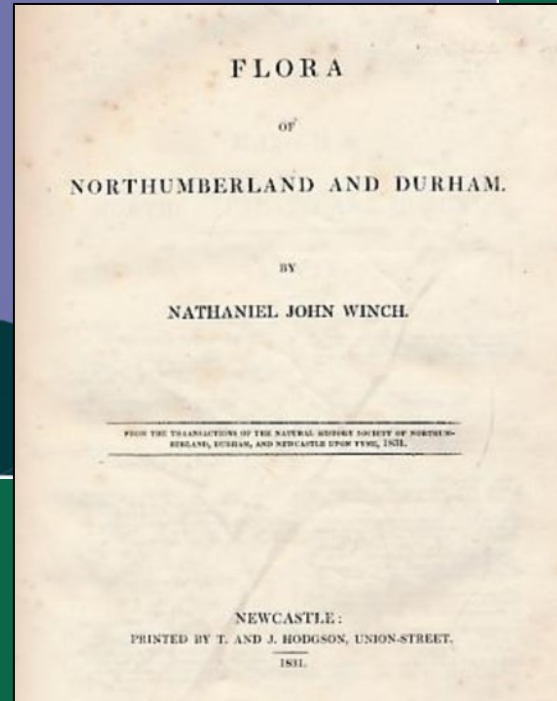
DATASET METRICS ACTIVITY DOWNLOAD HOME PAGE

5,583 OCCURRENCES 62 CITATIONS

5,583 GEOREFERENCED RECORDS



Generated 2 hours ago © OpenStreetMap contributors, © OpenMapTiles, GBIF.



Get data How-to Tools Community About

TREATMENT ARTICLE | REGISTERED APRIL 2, 2018

Review of the Palearctic species of Ismaridae Thomson, 1858 (Hymenoptera: Diaprioidea)

Mediated by [Plazi.org taxonomic treatments database](#)
Chang-Jun Kim • David G. Notton • Frode Ødegaard • Jong-Wook Lee • plazi • Guido Sautter

DATASET TAXONOMY METRICS ACTIVITY DOWNLOAD HOME PAGE

162 MATERIALS EXAMINED 15 RECORDS 6 CITATIONS

This dataset contains the digitized treatments in Plazi based on the original journal article Kim, Chang-Jun, Notton, David G., Ødegaard, Frode, Lee, Jong-Wook (2018): Review of the Palearctic species of Ismaridae Thomson, 1858 (Hymenoptera: Diaprioidea). European Journal of Taxonomy 417: 1-38, DOI: <https://doi.org/10.5852/ejt.2018.417>

Metadata last modified: October 29, 2019
Hosted by: [Plazi.org taxonomic treatments database](#)
License: [CC0 1.0](#)
How to cite: [DOI](#) 10.5852/ejt.2018.417

162 Occurrences	100% With taxon match	39% With coordinates	95% With year
15 Accepted names	0 Synonyms	100% Overlap with GBIF Backbone	23% Overlap with Catalogue of Life

63 GEOREFERENCED RECORDS



Generated an hour ago © OpenStreetMap contributors, © OpenMapTiles

Any year 1918 - 2016

EXPLORE

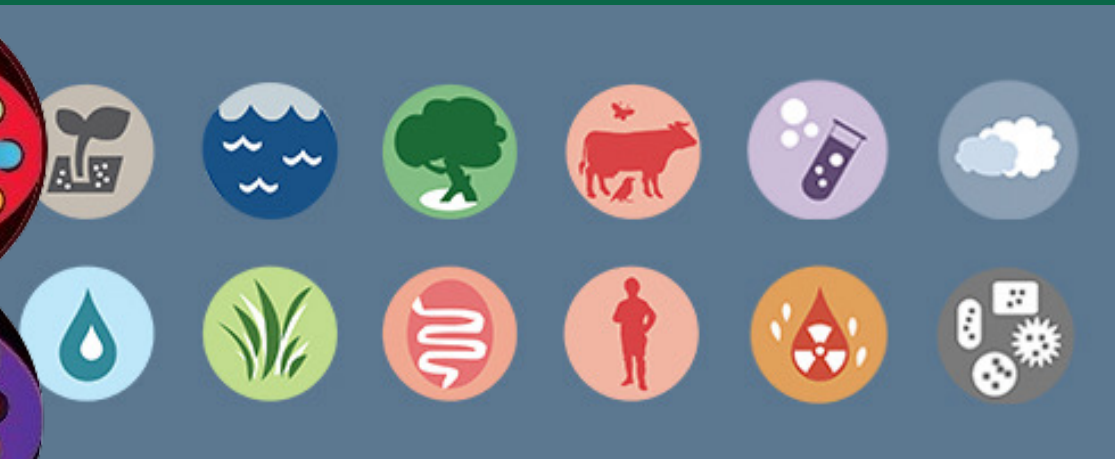
PLAZI
TAKING CARE OF FREEDOM
Data liberation



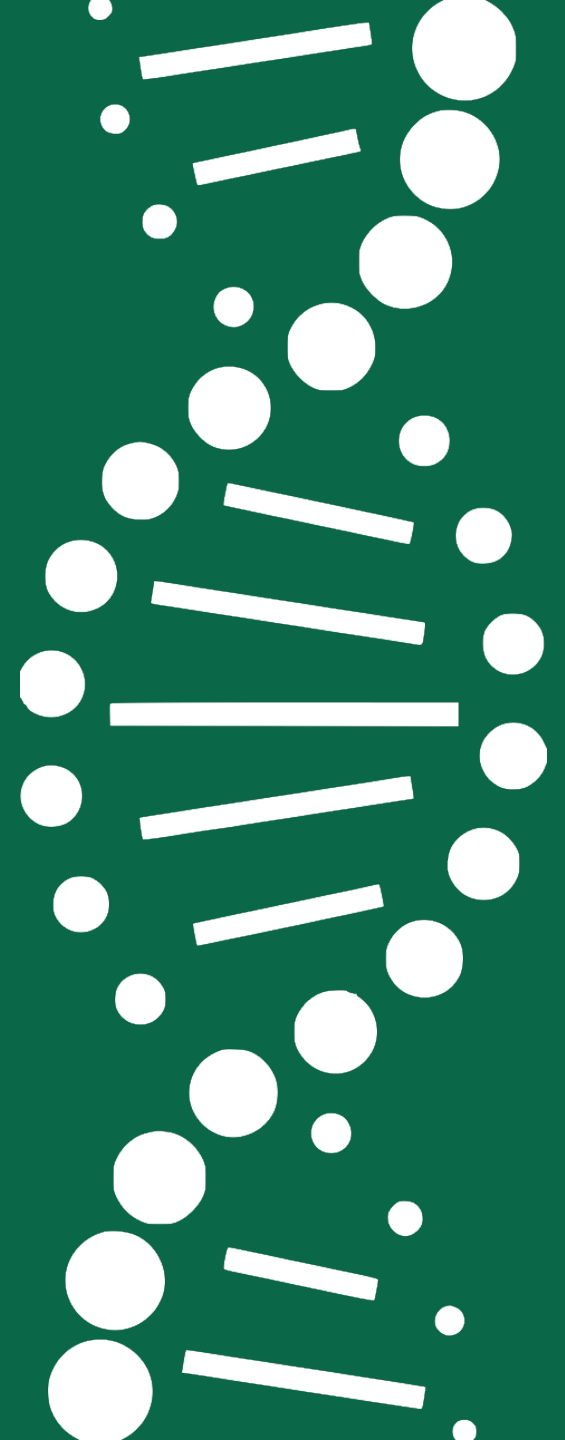
SOURCES OF DATA IN GBIF: DNA SEQUENCE-DERIVED OCCURRENCE DATA

The screenshot shows the MGnify website interface for a dataset titled "Atlantic salmon microbiota". At the top, it indicates a "SAMPLING EVENT" registered on March 7, 2019, published by MGnify. The dataset has 4,702 occurrences and 4 citations. A description states that Atlantic salmon skin mucus and surrounding water were sampled at production facilities in freshwater and after transfer to seawater, with DNA sequenced using barcoded 16S primers and PacBio SCC. Metadata includes a last modification date of March 13, 2019, hosted by the GBIF Secretariat, and a CC BY 4.0 license. A progress bar shows 4,702 occurrences, 94% with taxon match, 100% with coordinates, and 100% with year. A map of Europe shows the sampling location in the North Atlantic. Below the map, a table lists 66 events for the year 2017.

