GBIF | Global Biodiversity
Information Facility

# Annual Report 2014



www.gbif.org

GBIF | Global Biodiversity Information Facility

# What is GBIF?

The Global Biodiversity Information Facility is a network of governments and international organizations, collaborating with a Secretariat in Copenhagen, Denmark, to provide a vital infrastructure for research and policy. It enables information about all forms of life on Earth, gathered over centuries in all parts of the globe, to be readily accessible by anyone, anywhere. Through GBIF.org, web services and a growing number of national and thematic portals, GBIF users have free access to more than 14,000 datasets published by over 750 institutions, ranging from zoological and botanical collections to observations by citizen scientists and surveys from research expeditions.
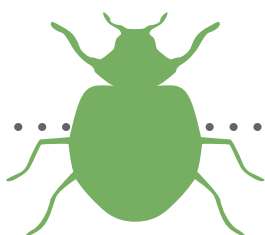
# GBIF's vision

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

# 2014 Highlights

GBIF GOVERNING BOARD AGREES NEW APPROACH TO STANDARD LICENSING OF DATASETS AND STREAMLINED PROCESS FOR ENDORSING DATA PUBLISHERS
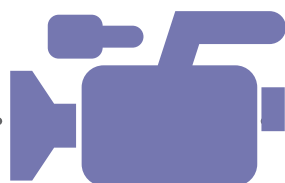
NUMBER OF SPECIES OCCURRENCE RECORDS PASSES HALF A BILLION

