

*free and open access to biodiversity data*

## GBIF and EU to improve biodiversity information for developing countries



Specimen digitization workshop. Photo by Jean Ganglo.

The European Union (EU) and GBIF have launched a four-year €3.9 million project aimed at increasing the amount of biodiversity information available for developing countries.

GBIF's [Biodiversity Information for Development \(BID\)](#) will focus on enhancing capacity and mobilizing data from countries in Africa, the Caribbean and the Pacific. By gathering information relevant for policymakers, BID will help those countries to meet key policy needs and commitments under intergovernmental processes like the Convention on Biological Diversity (CBD) and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). BID will also help the European Union fulfil the commitments made to avert global biodiversity loss.

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## DATA PUBLISHING

### New opportunity for publication of species sampling and monitoring data

[Biodiversity Information Standards](#) (TDWG), the international body responsible for maintaining standards for the exchange of biological data, has ratified changes that improve support for mobilization and access of sample-based species data through the GBIF network.

By adding to the rich set of terms already available in the [Darwin Core](#) (DwC) standard, this ratification will help GBIF-mediated data move beyond “presence only” data and support the discovery and application of richer, more quantitative information used in other areas of scientific discovery and research, particularly ecological monitoring and assessment.

In addition to bringing in new datasets, these changes could also improve the quality and utility of many datasets already published through GBIF, which derive from the more complex sources required to understand how species populations change across space and time.

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### New GBIF task force to speed up access to natural history collection data

A team of international experts convened by GBIF intends to help accelerate the discovery of and access to information about the world’s undigitized specimen collections.

The *task force on accelerating the discovery of bio-collections data* will start by defining the essential information needed about various types of collections. This ‘metadata’ will describe the contents of each collection and help data holders to assess and prioritize their digitization activities.

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### Software release supports consistent DOI-based citation

The GBIF Secretariat has published version 2.2 of its [Integrated Publishing Toolkit](#) (IPT), a free open-source software tool for publishing and sharing biodiversity data. The new version supports

consistent, traceable attribution of GBIF-mediated data and downloads, streamlines how publishers define appropriate uses of their data, and improves data quality control.

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### Norwegian data increase by 25%

The [Norwegian Biodiversity Information Centre](#) (NBIC) added 3.5 million observation records to the [Norwegian Species Observation Service dataset](#) in December, bringing the total number of records in the dataset to nearly 11 million.

The dataset’s dynamic growth is due in large part to Norway’s [Artsobservasjoner](#) portal, which gathers observations from 9,000 volunteers, who report an average of 5,000 observations each day. Artsobservasjoner currently holds 12 million records on over 14,000 species, along with more than a quarter million images. These data feed into the [Species Map Service](#), which shares more than 19 million species occurrence records related to over 31,000 species, provided by 34 Norwegian source institutions.



Musk ox (*Ovibos moschatus*). Image by Bernt Kåre Knutsen published on [Artsobservasjoner.no](#).

National and regional agencies, county governors, municipalities, private companies and scientific institutions use these data extensively.

NBIC expects a continued steady increase in species reporting and publishing through GBIF.org this year.

To learn more, contact [Dag Endresen](#) or [Nils Valland](#) at NBIC.

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[Behind the scenes: creating and operating the Species Observations database](#)



## GBIF COMMUNITY

### New GBIF Participants

The southeast African country of Malawi and Swiss non-profit organization Plazi are the newest Associate Participants in GBIF, while Togo has moved its status to Voting Participant.

“Joining GBIF will help Malawi gathering biodiversity data relevant for policy makers,” said Lyson Kampira, manager of the [new GBIF node at the National Commission for Science and Technology](#), noting its relevance for meeting international commitments for the CBD and IPBES.

[Plazi](#) supports linked open-access biodiversity data drawn from taxonomic literature, and Donat Agosti, president of Plazi, acknowledged “the shared efforts of both organizations to provide critically needed access to vast stores of data and knowledge about species found in biodiversity literature.”