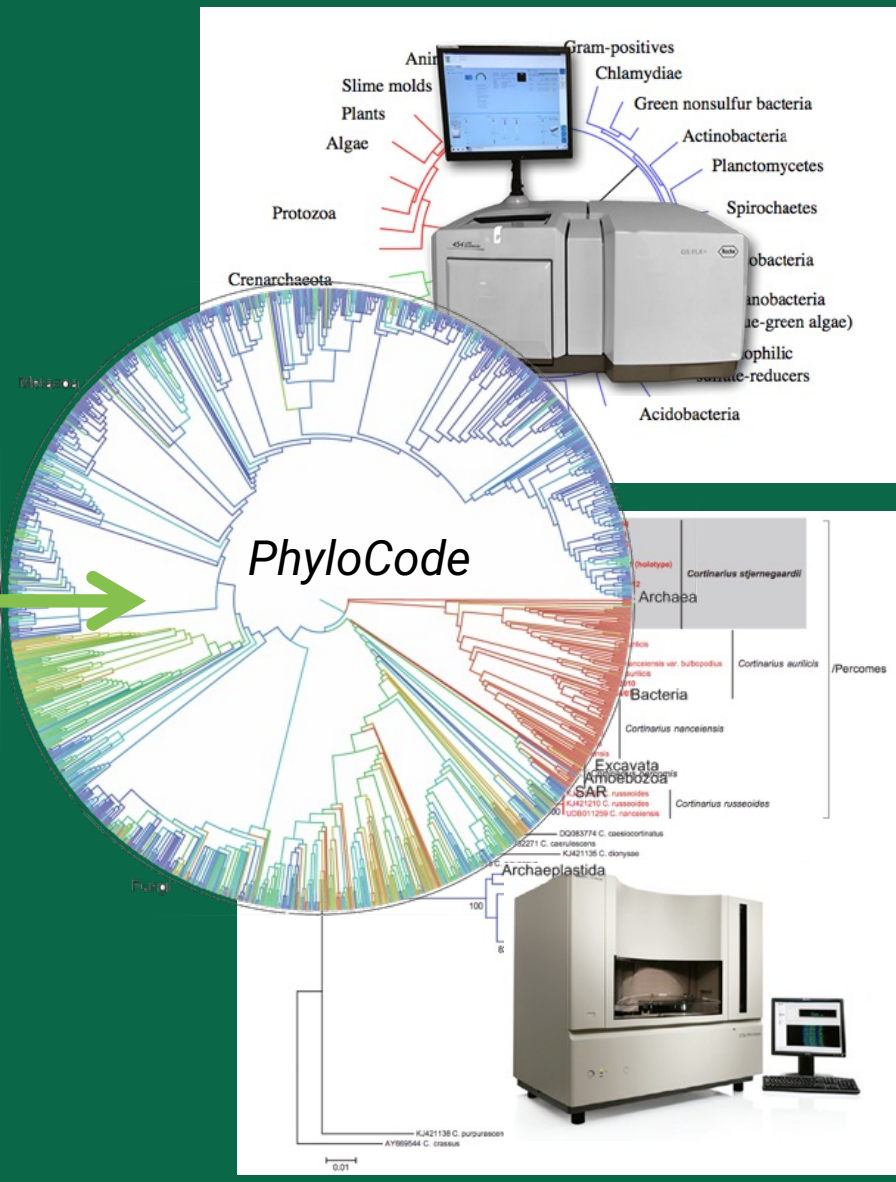
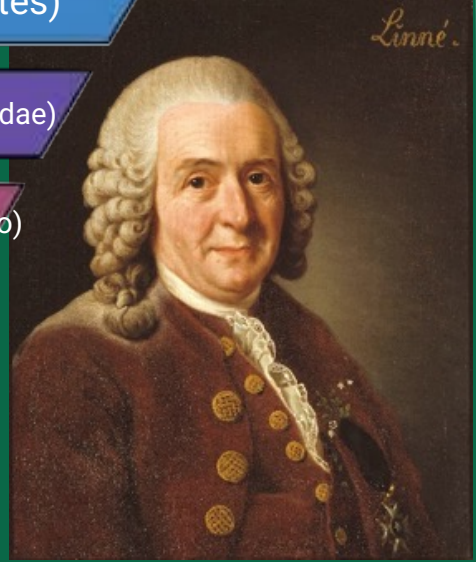
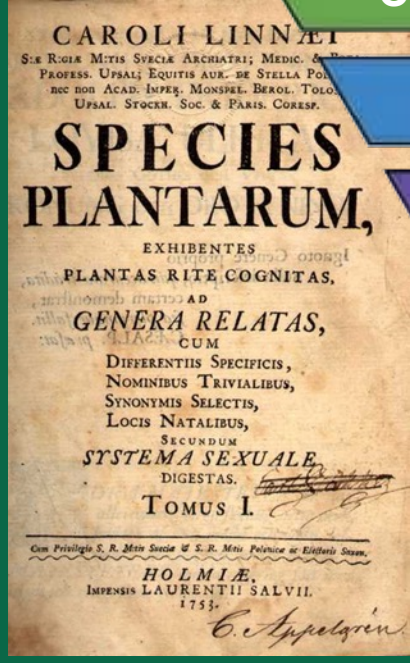
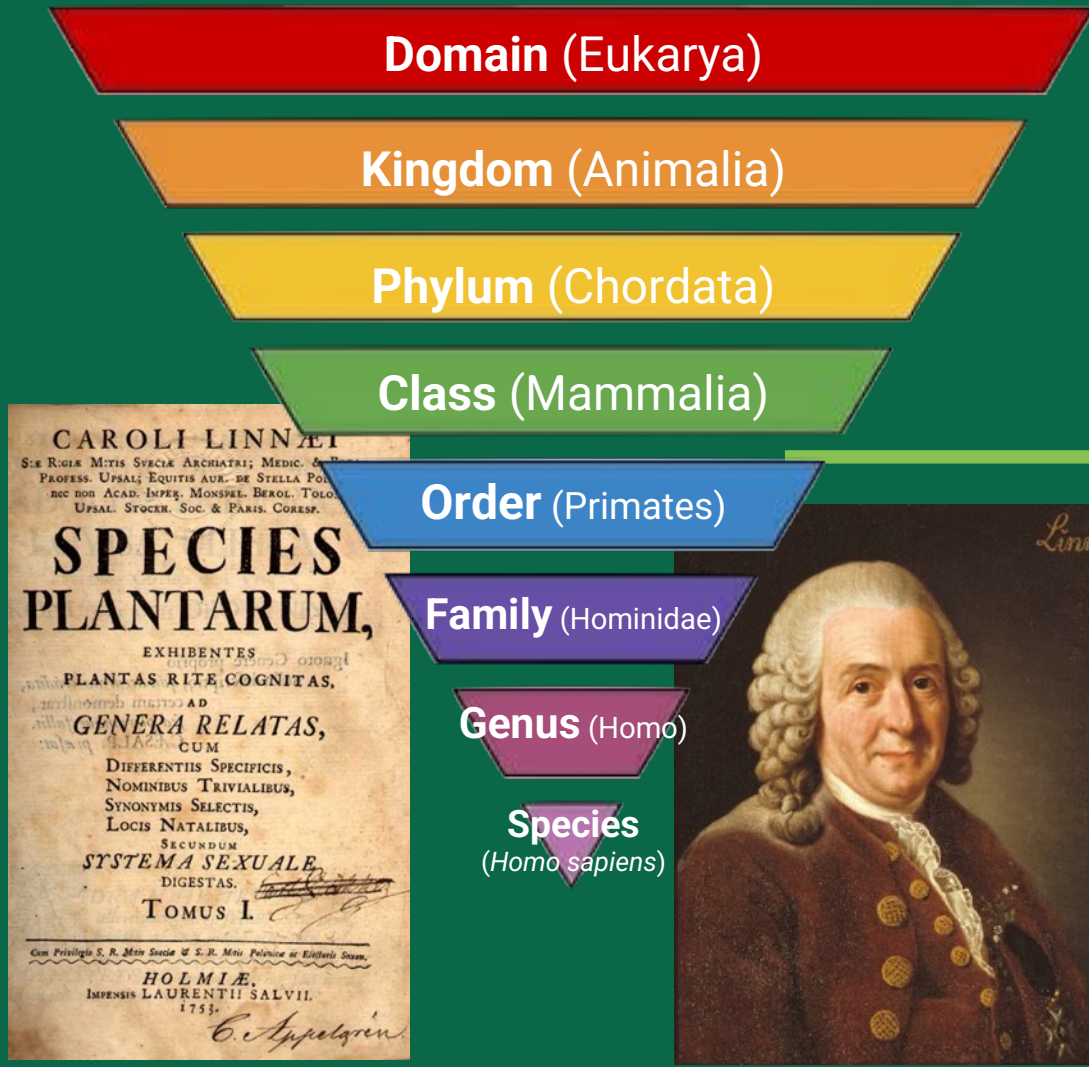
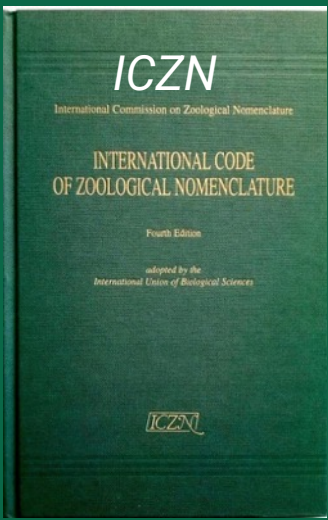
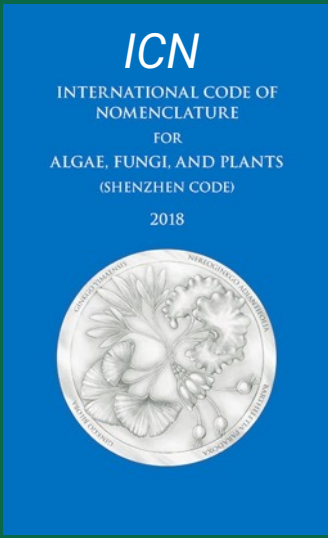
Event ID	Event date	Sampling protocol	Occurrence count
mgya00210126	1 January 2017		297
mgya00210073	1 January 2017		209
mgya00210106	1 January 2017		203



molecular DNA data



LATIN NAMES ARE RULED BY THE CODES





Species

DNA

Barcode



GBIF
backbone
taxonomy

SH ABC0001

OTU = Operational Taxonomic Unit



OTU = SH,
Species
hypothesis
numbers [DOI]



BIN DEF0002



OTU = BIN,
Barcode
identification
number

NEW GBIF GUIDE: PUBLISHING SEQUENCE-DERIVED DATA THROUGH BIODIVERSITY DISCOVERY PLATFORMS

- Authors from Australia, Norway, Sweden, Denmark, UNITE, and GBIF
 - Based on practical mapping and data publishing experiences
 - Cross-platform
 - About 40 pages long "cookbook"
 - ❖ **Introduction** – refresh your "data culinary" knowledge
 - ❖ **Categorization** – what "data ingredients" you got to publish?
 - ❖ **Mapping** – choose and follow the "recipe"
 - ❖ **Visuals** – clarity and guidelines
 - ❖ Future prospects
 - ❖ Resources: glossary, links, references
- Based on Darwin Core and MlxS data standards

Publishing sequence-derived data through biodiversity data platforms [Community review draft]

Anders F. Andersson · Andrew Bissett · Anders G. Finstad · Frode Fossoy · Marie Grosjean · Michael Hope · Urmas Kõljalg · Daniel Lundin · R. Henrik Nilsson · Maria Prager · Thomas Stjernegaard · Cecilie Svenningsen · Dmitry Schigel – Version 895576f, 2020-09-30 12:53:30 UTC

This document is also available in [PDF format](#).