DETAILED PAGES ON RECORDS INCLUDE FIELD NOTES, SAMPLING METHODOLOGIES, COLLECTOR NAMES

VISITS TO GBIF.ORG PASS 1.1M, NEARLY 85,000 REQUESTS FOR DATA DOWNLOADS

USERS CAN NOW FILTER FOR RECORDS WITH IMAGES, VIDEOS, SOUND RECORDINGS AS WELL AS TYPE STATUS

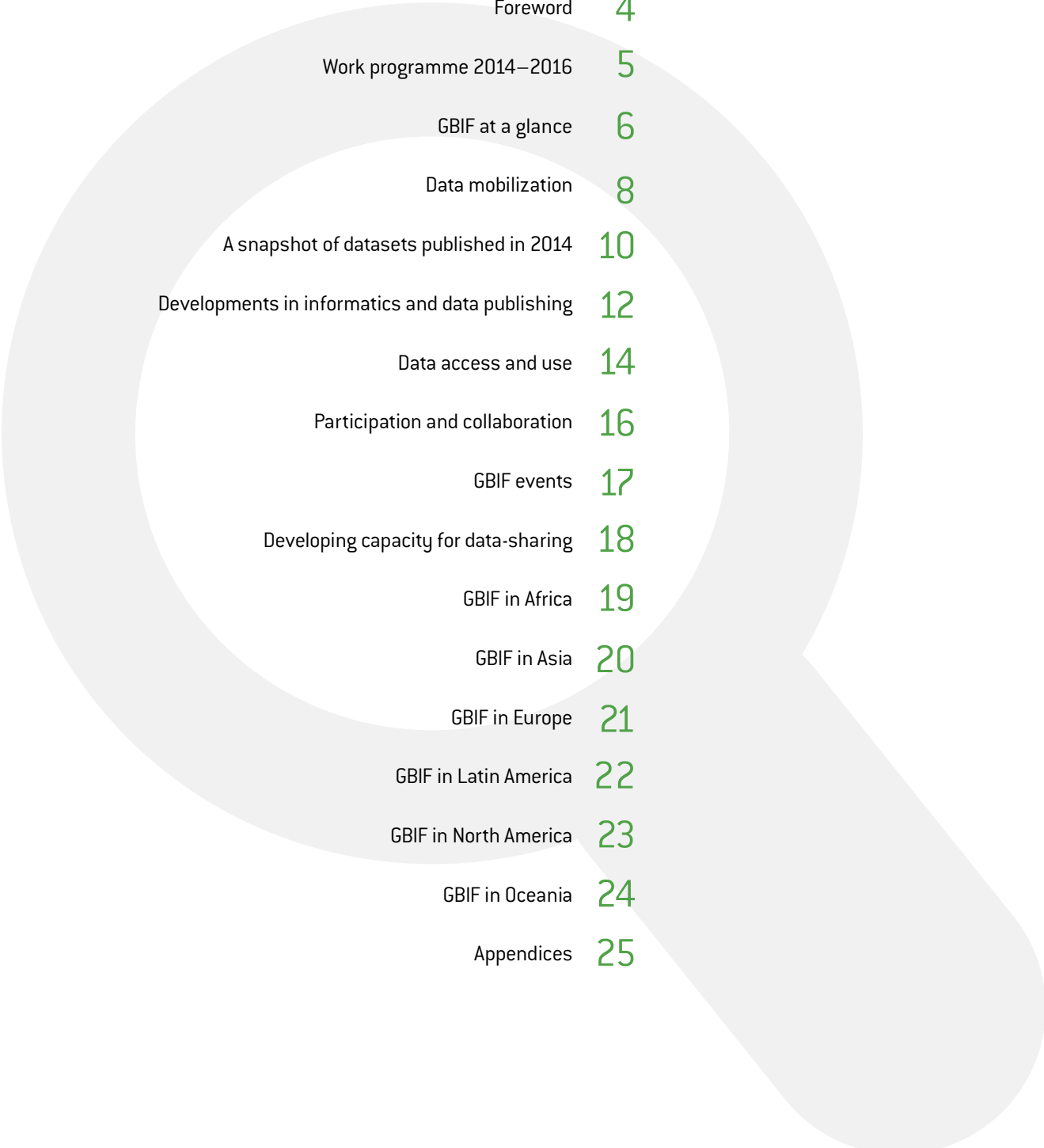DATA PUBLISHING TRENDS AND ANALYTICS AVAILABLE ON GBIF.ORG FOR ALL COUNTRIES

AGREEMENTS IN PLACE TO ENABLE BETTER CITATION AND PERSISTENCE OF DATASETS PUBLISHED THROUGH GBIF

357 PEER-REVIEWED RESEARCH ARTICLES CITE USE OF GBIF AS DATA SOURCE

# Contents

# Foreword

We have great pleasure in presenting the GBIF Annual Report for 2014. This year marked the start of a three-year work programme (2014-2016). Many of the activities started during the period covered by this report are still continuing, but this was a highly successful year for GBIF, with many important advances described in this document.

Significant improvements have been made to GBIF's technical infrastructure, bringing richer access to the wealth of data published throughout the network and benefitting data publishers and users alike with increasing support for standardized use and attribution. The volume of data in the network has passed a significant milestone of half a billion records and we have seen steady growth in the number of users accessing these data and acknowledging GBIF data within their publications.

These are excellent foundations for the remainder of this three-year work programme and for GBIF as it moves into its next phase of operation under a new strategic plan for 2017-2021. GBIF serves as the connection point between the many institutions and communities which collect or hold data on biodiversity, the researchers and policy-makers who depend on efficient access to these data, and global efforts to deliver open data infrastructures. Our focus in coming years is on improving the coverage, completeness and fitness-for-use of all data within the network and removing barriers to participation throughout the world.

During 2014, the GBIF Secretariat continued to restructure in response to staff turnover and to increase efficiency and responsiveness to the Participants and other stakeholders. Some work programme activities were delayed as relevant staff positions were filled. With Siro Masinde recruited as Programme Officer for Content Mobilization and Dmitry Schigel as Programme Officer for Content Analysis and Use, we are confident that these areas will move forward rapidly during 2015. During 2014, the Secretariat also saw the arrivals of Kyle Copas as GBIF Science Writer and Marlene Dalsgaard Nielsen as Administrative Assistant.

The GBIF Executive Committee and Budget Committee have been working to develop a stable and achievable funding model to take GBIF into the years beyond 2016. Securing continuous funding for existing infrastructures is difficult and will depend on all our friends highlighting GBIF's successes and the continuing importance of our mission to national stakeholders. We hope that you will find this report useful in telling this story. GBIF continued to perform well in 2014, supported by an enthusiastic and dedicated community. We look forward to our progress in 2015.

Peter Schalk
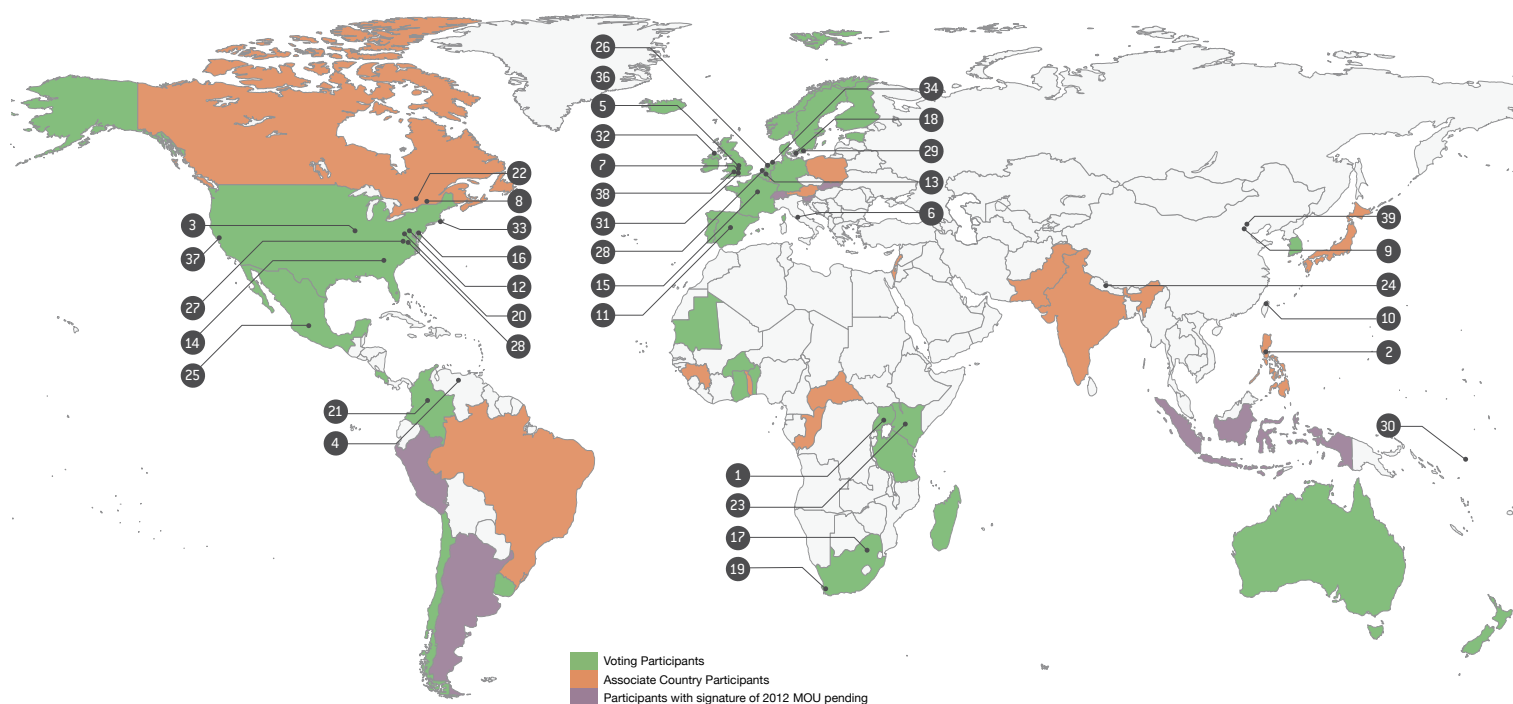Chair of the Governing Board