Togo’s [move from Associate to Voting Participant](#) gives the country a direct role in GBIF’s governance. The West African nation has participated in GBIF’s capacity enhancement programme, [mobilizing specimen records from the country’s herbarium](#) and publishing checklists related to [leguminous plants](#), [algae](#) and [West African mushrooms](#).

### New publications to guide sustainable mountain development in Africa

Albertine Rift Conservation Society, a GBIF Associate Participant, UNEP and partners have released two landmark publications—the African Mountains Atlas and the African Mountains Status Report—to guide sustainable mountain development in the continent. Both publications will support planners and decision makers in Africa.

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### GBIO report now available in Japanese

[JBIF](#), the GBIF node in Japan, released a Japanese translation of the [Global Biodiversity Informatics Outlook](#) (GBIO) at a December workshop in Tokyo. By focusing effort and investment in biodiversity informatics, the GBIO report provides a framework for harnessing the power of technology and an open data culture for the benefit of biodiversity.

The Japanese version includes new material aimed at helping users, including a commentary on open data and semantic web, and a glossary.

► [DOWNLOAD REPORT](#)

### New citizen science records on Australian data portal



*Anthracophyllum archer*, from ALA’s Fungi map

Fungimap, one of the largest citizen science groups in Australia, has been around for 20 years, but recent support from the [Atlas of Living Australia](#) (ALA), GBIF’s national node, has helped deliver its data to a wider audience.

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By providing a GPS-enabled smartphone app, ALA also enabled quick reporting of sightings for the National Koala Count. These data complement existing records, and a [full report on the 2014 results](#) is available.

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### Portal of the German national biodiversity data infrastructure revamped

[GFBio](#), the German Federation for Biological Data, has been relaunched with new tools and services, including new search features and in-depth information about the [data life cycle](#). Nineteen partner institutions, including national node hosts - the [Botanic Garden and Botanical Museum Berlin-Dahlem](#) (BGBM), [Museum für Naturkunde](#) (MfN), [Senckenberg Gesellschaft für Naturforschung](#), the [Bavarian Natural History Collections](#) and the

[Zoological Research Museum Alexander Koenig](#) - help implement the work of GFBio.

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## NEW DATA

### NEW SPECIES DATA ON GBIF.ORG

An [ongoing collaboration with Pensoft Publishers](#) to unlock and preserve the value of ‘small data’ has led to a steady stream of new datasets from research related to the description of new species and species distributions published in the peer-reviewed [Biodiversity Data Journal](#).

Notable examples include:



Holotype of *Neoniphon pencei*, Rarotonga, Cook Islands Photo by Richard Pyle and Brian Greene

- [Neoniphon pencei](#), a new species of ray-finned fish described from Rarotonga, Cook islands
- [Margaromantis piza](#), a second species of the neotropical mantid genus from Brazil
- [Vigna yadavii](#), a new species of cow pea identified in the Western Ghats of India
- [Land snails in the Srebarna Nature Reserve](#) in Bulgaria
- [Distribution of the Laotian rock rat](#) (*Laonastes aenigmamus*), the only surviving member of the otherwise extinct rodent family **Diatomyidae**
- [Distribution of an endemic leaf-nosed bat](#) (*Hipposideros durgadasi* Khajuria) from south India.

### ARGENTINA

The [Ministerio de Ciencia, Tecnología e Innovación Productiva](#) (Ministry of Science, Technology and Productive Innovation) has published 10,919 observations in a collection of 54 new bird family datasets from Aves Argentina / Asociación

Ornitológica del Plata, the oldest environmental organization in South America. The data represent more than 40 years’ worth of observations by Argentinian ornithologist Tito Narosky, author of *Birds of Argentina and Uruguay, a Field Guide*.

### BELGIUM

[46 occurrences of forage plants](#) collected in the [Democratic Republic of Congo](#) by the Université Pédagogique Nationale, Kinshasa were published by the [Royal Museum for Central Africa](#) in Belgium.