WoRMS

World Register of Marine Species

World Register of Marine Species (WoRMS) provide an authoritative and comprehensive list of names of marine organisms

- WoRMS 2022-09-15 (760 049 accepted names; 597 567 extant species)
- WoRMS available in GBIF at [doi:10.14284/170](https://doi.org/10.14284/170) (716 117 accepted names)



Catalogue of Life



- **The most complete authoritative list of the world's species** - maintained by hundreds of global taxonomists - probably includes just over **80% of the world's known species.**

- CoL 2021-10-18 [doi:10.48580/d4t2](https://doi.org/10.48580/d4t2) (approx. 2,4M accepted names)
- CoL available in GBIF at [doi:10.15468/rffz4x](https://doi.org/10.15468/rffz4x) (approx. 4,4M names)



species  2000

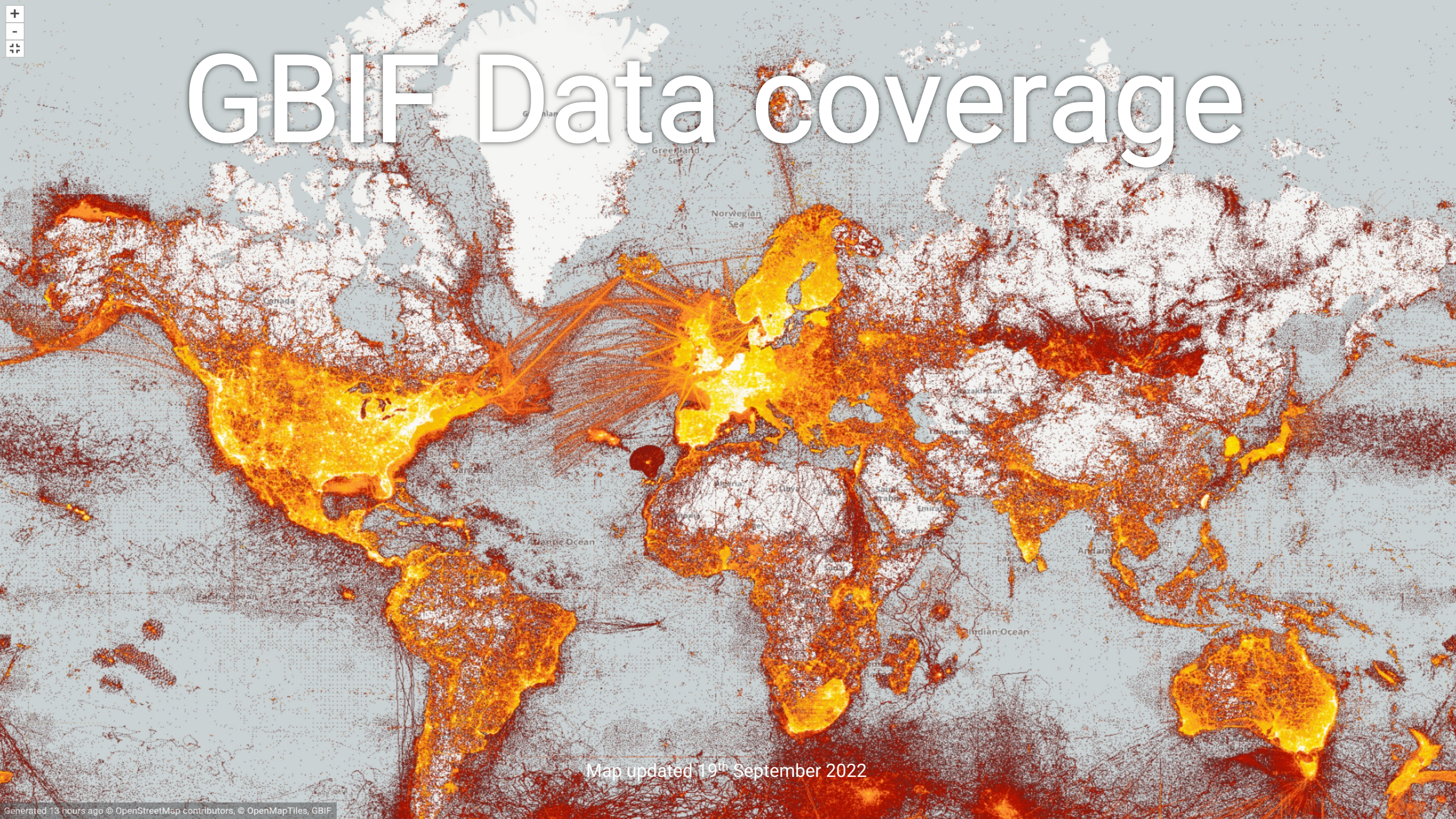


alliance for biodiversity knowledge



data coverage

GBIF Data coverage



Map updated 19th September 2022

GLOBAL BIODIVERSITY VS. DIGITALLY AVAILABLE DATA



1200 mill.
animals



300 m
plants



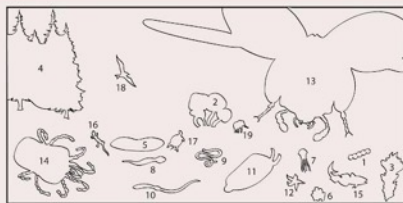
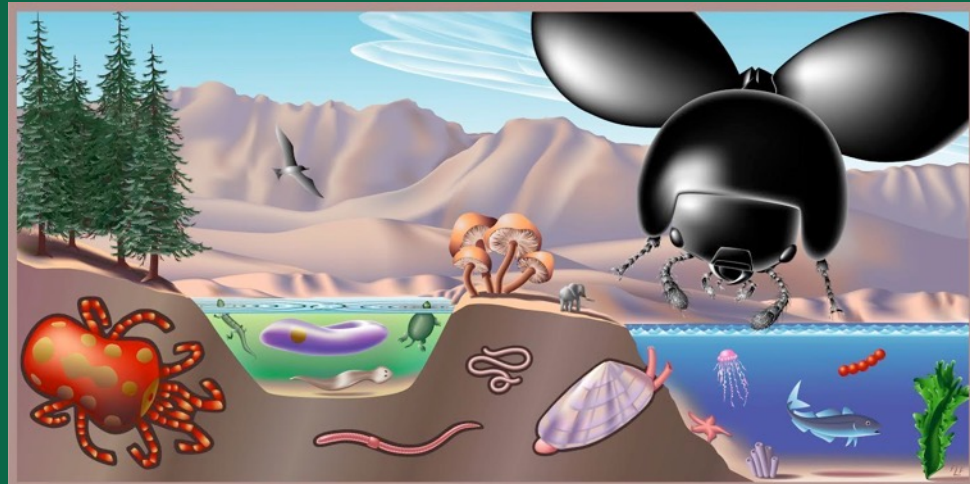
20 m
fungi



16 m
bacteria



0,04 m
virus



Size of individual organisms represents number of described species in major taxon.
Unit Area: □ = approximately 1,000 described species.

Taxon	No. of Described Species	Taxon	No. of Described Species
1 Monera (Bacteria, Blue-green Algae)	4,760	11 Mollusca (Mollusks)	50,000
2 Fungi	46,983	12 Echinodermata (Starfish etc.)	6,100
3 Algae	26,900	13 Insecta	751,000
4 Plantae (Multicellular Plants)	248,428	14 Non-insect Arthropoda (Mites, Spiders, Crustaceans etc.)	123,161
5 Protozoa	30,800	15 Pisces (Fish)	19,058
6 Porifera (Sponges)	5,000	16 Amphibia (Amphibians)	4,181
7 Coelenterata (Jellyfish, Corals, Comb Jellies)	9,000	17 Reptilia (Reptiles)	6,300
8 Platyhelminthes (Flatworms)	12,200	18 Aves (Birds)	9,040
9 Nematoda (Roundworms)	12,000	19 Mammalia (Mammals)	4,000
10 Annelida (Earthworms etc.)	12,000		

Illustration by Frances L. Fawcett. From Q. D. Wheeler. 1990. Ann. Entomol. Soc. Am. 83:1031-1047.