Donald Hobern
Executive Secretary

# Work programme 2014-2016

A new, three-year work programme for the GBIF community was agreed during the 20th meeting of the Governing Board in Berlin in October 2013. This table summarizes progress towards key deliverables of this work programme during 2014.

| Work streams | Key deliverables | 2014 progress |
|---|---|---|
| Advance the informatics – persistence and validation | Stable operation of GBIF.org and services | Web service API stabilized; indexing of wider set of data elements for occurrence records. |
| | Stable identifiers for datasets and records | Version 2.1 of Integrated Publishing Toolkit (IPT) requires presence and uniqueness of stable identifiers. |
| | Tools to support data citation | Plan presented to Governing Board for implementation of Digital Object Identifiers (DOIs) for datasets and downloads for rollout in 2015. |
| | Clear machine-readable data licences and guidelines | Consultation on licensing options; decision from Governing Board to implement mandatory selection of one of three Creative Commons licences with recommendation to select most open licence possible. |
| | Repositories to improve long-term persistence | Memorandum of Cooperation with DataONE to implement pilot repository for datasets published through GBIF. |
| | Expanded model for data publisher endorsement | Consultation on new endorsement model; Governing Board decision to implement streamlined publisher endorsement and guidelines during 2015. |
| | Mobilization of sample-based datasets | Collaboration through EU BON to set up pilot repository for monitoring datasets; proposal to Biodiversity Information Standards (TDWG) of new terms to accommodate sampling events and species abundance. |
| Advance the engagement – communication and implementation | Communication strategy | Draft communication strategy identified key audiences and messages relevant to GBIF. |
| | Essential documentation | Review of key documents required by GBIF community; publication of new guides on data cleaning tools and managing camera trap data. |
| | National biodiversity information facilities | Draft revision of guide to establishing an effective GBIF node; implementation of data analytics on GBIF.org to track national progress on data mobilization. |
| | Capacity enhancement strategy | Consultation with nodes community on draft framework to guide GBIF capacity evaluation and enhancement; new integrated capacity enhancement support programme merges former mentoring and regional training support programmes. |
| Advance the content – relevance and fitness for use | Engagement of expert communities to form fitness-for-use working groups | Postponed to 2015 due to staff vacancies. |
| | Metrics and indicators to assess relevance of GBIF-mobilized data | Completeness of data coverage included in new analytics service on GBIF.org; creation of combined GBIF/TDWG data quality interest group. |
| | Identification of content mobilization priorities | Postponed to 2015 due to staff vacancies. |
| | Evaluation of models for creating and curating reference datasets within GBIF network | Dependent on 2015 implementation of DOIs and persistent repositories. |
| | Support for publishing metadata for undigitized natural history collections | Postponed to 2015 due to staff vacancies. |

# GBIF at a glance



Voting Participants
Associate Country Participants
Participants with signature of 2012 MOU pending

Uruguay rejoined GBIF as Voting Participant (see pg 16) and Japan moved from Voting Participant to Associate Participant status in December 2014 (see pg 17).

## > Non-country Participants

(* virtual networks with no fixed headquarters)