### BENIN

[GBIF Benin](#) has published three new datasets from recent censuses:

- More than [18,000 records gathered in 2014](#) for a planned national atlas of the animals of Benin.
- A [national forest census](#) including more than 40,000 records
- [3,161 plant occurrences in the Agrimey forest reserve](#) in southern Benin.

### CANADA

Cretaceous dinosaurs from Alberta and Jurassic ichthyosaurs from Saskatchewan are among the specimens published by the [Royal Ontario Museum](#) from their collection of vertebrate fossils. The [24,600 records](#) published represent one-third of the century-old collection of more than 72,000 catalogued specimens.

### COLOMBIA

The [Alexander von Humboldt institute](#), host of the GBIF national node, has published [data on plants, soil fauna, amphibians and birds](#) in the high-altitude páramos ecosystems of Los Nevados and Chili-Barragán in the Colombian Andes.

The Institute also published [bird data from a 2006 study](#) in the Caldas department, which includes records of two endangered species – the yellow-headed brush finch (*Atlapetes flaviceps*) and Stiles’ tapaculo (*Scytalopus stilesi*).

Colombia’s universities have published new several datasets, including:

- the [insect collection](#) of the Universidad Tecnológica del Chocó
- the [fish collection](#) of the Universidad Industrial de Santander
- [aquatic plants](#) of the Orinoquía region from the Universidad de los Andes

- the [fish collection](#) of the Universidad Católica de Oriente.

Other new Colombian datasets include rainforest vegetation plots from REDD+ (Reduced Emissions from Deforestation and Forest Degradation) projects in

- [Bahía Málaga](#), Valle del Cauca
- [Rio Cajambre](#), Valle del Cauca
- [Chocó](#)

## GERMANY

The [Botanic Garden and Botanical Museum Berlin-Dahlem](#) has published a dataset with more than [15,000 photographs of type specimens](#) collected in Central and South America between 1778 and 1930. The images are the work of botanist [J. Francis Macbride](#), whose photographs of these tropical American plants in European herbaria became even more valuable when parts of the collections were destroyed during World War II.



Image of type specimen of *Oreopanax trollii* Harms from the collection of BGBM's historical photographs.

## INDIA

The Wildlife Institute of India, host of the GBIF national node, has published [31,936 records of recent bird observations](#) from the Keoladeo National Park in north India. Previously known as the Bharatpur bird sanctuary, the park is listed as a UNESCO World Heritage Site due to its significance as wintering grounds for migratory birds.

## JAPAN

The [National Institute of Genetics](#) has published occurrence [data for migratory shorebirds](#) captured in the marshes and lakes of Hokkaido as part of a study of avian infections of West Nile virus and haematozoa.

## PORTUGAL

[Citizen scientists' observations of invasive plants](#) in Portugal are now available from [invasoras.pt](#), a combined web platform and phone application developed at the University of Coimbra's [Centre for Functional Ecology](#).

The [National Museum of Natural History and Science](#) at the University of Lisbon has published more than [6,000 herbarium records of Angolan plant specimens](#) dating back to the mid-nineteenth century.

## SPAIN

The [VIT herbarium](#) at the Museum of Natural Sciences of Alava, Spain has published records for more than [85,000 plant specimens](#), mostly from Spain.

## GBIF DATA IN USE

*The Secretariat maintains a programme to monitor use of GBIF-mediated data in scientific literature. The following peer-reviewed articles represent some recent highlights.*

Bradley BA, Early R & Sorte CJB (2015) [Space to invade? Comparative range infilling and potential range of invasive and native plants](#). *Global Ecology and Biogeography*.

Testing the notion that species distribution models predict disproportionately smaller potential ranges for non-natives than natives, researchers compared the distributions of 13,575 native, endemic, alien and invasive plants in the United States to determine how these groups' different range attributes might influence ecological forecasting. Describing GBIF as "the only source that could consistently provide distributional data for all of our target species at a global scale", the study concluded that invasives had not achieved the expected degree of range infilling, suggesting that "plants introduced to the US still have plenty of space to invade".