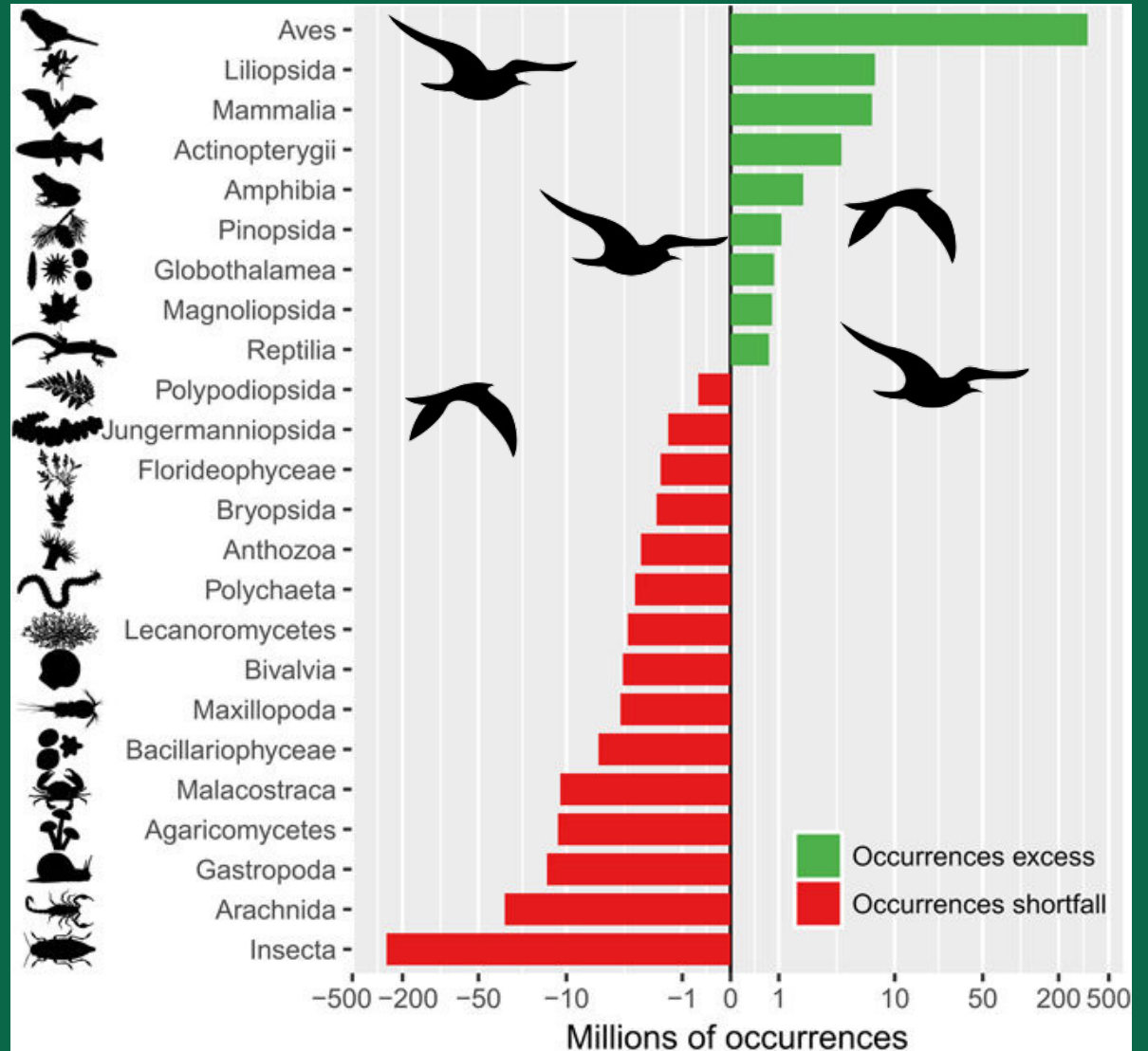
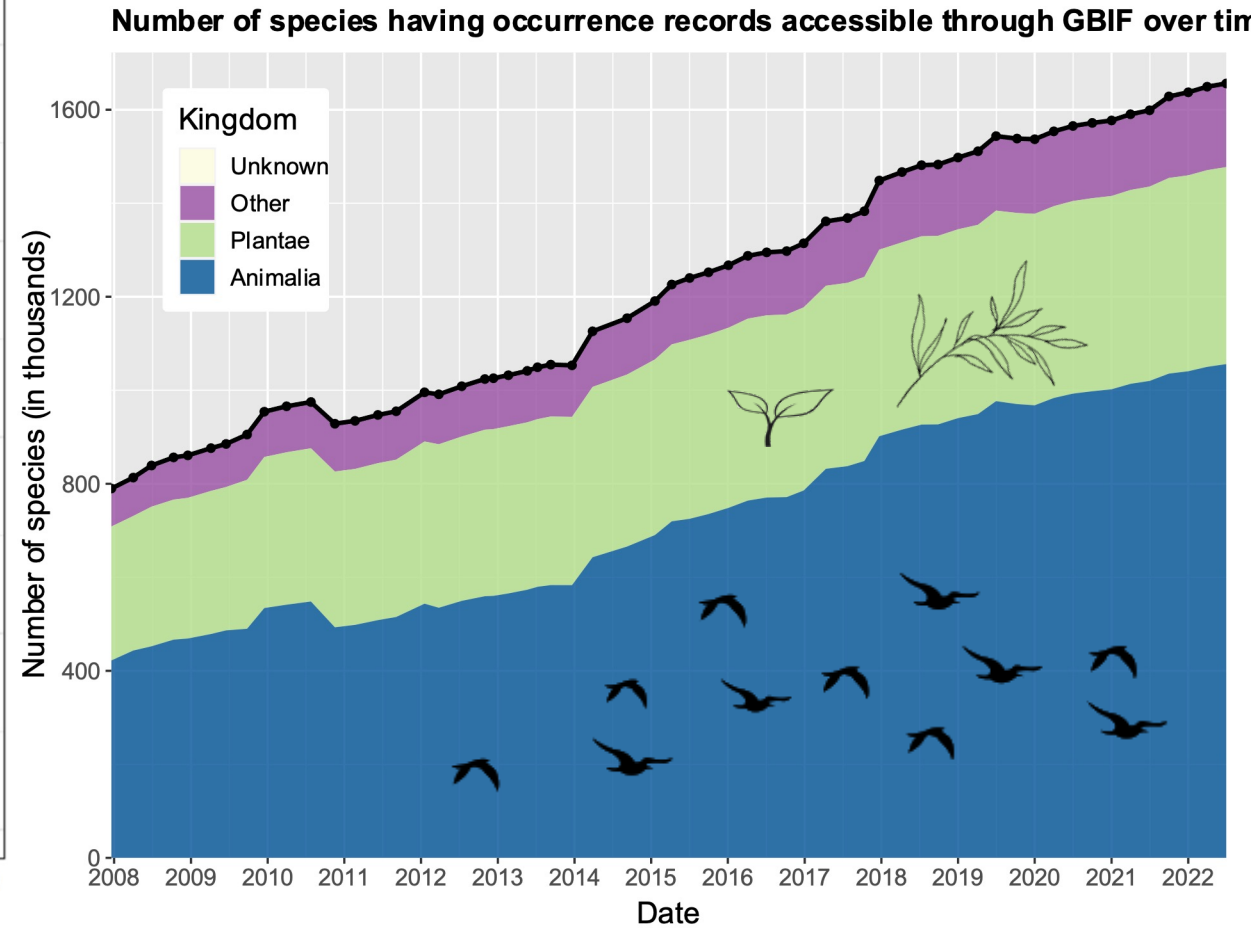
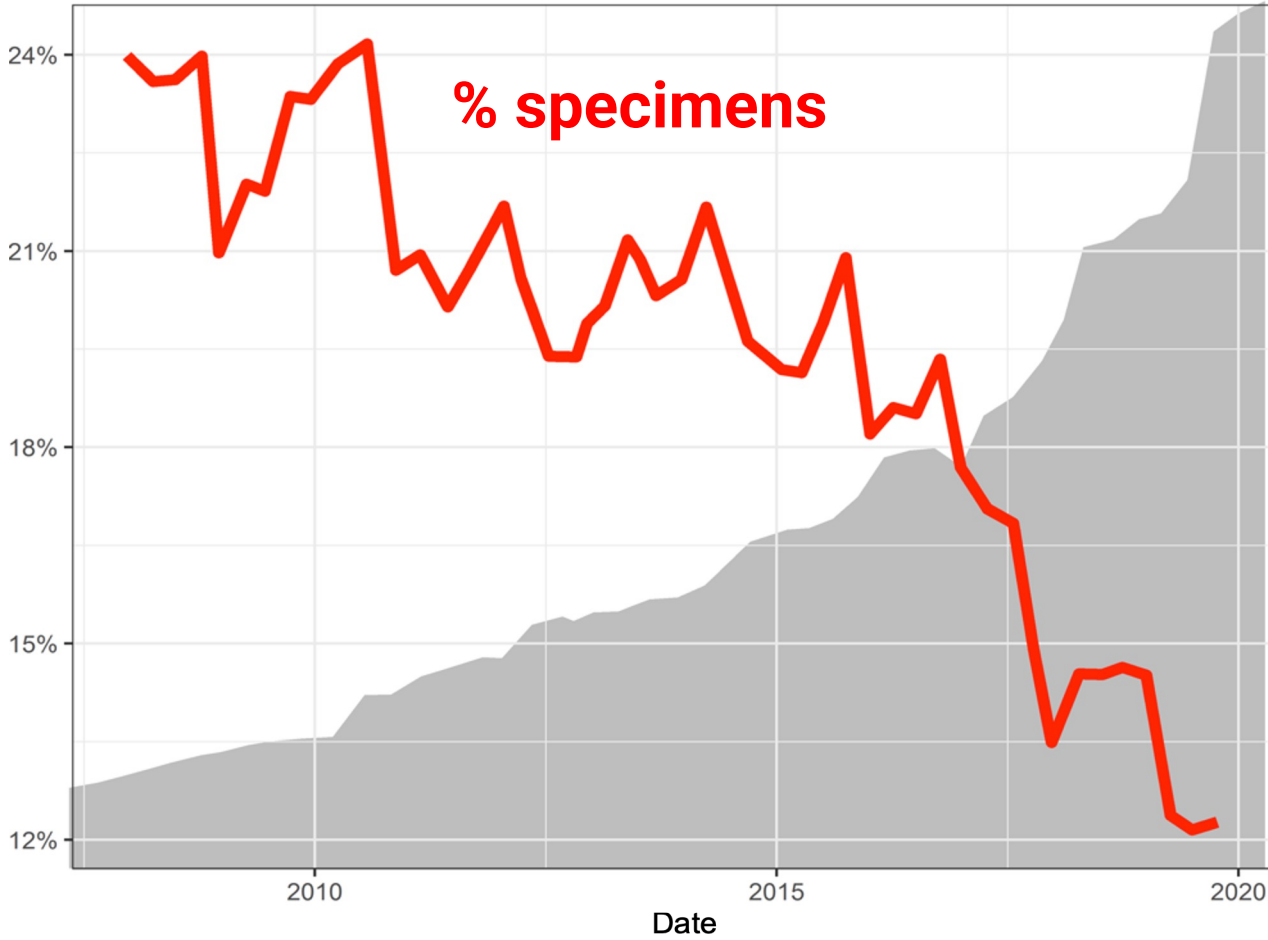


Image: FL Fawcett in Wheller Ann. Entomol. Soc. Am. 1990

Troudet et al. Nature Scientific Reports 2017

DATA TRENDS ON GBIF.org





Very few museum specimens are digitized

Natural history museum collections worldwide conserve an estimated **1.2 - 3 billion specimens**