1. Albertine Rift Conservation Society (ARCOS)

2. ASEAN Centre for Biodiversity (ACB)

3. Biodiversity Heritage Library (BHL)

4. Bionet-Andinonet

5. Bionet-International

6. Bioversity International

7. Botanic Gardens Conservation International (BGCI)

8. Canadensys

9. Chinese Academy of Sciences (CAS)

10. Chinese Taipei

11. Ciencia y Tecnología para el Desarrollo (CYTED)

12. Consortium for the Barcode of Life (CBOL)

13. Consortium of European Taxonomic Facilities (CETAF)

14. Discover Life

15. Diversitas

16. Encyclopedia of Life (EOL)

17. Endangered Wildlife Trust (EWT)

18. European Environment Agency (EEA)

19. ICLEI - Local Governments for Sustainability (ICLEI)

20. Integrated Taxonomic Information System (ITIS)

21. Inter-American Biodiversity Information Network (IABIN)

22. International Barcode of Life Project (IBOL)

23. International Centre for Insect Physiology and Ecology (ICIPE)

24. International Centre for Integrated Mountain Development (ICIMOD)

25. International Long Term Ecological Research (ILTER)*

26. Naturalis

27. Natural Science Collections Alliance (NSCA)

28. NatureServe

29. Nordic Genetic Resource Center (NORDGEN)

30. Pacific Biodiversity Information Forum (PBIF)

31. Scientific Committee on Antarctic Research (SCAR)

32. Society for the Management of Electronic Biodiversity Data (SMEBD)*

33. Society for the Preservation of Natural History Collections (SPNHC)

34. Species 2000

35. Taxonomic Databases Working Group (TDWG)*

36. United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC)

37. VertNet

38. Wildscreen

39. World Federation For Culture Collections (WFCC)

# GBIF at a glance

## > Data publication
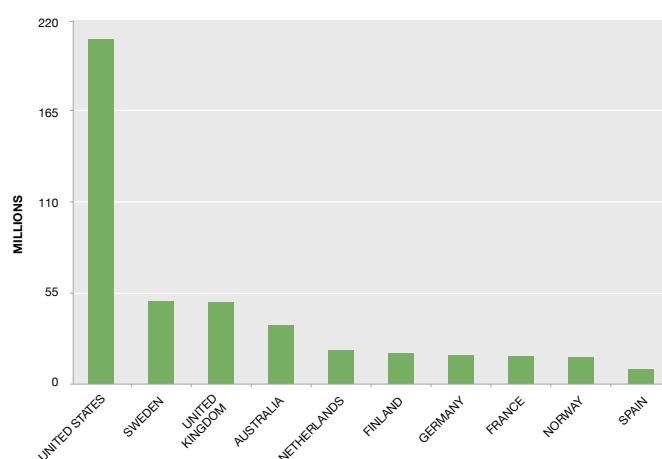


**Figure 1**: Top 10 countries by total number of species occurrence records published on GBIF.org. More information on pg 9.

## > Data download requests
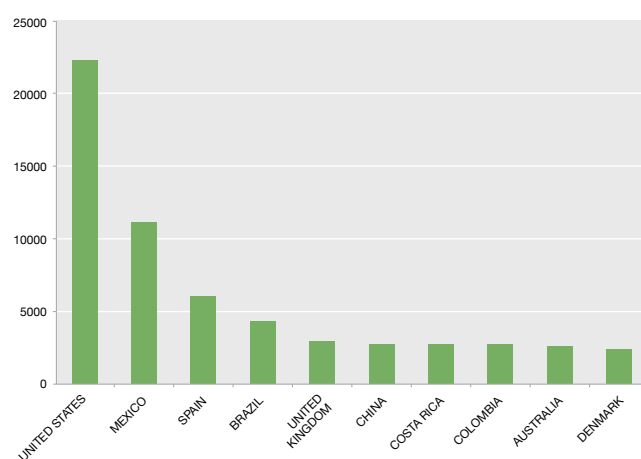


**Figure 2:** Top 10 countries by number of data download requests from GBIF.org. See pg 15 for details.

## > Web visitors



**Figure 3**: Top 10 countries by visits to GBIF.org in 2014. More information on pg 15.

## > Research uses



**Figure 4**: Top 10 countries with peer-reviewed articles published in 2014 that cite the use of GBIF-mediated data, ranked by location of researchers' institutions. More information on pg 14 and 15.

# Data mobilization

The figures on these pages provide a summary of the trends and breakdown of the biodiversity data shared by GBIF's registered institutions by the end of 2014.
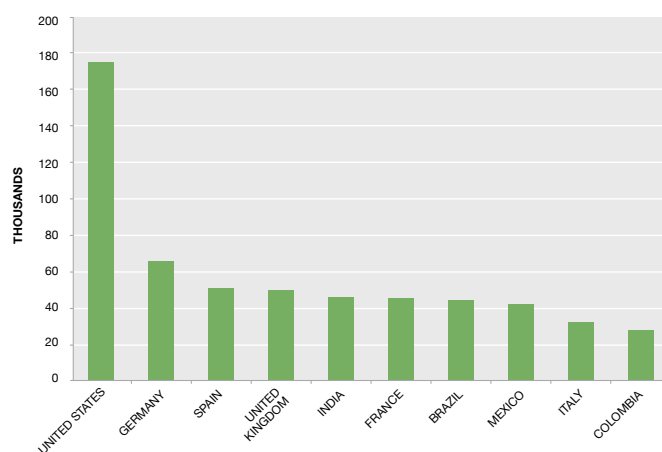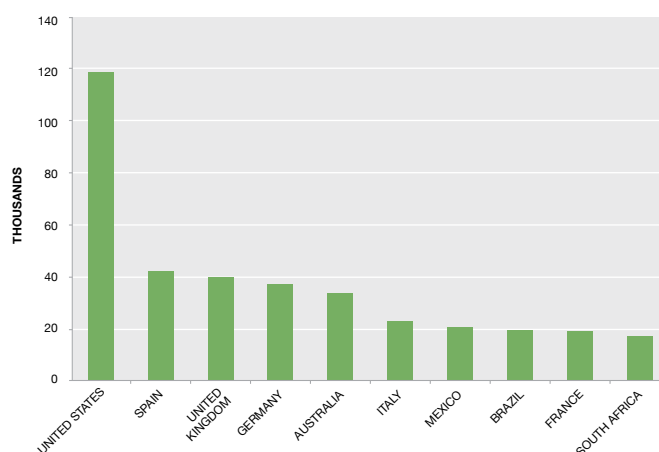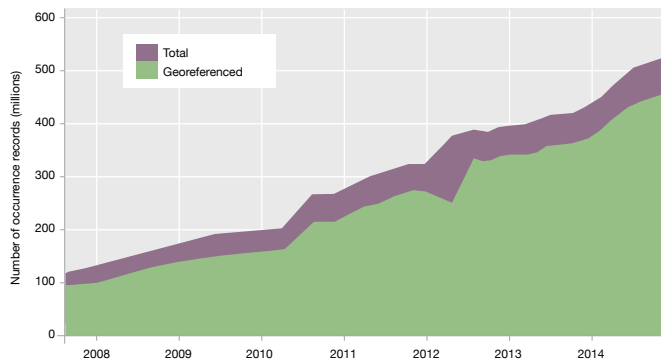