Campbell J (2014) [Access to scientific data in the 21st century: rationale and illustrative usage rights review](#). *Data Science Journal*.

A researcher into information policy and access describes the need for establishing clearer definitions of 'open access' while outlining how freely available scientific data can encourage both validation of research results and economic development.

Candela L, Castelli D, Manghi P & Tani A (2015) [Data journals: A survey](#). Journal of the Association for Information Science and Technology.

Authors cite the GBIF's Integrated Publishing Toolkit as one tool that provides direct support for describing and authoring peer-reviewed datasets, which in turn increase the discoverability, availability, and reuse of data by others.

Elmendorf SC, Henry GHR, Hollister RD, Fosaa AM, Gould WA et al. (2014) [Experiment, monitoring, and gradient methods used to infer climate change effects on plant communities yield consistent patterns](#).

To assess and address potential inconsistencies in three common methods for modelling potential climate impacts, a broad international team used GBIF-mediated data from plant communities in arctic and alpine North America and Europe to analyse predicted changes in community composition. Results from in situ experimental warming and monitoring approaches yield consistent estimates of the communities' magnitude of response to contemporary climate warming, while inferences based on present-day patterns of ecological systems tend to overestimate them.



Sawfish (*Pristis pectinata*). Photo by David Iliff.

Ferretti F, Verd GM, Seret B, Šprem JS & Micheli F (2015) [Falling through the cracks: the fading history of a large iconic predator](#). Fish and Fisheries. Sawfishes are among the world's most endangered marine vertebrates. Human impacts have contributed to their extinction from many coastal waters, and debates about their past presence and possible extinction in the Mediterranean have carried on for decades. This research team reconstructed the history of the occurrence of two sawfish species in the western Mediterranean between 1576 and 1959, using records accessed through GBIF among other sources. By suggesting that both species went extinct in the Mediterranean in the 1960s or 70s, the results challenge current assumptions on sawfish ecology and biogeography,

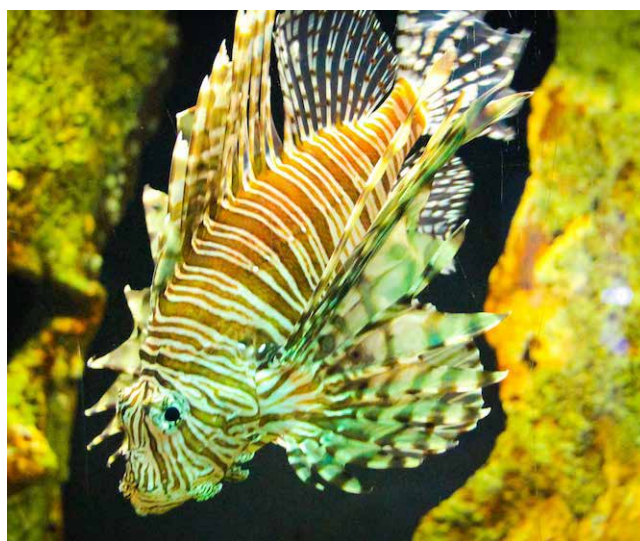
offer new options for sawfish conservation in the Atlantic and highlight the importance of historical analyses for reconstructing ecosystem baselines and setting recovery targets.

Ficetola GF, Rondinini C, Bonardi A, Basiero D & Padoa-Schioppa E (2015) [Habitat availability for amphibians and extinction threat: a global analysis](#). Diversity and Distributions. Journal of Biogeography.

Despite the threats of habitat loss and degradation detailed by the IUCN Red List over the past decade, quantitative measures of habitat exist for only a small subset of amphibian species. Using more than 200,000 GBIF-mediated records along with other data, researchers produced models for 5,363 amphibians (84% of the species evaluated by the IUCN's Global Amphibian Assessment) and found that models can accurately predict fine-scale distribution of many species, suggesting their usefulness as a complement to expert-led conservation assessments.