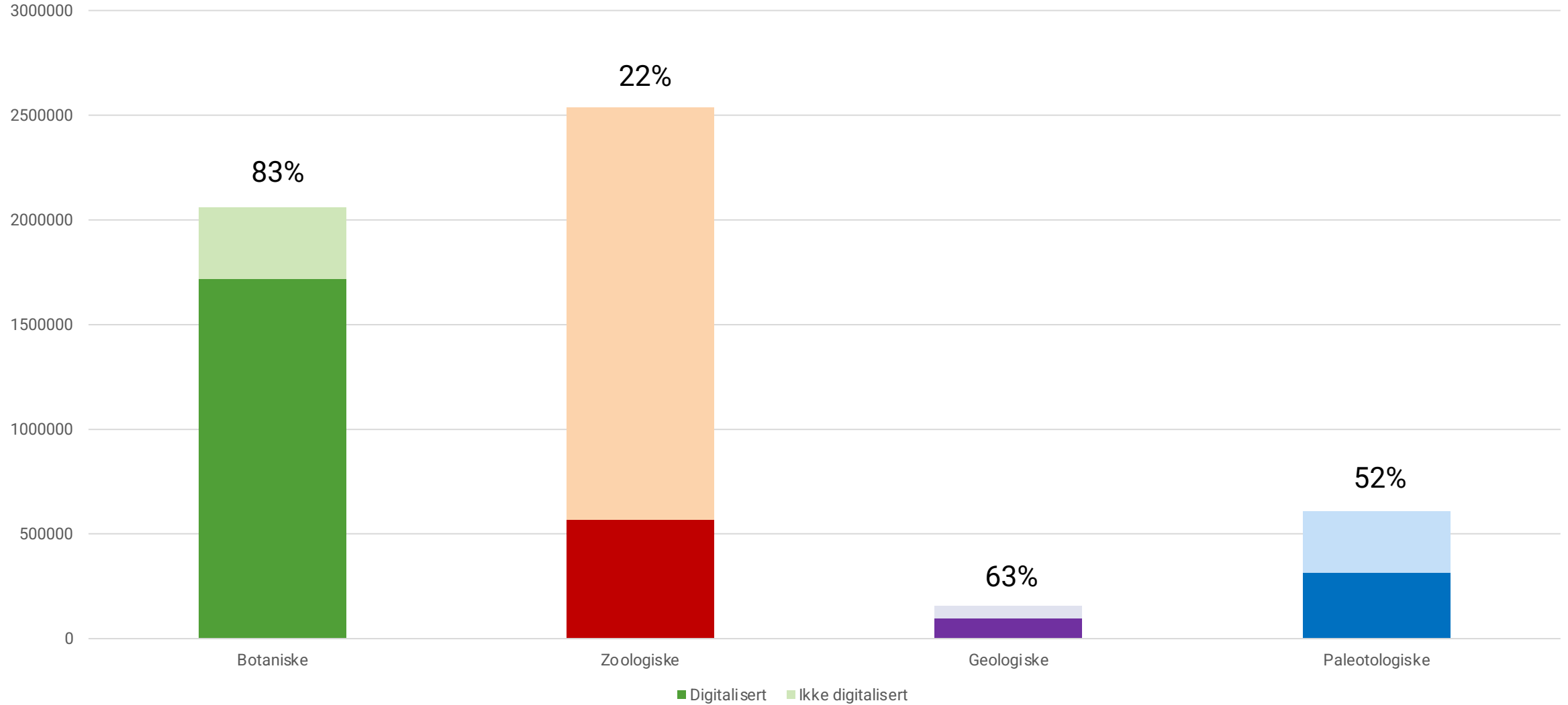
(Ariño 2010; Duckworth *et al.* 1993)

GBIF publishes 2,2 billion records – including **261 million specimens**

approx. 10% coverage?

Photo: Botany Collection, Algae, Smithsonian National Museum of Natural History Museum, by Chip Clark.

Specimens at UiO NHM (approx 52% digitized)





GBIF

data publishing



PUBLISH YOUR DATASETS WITH GBIF

- *Step 1:* digitize collections & herbaria
- *Step 2:* register for endorsement in GBIF
- *Step 3:* convert to Darwin Core format
- *Step 4:* publish from national GBIF node

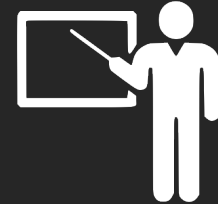
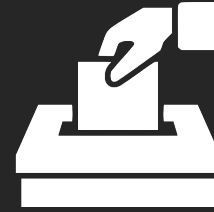
- *Alternative:* publish from regional GBIF cloud data repository - cloud.gbif.org/eca
- *Alternative:* Many citizen science data platforms publish data in GBIF