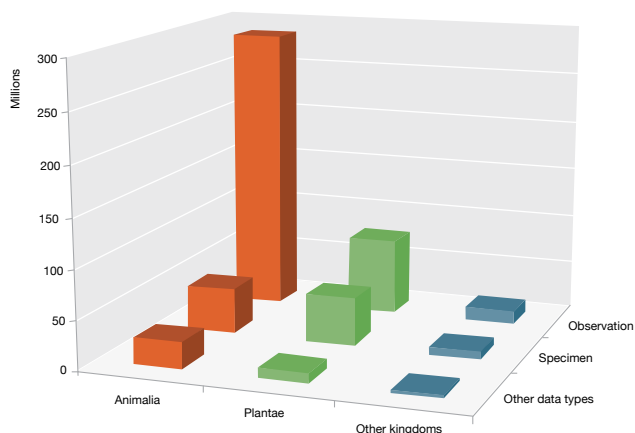**Figure 5.** The number of data records accessible through GBIF, from December 2007 to December 2014.



**Figure 6.** Primary biodiversity records by kingdom and record type, at end 2014.

- The number of species occurrence records passed 500 million, with over 450 million of them georeferenced (Fig 5).

- Animal observations remain the largest category of data records, increasing by 69.6 million to 286 million between 2013 and 2014. More than 22 million plant records were added during the year (Fig 6).

- The proportion of records shared by North American institutions rose sharply, from 25% to over 40% during 2014. This was largely due to the update of the eBird Observational Dataset, managed by the Cornell Lab of Ornithology in the United States, which added more than 50 million records. The proportion of records of species originating in North America rose more modestly, from 34% to 37%, reflecting the fact that North American institutions share records of biodiversity from all over the world (Fig 9).

- In the country rankings for the number of published records, the eBird refresh also accounted for a sharp increase in records from the United States. Sweden, the United Kingdom and Australia remained in second, third and fourth place respectively. The Netherlands moved up from seventh to fifth position, while Germany moved up from tenth to seventh position (Fig 10).
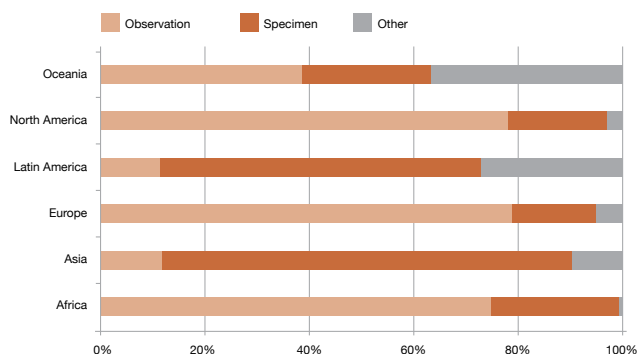


**Figure 7.** Occurrence records published by regional institutions by basis of record (observation, specimen, and other).
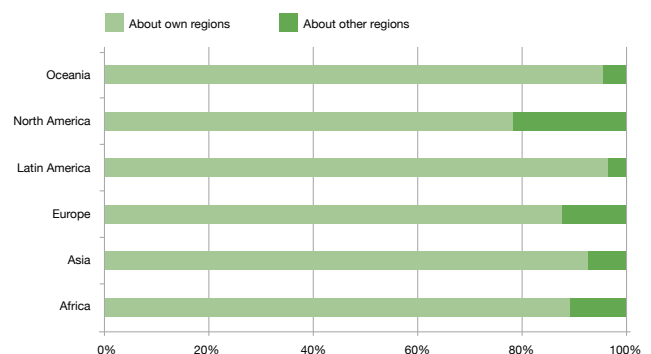


**Figure 8.** Data published from each GBIF region, with percentages relating to biodiversity within the region, and to biodiversity from outside the regions.