Fuller P & Neilson ME (2015) [The U.S. Geological Survey's Nonindigenous Aquatic Species Database: over thirty years of tracking introduced aquatic species in the United States \(and counting\)](#). Management of Biological Invasions.

In describing the capabilities, functionality, and 40-year history of this U.S. database, the authors outline how it harnesses the wealth of other sources of biodiversity and biogeographic observation data, including more than 12,000 records harvested via the GBIF.org API.



Lionfish (*Pterois miles*), an invasive species along the east coast of the United States. Photo by Lindley Ashline.

García-Roselló E, Guisande C, Manjarrés-Hernández A, González-Dacosta J, Heine J et al. (2014) [Can we derive macroecological patterns from primary Global Biodiversity Information Facility data?](#) *Global Ecology and Biogeography*.

To understand the impact of data sampling biases and quality concerns in global-scale macroecological models, this team used all available GBIF-mediated data for fish species from marine-only orders to compare four common procedures. Provided that researchers clean the original data, correct for autocorrelation and accounting for obvious underestimations in species richness, the findings suggest that improving data quantity and quality may matter more than sophisticated mathematical models in predicting the distributions.

Lira-Noriega A & Soberón J (2014) [The relationship among biodiversity, governance, wealth, and scientific capacity at a country level: Disaggregation and prioritization](#). *AMBIO*.

The authors examine the relationships between biodiversity richness, wealth and institutional capacity in more than 200 countries and territories, using the number of records mobilized through GBIF as part of an index of scientific capacity. Such relationships are not simple, and patterns of wealth and capacity show a more complicated pattern that cuts against conventional wisdom. The paper concludes by encouraging collaborations to improve access to primary biodiversity data, both digitized and not, that are not yet available for analysis, science and policy.

Mathew C, Güntsch A, Obst M, Vicario S, Haines R et al. (2014) [A semi-automated workflow for biodiversity data retrieval, cleaning, and quality control](#). *PNAS*.

To address the time-consuming and complex process of compiling and preparing data for analyses and prediction of species distributions, the researchers describe the design and implementation of a Taverna-based data refinement workflow for retrieving, cleaning and selecting taxonomic data from sources including GBIF.org and the GBIF API.



*Pristimantis cruentus*. Photo by Brian Gratwicke.

Mendoza ÁM, Ospina OE, Cárdenas-Henao H & García-R JC (2015) [A likelihood inference of historical biogeography in the world's most diverse terrestrial vertebrate genus: Diversification of direct-developing frogs \(Craugastoridae: Pristimantis\) across the Neotropics](#). *Molecular Phylogenetics and Evolution*.

This analysis of new and published DNA sequencing data helps improve understanding of how the geological complexity of the Andes may have contributed to the astounding diversity of *Pristimantis*, a frog genus composed of more than 420 species. Combining GBIF-mediated data with information from the Global Amphibian Assessment and recent publications that describe new records and range extensions, researchers reconstructed ancestral range maps suggesting that the paleogeological changes in the northwestern Andes promoted diversification and dispersion of the genus across a wide swathe of Central and South America.

Owen CL, Bracken-Grissom H, Stern D & Crandall KA (2015) [A synthetic phylogeny of freshwater crayfish: insights for conservation](#). *Philosophical Transactions B*.

Drawing upon GBIF-mediated data as well as other sources, the authors describe their use of The Open Tree of Life, a user-curated taxonomic project, to create a synthesis evolutionary tree for freshwater crayfish. Their conclusions present the threat distribution across species, an estimated molecular phylogeny, and analyses identifying freshwater crayfish species that are high-priority candidates for conservation efforts.

van Andel TR, Croft S, van Loon EE, Quiroz D, Towns AM & Raes N (2014) [Prioritizing West African medicinal plants for conservation and sustainable extraction studies based on market surveys and species distribution models](#).

Biological Conservation.