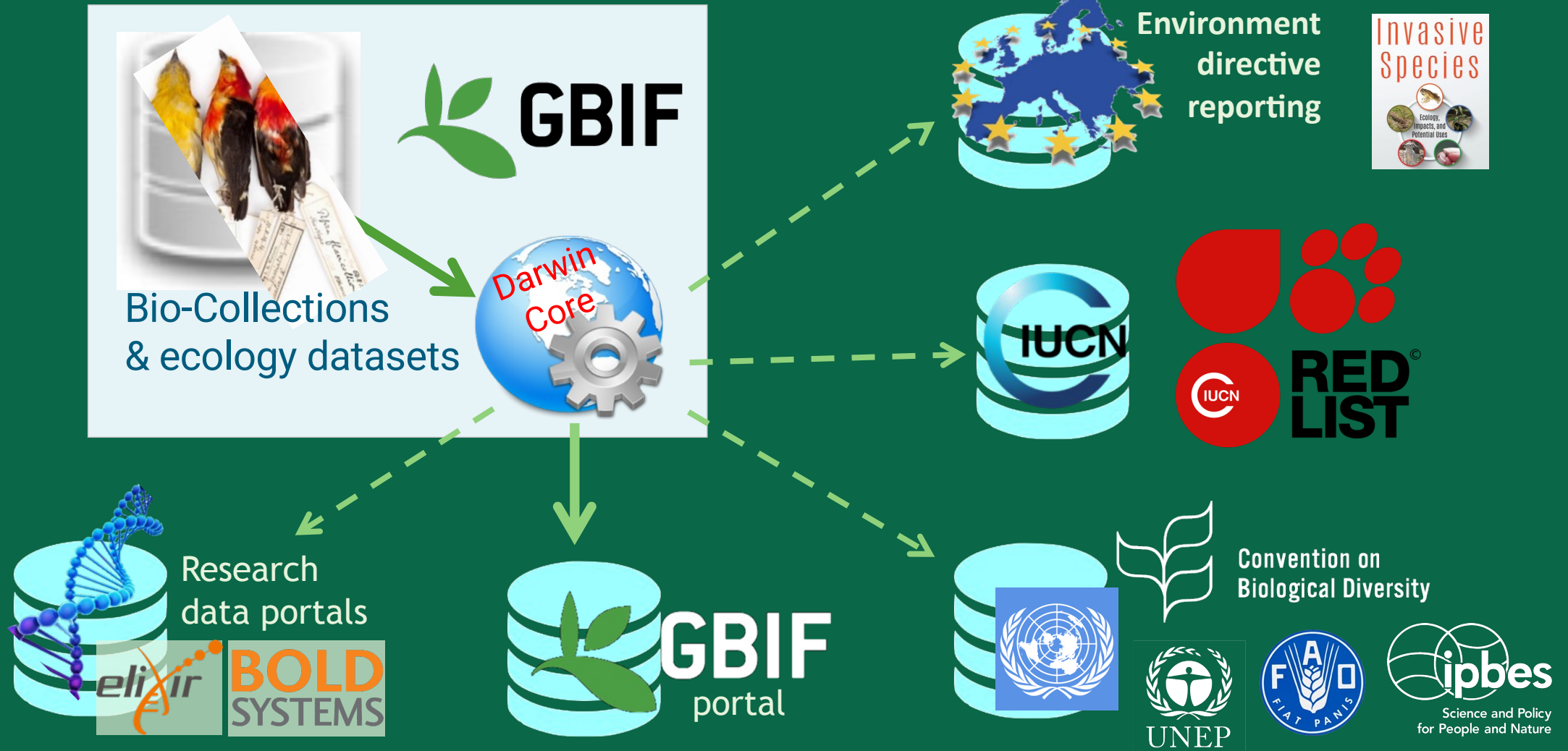


GBIF

data use



GBIF: MULTIPLE-PURPOSE DATA PUBLISHING SERVICES



POLICY LINKS



Convention on
Biological Diversity



SUSTAINABLE
DEVELOPMENT
GOALS

COUNTRY PROFILES

Norway



Norway

Convention

Party since: 1993-12-29

By: Ratification

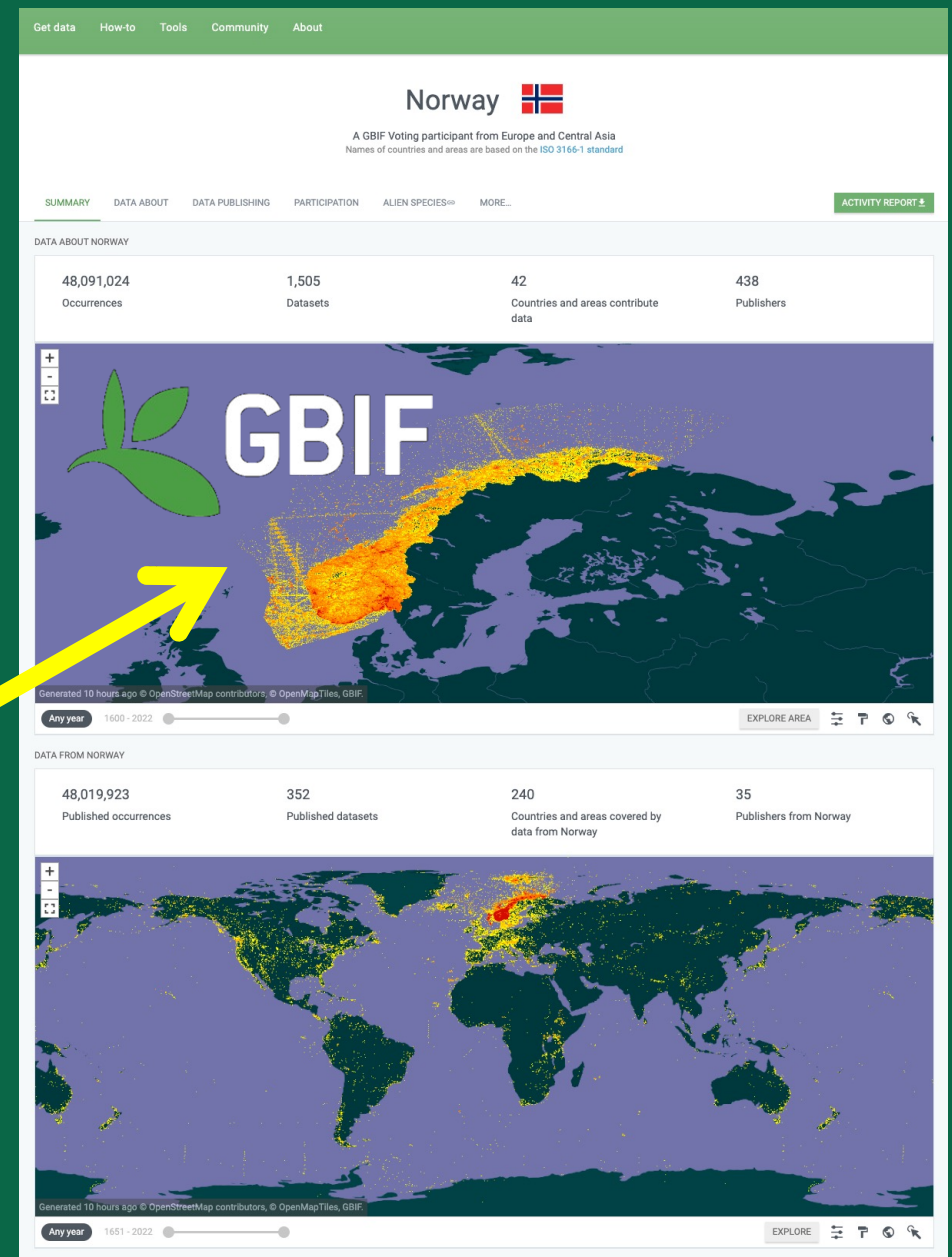
Cartagena Protocol

Party since: 2003-09-11

By: Ratification

Further Information

- > InforMEA Profile
- > World Heritage Sites
- > GBIF Data
- > WTO Statistics
- > Law and Environment
- > Invasive Alien Species
- > Related Websites



POLICY LINKS: AICHI TARGETSUPPORTING BIODIVERSITY INDICATORS



- Trend in invasive alien species introductions (through Global Register of Introduced and Invasive Species)



- Species Protection Index
- Protected Area Representativeness Index

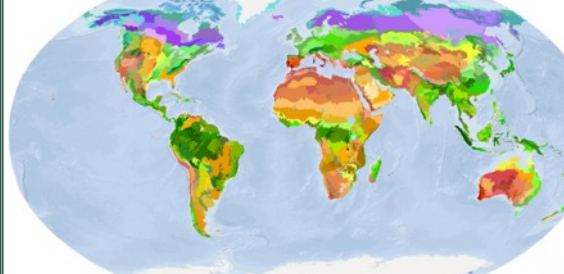


- Comprehensiveness of conservation of socioeconomically/culturally valuable species
- Agrobiodiversity Index
- Crop Wild Relative Index



- Growth in species occurrence records accessible through GBIF
- Species Status Information Index

A DATA RESOURCE TO SUPPORT RESEARCH AND SUSTAINABLE DEVELOPMENT



SERVED AS THE BASIS OF THE STATISTICAL ANALYSIS IN SMITH ET AL. 2018, THE LATEST EXPERT-LED REFINEMENT OF A GLOBAL MAP OF ECOREGIONS DEVELOPED AS PART OF THE PROPOSED GLOBAL DEAL FOR NATURE HAD ITS APPROACH VALIDATED BY THE RESEARCH. FIGURE FROM DINERSTEIN ET AL. (2017) <https://doi.org/10.1093/biosci/bix014> [CC BY 4.0]

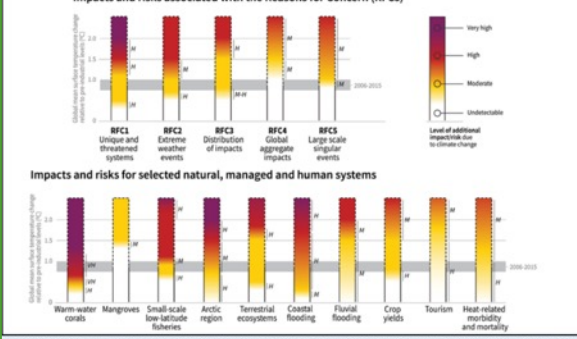
DATA STORY USING SPECIES OCCURRENCE DATA AS EVIDENCE TO TEST RECEIVED BIOGEOGRAPHIC WISDOM

DATA USED: 200 MILLION SPECIES OCCURRENCES



COFFEA LIBERICA BY DINESH VALKE https://www.flickr.com/photos/dinesh_valke/5597839545 [CC BY-SA 2.0]

DATA STORY DEVELOPING AN INDICATOR FOR SUSTAINABLE DEVELOPMENT GOALS & BIODIVERSITY TARGETS USING OPEN DATA



Impacts and risks associated with the reasons for concern (RFCs)

Impacts and risks for selected natural, managed and human systems

IMPLICATIONS OF GLOBAL WARMING FOR PEOPLE, ECONOMIES AND ECOSYSTEMS. CROPPED FROM FIGURE IN IPCC SR1.5: SUMMARY FOR POLICYMAKERS*

DATA STORY DATA FROM THE GBIF NETWORK UNDERPINS BIODIVERSITY-RELATED FINDINGS IN LATEST IPCC REPORT



PTEROPUS GIGANTEUS BY HEMANT KUMAR <https://www.gbif.org/occurrence/1092888502> [CC BY-NC 4.0]

DATA STORY FLYING FOXES PREDICT NIPAH VIRUS TRANSMISSION RISK

DATA USED: 47,942 SPECIES OCCURRENCES

Conservation

- Protected areas
- Threatened species
- Invasive species risk

Food Security

- Crop wild relatives
- *In situ, ex situ* conservation of genetic diversity
- Fisheries planning

Climate change

- Modelling impacts on species ranges
- Adaptation strategies
- Mitigation benefits, risks

Human health

- Disease risk based on occurrence of vectors, hosts, reservoirs
- Medicinal plants
- Hazards e.g. snakebite

PEER-REVIEWED PUBLICATIONS USING GBIF-MEDIATED DATA



WHY OPEN MARINE SCIENCE?



WHY OPEN MARINE SCIENCE?

- ❖ We are in the middle of an ongoing **paradigm shift** in scientific practice (*and impact metrics*).
- ❖ Marine science will also need to develop **different approaches**, than they needed in the past – *to remain relevant*.
- ❖ Society is gaining Big Data maturity and will **expect new services** from marine sciences.
- ❖ The open science wave is moving **fast**!





DATA CITATION - A NEW CURRENCY OF SCIENCE

- **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...**



DECLARATION ON RESEARCH ASSESSMENT DORA

- 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 (2022-09-20), **19 531 individuals** and **2 630 organizations** in **159 countries** have signed DORA.
- The Research Council of Norway (RCN) signed DORA in May 2018 [\[link\]](#)

INCENTIVE FOR DATA REUSE

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





GBIF

#CiteTheDOI

GBIF started issuing DOIs on 3 February 2015

The logo for Digital Object Identifiers (DOIs), featuring the lowercase letters 'doi' in a bold, sans-serif font. The 'd' is black, and the 'oi' is white. This text is centered within a bright yellow circle, which is itself set against a larger, light orange starburst shape.

HOW TO CITE DATA MEDIATED BY GBIF ATA CITATION

1. **Download data** from GBIF.org
2. and receive recommended citation with a **download DOI**
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Brighly, W. H., ... (2020) Global Change Biology

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subtropical southeastern Africa during the past 790,000 yr

Chevalier, M., Chase, B., Quirk, L., Dupont, L., Johnson, T. (2020) Geology

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Lindelf, K., ... (2020) Journal of Systematics and Evolution

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

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

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. *Yinquantia*, 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 disjunct 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

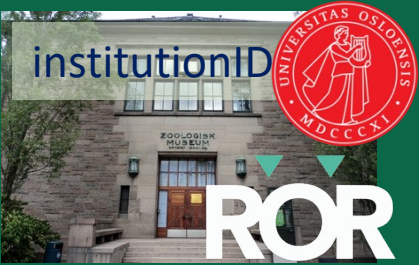
Adams DC, Berns CM, Kozak KH, Wiens JJ. 2009. Are rates of species diversification correlated with rates of morphological evolution? *Proceedings Biological Sciences* 276: 2729–2738. Crossref | PubMed | Web of Science® | Google Scholar

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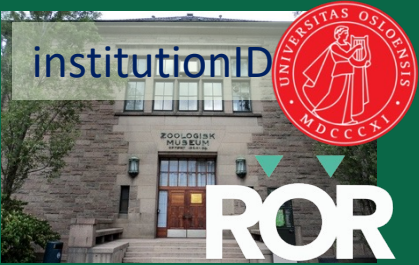