## > Data records breakdown

**By location of publishing institution**

**By origin of biodiversity**

2014

2013

**All records**

**Specimen records only**

**Observation records only**

Legend: ■ Europe ■ North America (incl. Mexico) ■ Oceania ■ South And Central America ■ Africa ■ High Seas ■ Asia ■ International Networks
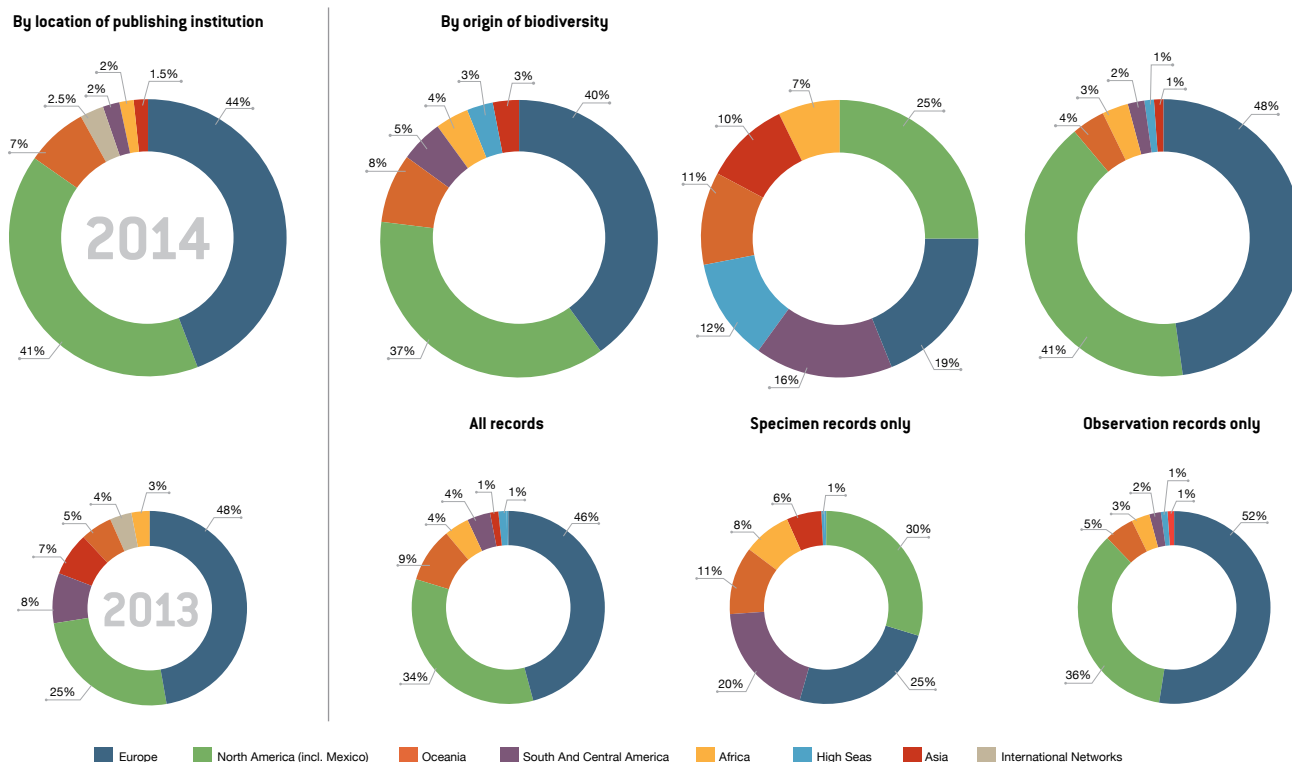
**Figure 9.** GBIF-mediated occurrences by location of publishing institution and species occurrences. The comparable breakdown for 2013 is shown in the lower row of charts.

## > Data breakdown by GBIF Participant

Indexed occurrence records (millions)

Legend: ■ Indexed by end 2014 ■ Indexed by end 2013
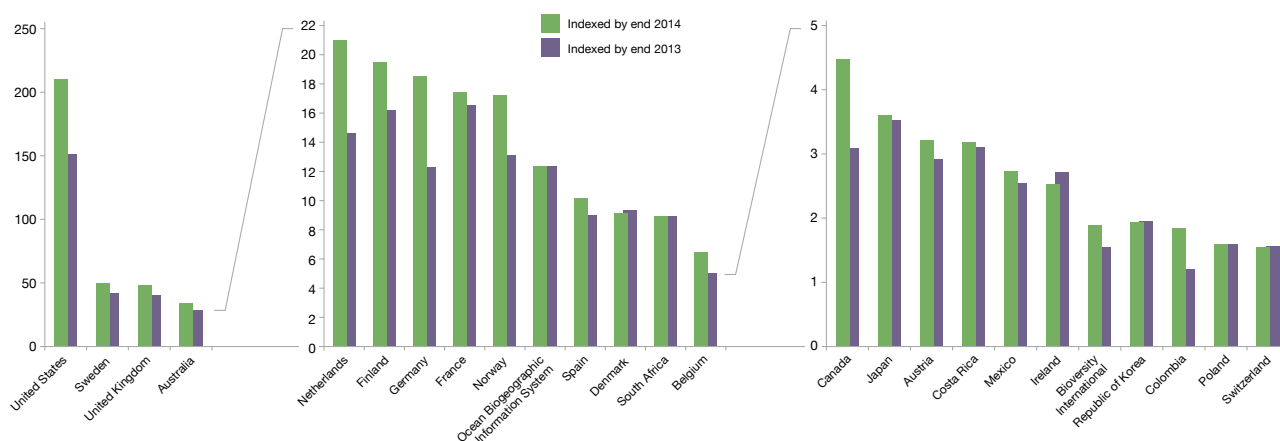
**Figure 10.** Number of records published on GBIF.org from participating countries and organizations, ranked by endorsing Participant node (top 25 shown). Note that the top four are shown on a different scale, followed by the next 10 and the last 11 on different scales. For a full list of data records published by GBIF Participants, see Appendix 1.

# A snapshot of datasets published in 2014

Datasets shared in 2014 reflected the diversity of data sources contributing to GBIF.org – from museum specimens to citizens' observations, living collections of seeds and microorganisms, wildlife monitoring and tracking projects, and even fossils. Some examples are shown on these pages.

## > CITIZEN OBSERVATIONS

### Global
The eBird Observational Dataset (EOD)
Publisher: Cornell Lab of Ornithology
Total records: 153 million
Date range: 1810–2013
Run by the Cornell Lab of Ornithology and the National Audubon Society, eBird is a vast collection of high-quality observations collected by professional ornithologists, recreational birders and citizen scientists alike.
More info at http://www.gbif.org/page/6564.

## > MUSEUM AND HERBARIUM SPECIMENS

### Republic of Korea
Diplopoda (Millipedes)
Publisher: National Science Museum of Korea
Total records: 5,549
A dataset containing 6,668 records of algae and another with 2,500 records of zooplankton were also among other data published by the museum.