Wild-harvested medicinal plants are an important source of health and trade for people in sub-Saharan Africa. By combining quantitative surveys of herbal markets in Ghana and Benin with the first detailed distribution maps for 12 commercially extracted medicinal plants (which draw upon GBIF-mediated data), this study assesses the potential vulnerability of species to overharvesting with the goal of safeguarding important provisioning services of West African ecosystems.



Sun drying of *Piper guineense* fruits at Bode Market in Ibadan, Nigeria. Photo by the International Institute of Tropical Agriculture.

Paknia O, Rajaei Sh. H & Koch A (2015) [Lack of well-maintained natural history collections and taxonomists in megadiverse developing countries hampers global biodiversity exploration](#). Organisms Diversity & Evolution.

Described as the first critical assessment of current conditions of institutional infrastructure in biologically megadiverse developing countries, this research highlights a shortage of trained taxonomists and the lack of well-maintained collection infrastructure as the main bottlenecks for biodiversity exploration. Citing GBIF.org's high proportion of observational data and small proportion of records with photographs for voucher specimens, the authors call for an expansion of digitization projects aimed at covering all voucher specimens in natural history collections worldwide.

Wisz MS, Broennimann O, Grønkjær P, Møller PR, Olsen SM et al. (2015) [Arctic warming will promote Atlantic–Pacific fish interchange](#). Nature Climate Change.

With the Arctic warming rapidly, the long-term barrier separating the marine organisms of the North Atlantic and the North Pacific is becoming less formidable. Using data gathered from GBIF and the Ocean Biogeographic Information System, researchers forecast the potential northward progression of 515 fish species due to climate change, finding that as many as 41 fish species could enter the Pacific and 44 species could enter the Atlantic by 2100.

## TRAINING

### Data publishing training organized in North America

Seventy-four data and collection managers, taxonomists, curators and researchers gathered in Ottawa, Canada, and Gainesville, Florida, on 13-14 January 2015 for a training event on publishing and sharing biodiversity data using the [GBIF Integrated Publishing Toolkit](#) (IPT).

Co-organized by iDigBio, VertNET, Canadensys, Agriculture and Agri-food Canada, the Canadian node CBIF, USGS-BISON and GBIF, the event connected participants via the Internet as they published test datasets. A preliminary webinar on 7 January focused on installing IPT.

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[iDigBio website](#)





## Hackathon targets preparing national checklists

A training hackathon in the Netherlands brought together staff from GBIF's European nodes to generate national species checklists using GBIF-mediated data. Participants received training in cross-mapping tools and in the creation of workflows needed for checklist creation.

The event was one of five [GBIF capacity enhancement grant recipients for 2014](#), and presentations are [available here](#).

## Course material from Biodiversity Informatics week in Brazil available online

The National Laboratory for Scientific Computing in Brazil (Laboratório Nacional de Computação Científica, or LNCC), host of GBIF's national node, organized a [full week of biodiversity informatics courses](#) led by international experts on data publishing, data quality, niche modelling and data visualization as part of its 2015 summer programme.

Course materials are [available from SiBBr](#).

## GBIF Portugal organizes seminar series

A series of 'information days' organized by GBIF Portugal in six cities in the country brought in 159 participants from 26 different institutions.

The events introduced available data resources, software and protocols to representatives of universities, research institutions, the national Institute for Nature Conservation and Forests – ICNF, regional and local administrations, private companies, NGOs and aquariums. The seminars also included hands-on sessions about using the

data, and participants expressed interest in data papers and the way in which they provide credit for data publishers.

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## EVENTS

[ICLEI World Congress 2015](#)

8 - 12 April 2015, Seoul, Republic of Korea

7th European Nodes Meeting

5 - 7 May 2015, Paris, France

[Africa Rising: Mobilising Biodiversity Data for Sustainable Development](#)

19-22 May 2015, Cape Town, South Africa



**GBIF VISION** *A world in which biodiversity information is freely and universally available for science, society, and a sustainable future.*

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