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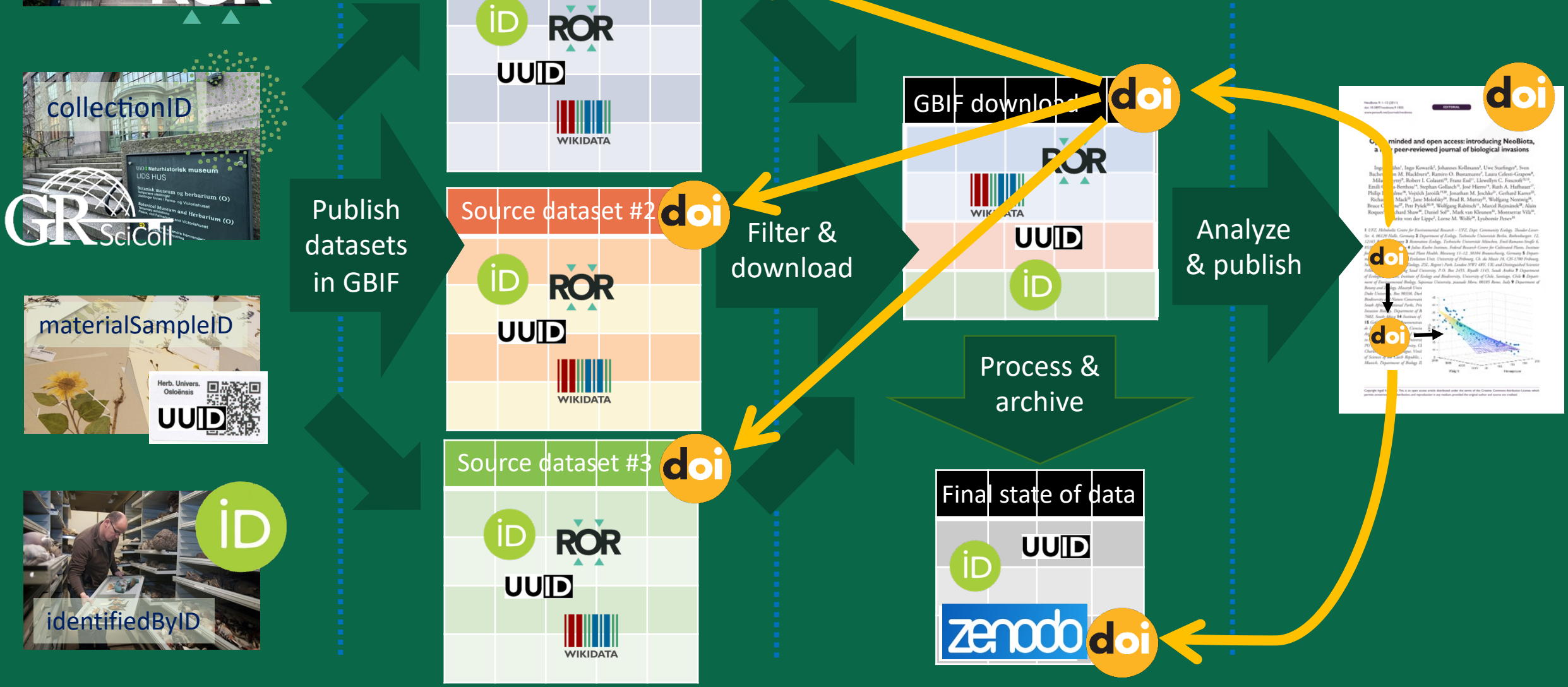
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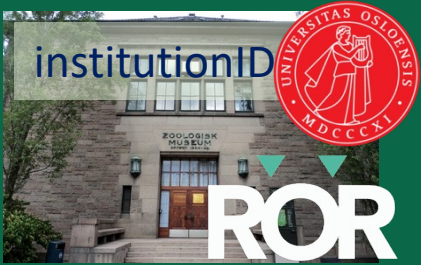
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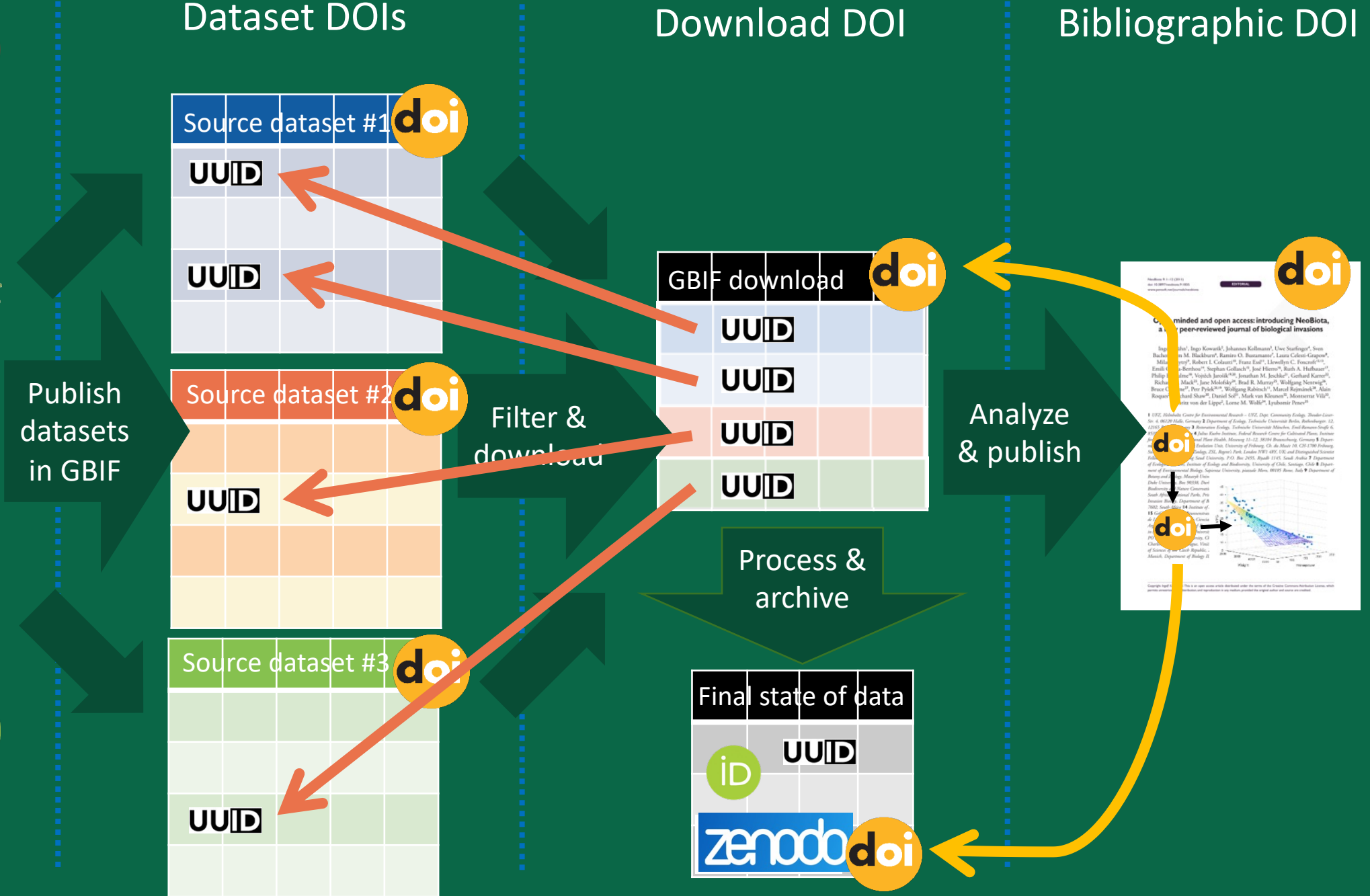


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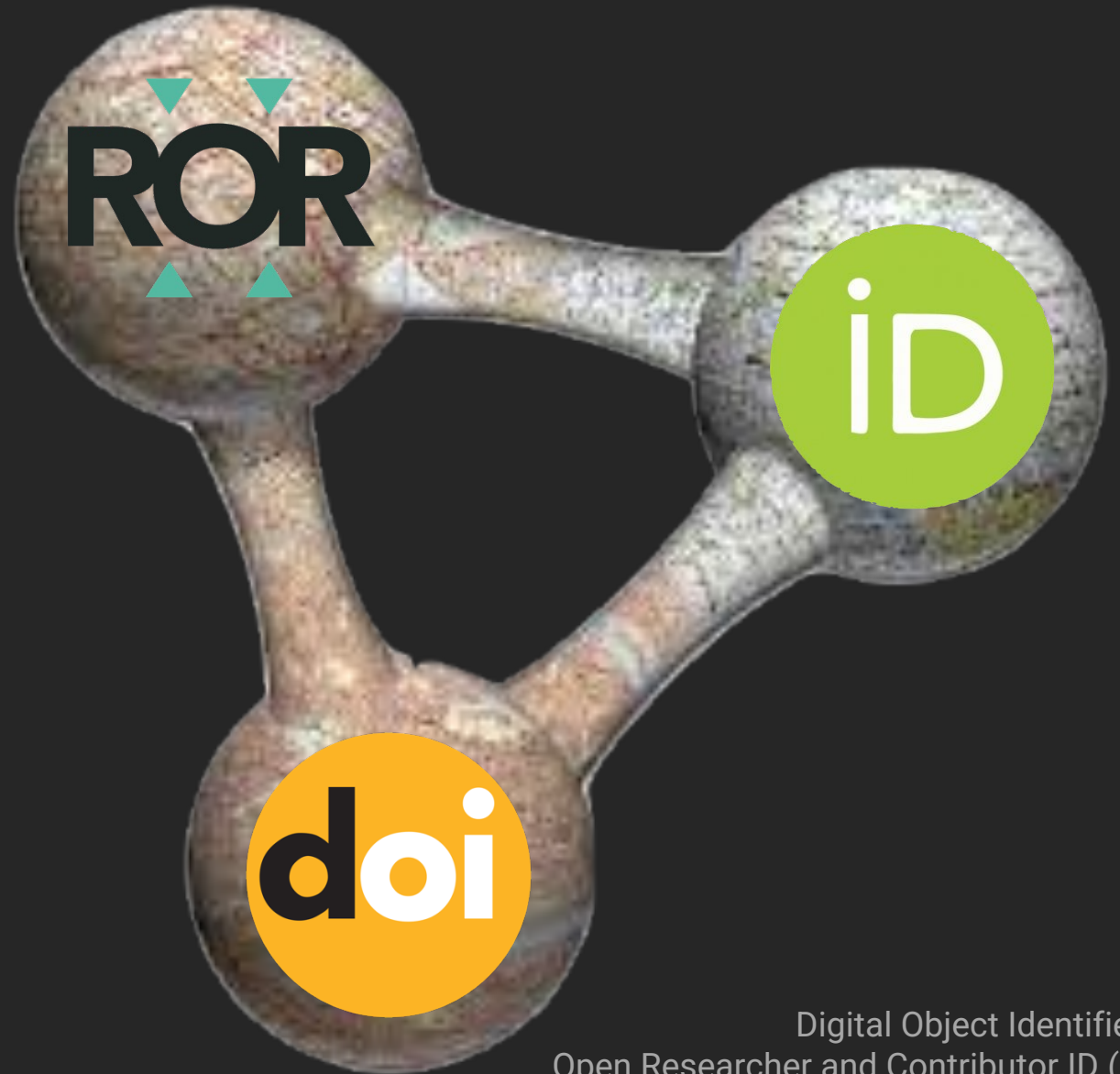
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Scientific name	Country or area	Coordinates	Month & year	Basis of record	Dataset
Sphaerophorus fragilis (L.) Pers.	Norway	60.6N, 6.7E	1975 August	Preserved specimen	Lichen herbarium, Oslo (O) UiO
<i>Atriplex</i> 1758	Spain		1971 January		Oslo (O) UiO
<i>Schismus barbatus</i> (L.) Thell.	Spain		1971 January		Oslo (O) UiO
<i>Amaranthus</i> L.			1971 January		Oslo (O) UiO
<i>Setaria</i> Beauv.			1971 January		Oslo (O) UiO
<i>Amaranthus</i> L.			1971 January		Oslo (O) UiO
<i>Spergularia</i> (Pe			1971 January		Oslo (O) UiO
<i>Salix phylicifoli</i>			1971 January		Oslo (O) UiO
<i>Beta patellaris</i> Moq.	Spain		1970 January		Oslo (O) UiO
<i>Bromus rigidus</i>			1971 January		Oslo (O) UiO
<i>Asparagus pas</i>			1971 January		Oslo (O) UiO
<i>Cheilanthes marantae</i> (L.) Domin	Spain	28.2N, 15.6W	1970 January		Oslo (O) UiO
<i>Spergula fallax</i> (Lowe) E.H.L.Krause	Spain		1970 January		Oslo (O) UiO
<i>Schismus barbatus</i> (L.) Thell.	Spain		1970 January		Oslo (O) UiO
<i>Asphodelus fistulosus</i> L.	Spain		1970 January		Oslo (O) UiO
Polypodium serratum Milde	Spain	28.2N, 15.6W	1970 January		Oslo (O) UiO
<i>Sporobolus indicus</i> R.Br.	Spain	28.1N, 15.5W	1970 January		Oslo (O) UiO
<i>Trisetaria pumila</i> (Desf.) Maire	Spain	28.1N, 15.5W	1970 January		Oslo (O) UiO
<i>Schismus barbatus</i> (L.) Thell.	Spain		1970 January	Preserved specimen	Vascular Plant Herbarium, Oslo (O) UiO