### Chinese Taipei
Plant specimens at the National Taiwan University
Publisher: Taiwan E-Learning and Digital Archives Program
Total records: 119,366
Date range: 1895–2012
Data are from the collections of the herbarium at the National Taiwan University, which holds representative specimens of about 95% of vascular plant species of Taiwan. Most of the collection of 260,000 specimens has been digitized.

### Chinese Academy of Sciences
Plants of Yunnan
Publisher: Chinese Academy of Sciences
Total records: 163,199
Date range: 1992–2008
The Academy also published botanical datasets from five Chinese herbaria in Lushan, Wuhan, Chengdu, Guangxi, and Jiangsu, adding more than 360,000 plant records and significantly increasing the geographic coverage of data from China.

### Thailand
Amphibians of Thailand
Publisher: Princess Maha Chakri Sirindhorn Natural History Museum
Total records: 800
Date range: 2005–2013
This is the first dataset published by a Thai institution. 90% of the records contained in it relate to specimens collected from the Thai peninsula.

### Belgium / Central Africa
Endemic plants of the Congo Basin
Publisher: Botanical Garden Meise
Total records: 24,121
Date range: 1955–2014
The Belgium Biodiversity Information Facility (BeBIF) worked with the publisher to publish this dataset of specimen records from Burundi, Rwanda and the Democratic Republic of Congo.



The Lulilaka river, Salonga National Park, Democratic Republic of Congo. By Radio Okapi. Licensed under CC-BY-2.0 via Wikimedia Commons.

### Brazil
Spiders of the order Araneae
Publisher: Museu Paraense Emilio Goeldi
Total records: 22,683
Date range: 2006–2013
The museum, which specializes in the biodiversity of the Brazilian Amazon region, also published 25,000 records of Amazon fish specimens, 46,400 reptile records and 20,000 records from its bird collection.

### Chile
Herpetological collection of the National Museum of Natural History
Publisher: Ministry of Environment of Chile
Total records: 4,490
Date range: 1882 – 2010
Other data mobilized by GBIF Chile included collections of flatworms (*Platyhelminthes*), crustaceans and algae from Chile's National Museum of Natural History. These were among the first datasets from the country to be published via GBIF and were the result of a mentoring project with partners in Costa Rica.

## >RECORDS EXTRACTED FROM LITERATURE

### Belgium/UK
Flora of Northumberland and Durham
Publisher: Belgian Biodiversity Information Facility (BeBIF)
Total records: 5,583
Date range: 1797-1828
The observation records of plants and fungi in this dataset were derived from *The Flora of Northumberland and Durham* (N.J. Winch 1831). The Botanic Garden Meise initiated the digitization of this historic literature reference by providing a semantically enhanced XML file, from which academic publishers Pensoft created an HTML re-publication.

### Czech Republic — Iran
Literary descriptions of Iranian lizards
Publisher: National Museum in Prague
Total records: 8,525
This particular dataset is described by a data paper presenting a comprehensive summary of the distribution of the lizards of Iran. Because the Czech Republic is not a national Participant in GBIF, the Consortium of European Taxonomic Facilities (CETAF), a GBIF Associate Participant, endorsed the museum as a new publisher.



*Apathya cappadocica urmiana*. By Omid Mozaffari. Licensed under CC0 via Wikimedia Commons.

## > LIVING COLLECTIONS

### Germany
Collection of myxobacteria
Publisher: Leibniz Institute DSMZ - German Collection of Microorganisms and Cell Cultures
Total records: 13,937
The institute's collection comprises 7,000 strains of myxobacteria.

### France
National collection of *Solanum tuberosum*
Publisher: Institut National de la Recherche Agronomique (INRA)
Total records: 99
The dataset relates to young potato plants maintained in test tubes by INRA or as field-produced tubers, and are available as genetic resource material. These specimens come from old cultivars of potato grown in France in the past. INRA also published records from national collections of other species including barrel clover (*Medicago truncatula*), soft wheat and grape cultivars.

## > FOSSILS

### Czech Republic
Paleontological collection
Publisher: National Museum in Prague
Total records: 55,563
The museum published two datasets of over 55,000 species occurrences from the museum's paleontological collection of fauna and flora.

## >CHECKLISTS

### Netherlands
Taxa Watermanagement the Netherlands
Publisher: Laboratory for Hydrobiological Analysis, Rijkswaterstaat
Total records: 13,349 species
This dataset, containing a list of species relevant to the management of Dutch inland water bodies, is regularly updated by specialists at the Rijkswaterstaat, the body responsible for public works and water management in the country.

## >MONITORING / SURVEY DATA

### Russia
Plant distribution in the Meshchera National Park, Russia
Publisher: Moscow University Herbarium
Total records: 22,625
This dataset is based on a grid scheme and contains records of unique occurrences of 812 species of vascular plants from the Meshchera National Park. Because Russia is not yet a GBIF national Participant, GBIF Finland (a Voting Participant) endorsed Moscow University Herbarium as a new data publisher.

## >CAMERA TRAP DATA

### India
Tiger records from Rajaji National Park
Publisher: Wildlife Institute of India
Total records: 306
Date range: 2008-2011
The publishing of this dataset was a result of a pilot project to demonstrate capacity building for the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES). A guide for publishing camera trap data was also produced by the GBIF Secretariat, with Indian and Norwegian partners, as part of the project.