Catalogue number 2007334

Occurrence ID urn:catalog:O:V:2007334

Other catalogue numbers urn:uuid:0574816d-3d99-41b8-b3b8-c6035de0e929

Event date 1971-01-04

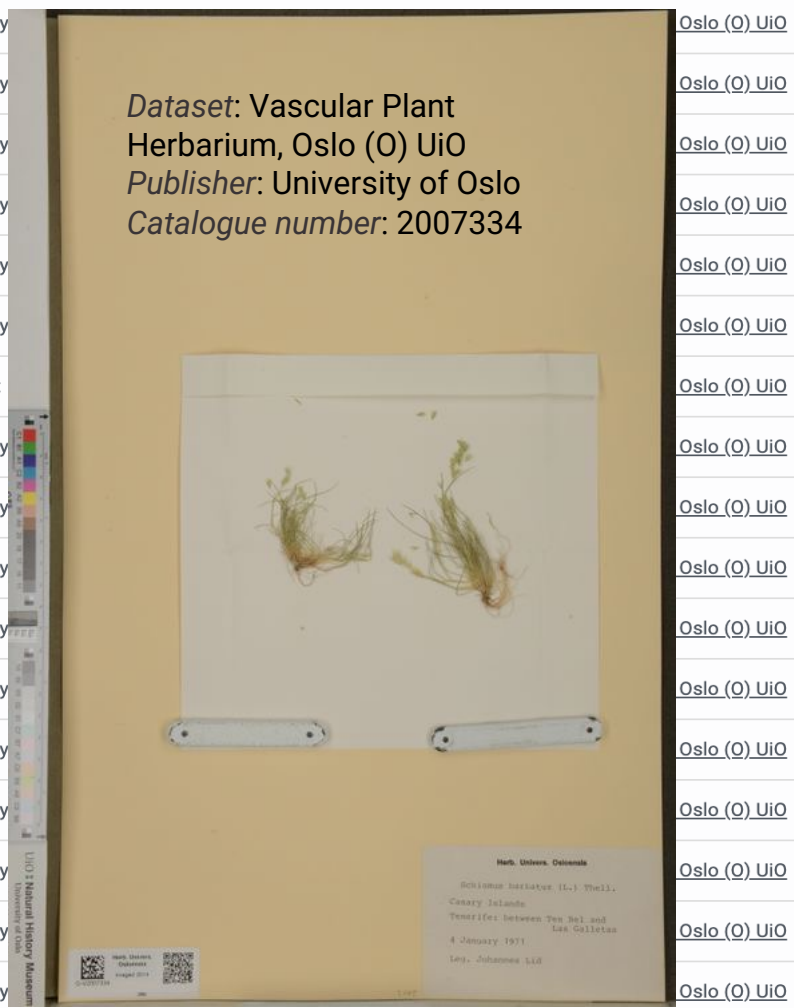
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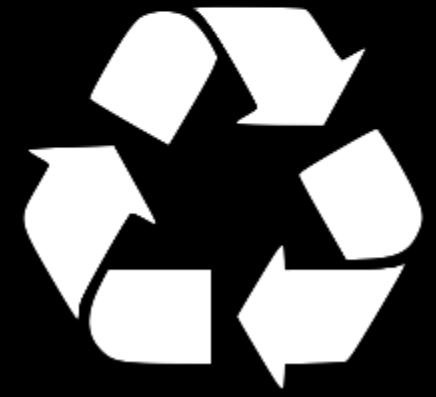


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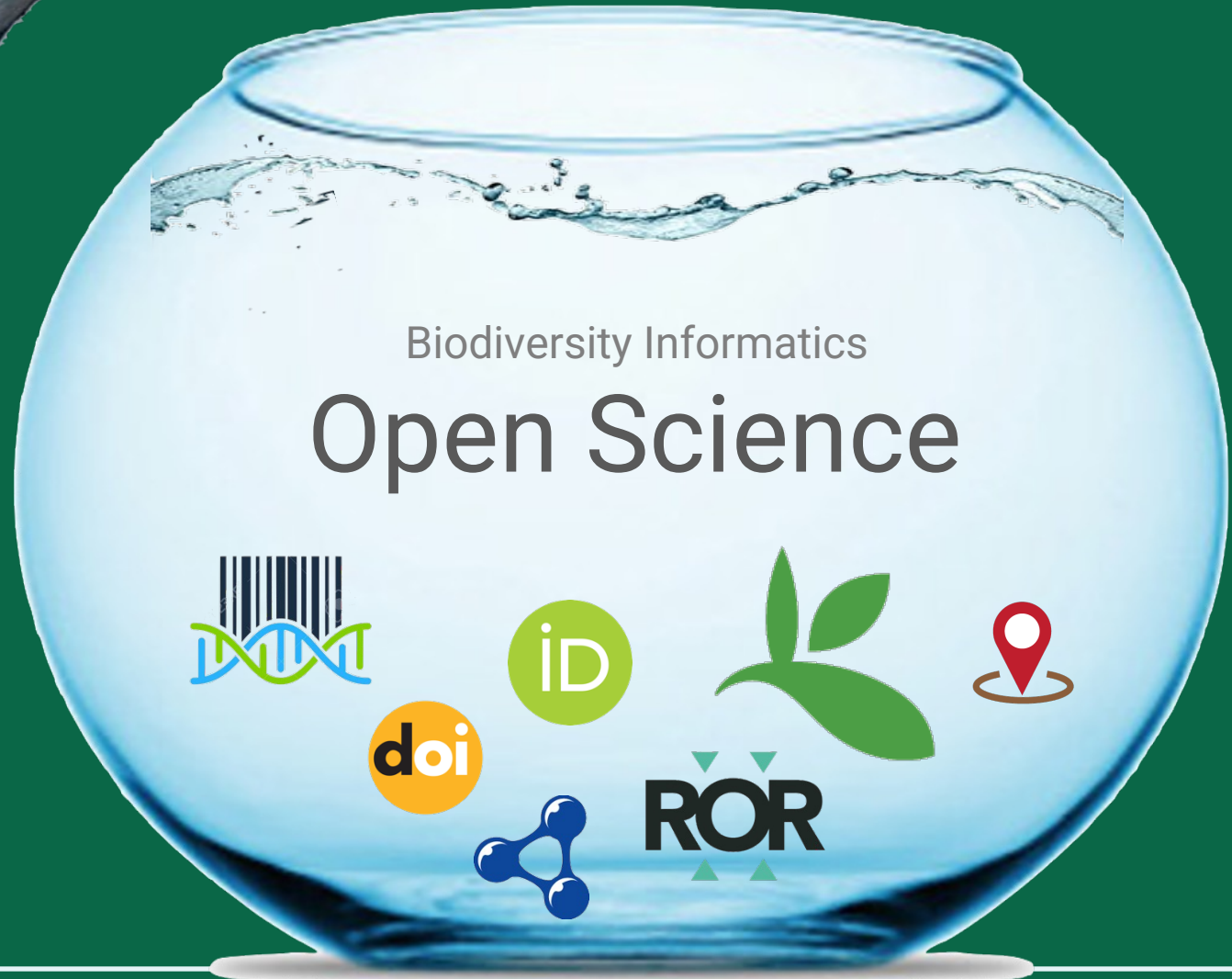
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... to name things
... making it possible to refer to them*



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- A Persistent Identifier is **globally unique, persistent, and resolvable**“.
- A PID is resolvable when it allows both **human and machine** users to access an object or its representation, and its *Kernel* Information.
- **Kernel Information** is a structured record that contains information (metadata) about the referred object, such as a pointer to the location where the data for the object can be found.



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