## > AUDIO RECORDINGS

### United States
Sound recordings of animals, birds and insects
Publisher: Museum of Biological Diversity, the Ohio State University
Total records: 44,770
Records in this dataset were gathered by the Borror Laboratory, which holds one of the largest animal sound archives in the world.

## > TRACKING DATA

### Belgium
GPS tracking of gulls
Publisher: Research Institute for Nature and Forest (INBO)
Total records: 1,181,274
The dataset contains occurrences recorded in 2013 and 2014 by 60 GPS trackers mounted on 44 lesser black-backed gulls (*Larus fuscus*) and 16 herring gulls (*Larus argentatus*) breeding on the Belgian coast.

## > GENE SEQUENCE DATA

### United Kingdom
Geographically tagged genetic sequences
Publisher: European Molecular Biology Laboratory
Total records: 4,661,554
This dataset of geographically tagged genetic sequences pilots the publication of genomic data through GBIF.

# Developments in informatics and data publishing

## Enhancements to GBIF.org

To serve users and enhance their ability to access data mediated by GBIF.org, the Secretariat responds to feedback and prioritizes ongoing improvements to the platform. Significant new features and refinements in 2014 included:

- Release of version 1 of the GBIF API, which enables the use of GBIF-mediated data via web services by other online applications.

- 'Widened' occurrence records, exposing more details provided by publishers in the species data shared through GBIF.org, including for example the type status of specimens, sampling methodology, collectors' names and field notes providing context for the collection or observation record.

- Filtering and display of multimedia files, allowing users to view images and play back audio and video files associated with occurrence records where they are provided by data publishers.

- New 'data trends' visualizations offering insight into both global and national trends in data mobilization, which could aid national partners in organizing their efforts and networks.

- Richer information about GBIF's national nodes added to the Participation section of each country page (see for example http://www.gbif.org/country/BE/participation)

## Refinements in publishing

With nearly 650 institutions publishing their data through GBIF.org, the publishing community represents another sizeable audience served by the GBIF network. As with data users, the Secretariat maintains an ongoing programme of improvements that serve publishers' needs and activities. New features and refinements for 2014 include:

- The release of version 2.1 of the Integrated Publishing Toolkit (IPT) in April, with a number of enhancements including versioning of datasets, a development detailed in PLOS ONE in August, and an additional translation of the user interface into Japanese.

- A new workflow to simplify publication of 'small data' associated with taxonomic research such as new species descriptions, developed with Pensoft Publishers through its *Biodiversity Data Journal,* and also involving Encyclopedia of Life (EOL) and Plazi, an association supporting open access to data from taxonomic literature.

Two other developments during 2014 paved the way for future enhancements to the persistence and provenance of data.

- A new partnership with the Data Observation Network for Earth (DataONE) targeted data persistence by designing a pilot repository to archive datasets shared through GBIF.

- The GBIF Secretariat released a detailed plan for assigning Digital Object Identifiers (DOIs) to datasets, thus simplifying citation of biodiversity data and tracking of its use, with rollout scheduled for 2015.

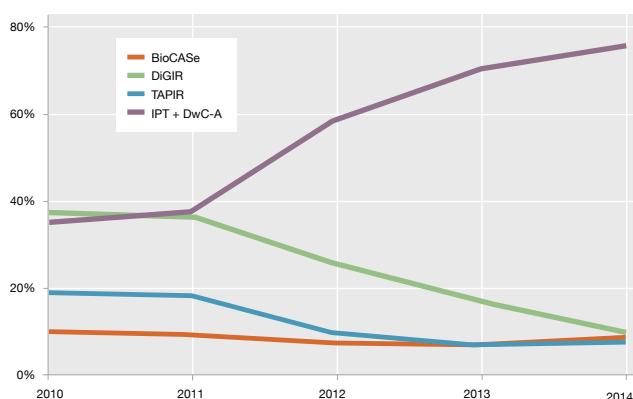## >Data publishing protocols, by percentage of publishers



**Figure 11.** Use of data publishing protocols, by percentage of publishers. The number of publishers using the GBIF Integrated Publishing Toolkit (IPT) and the associated Darwin Core Archive (DwC-A) continued to increase in 2014, with three-quarters serving data to GBIF.org through the IPT.

## Data licensing and endorsement

The GBIF Secretariat carried out two open consultations during 2014 on proposed changes to the licensing conditions attached to data published through GBIF.org, and on the process for adding new publishers to the GBIF network. After analysis of responses received from GBIF Participants, nodes, data publishers and the wider community, principles and next steps relating to licensing and publisher endorsement were approved at the 21st meeting of the GBIF Governing Board. The decisions will be implemented during 2015.

On licensing, the Governing Board approved the proposal that all species occurrence datasets within the network be associated with digital licences equivalent to one of the following three choices supplied by Creative Commons:

- **CC0**, under which data are made available for any use without restriction or particular requirements on the part of users

- **CC-BY**, under which data are made available for any use provided that attribution is appropriately given for the sources of data used

- **CC-BY-NC**, under which data are made available for any use provided that attribution is appropriately given and provided the use is not for commercial purposes

The Governing Board agreed that GBIF should encourage publishers to adopt the most open licence possible in their situation.

On endorsement, GBIF will retain the current requirement for new data publishers to be endorsed by a Participant country or organization. However, two significant enhancements will be introduced:

- The GBIF Secretariat, in consultation with the community, will draw up guidance and simple decision criteria, helping Participant nodes to evaluate potential new data publishers during the endorsement process.

- For cases in which a prospective data publisher is in a country not yet participating in GBIF, and has no connections with an existing Participant node, the Nodes Steering Group (NSG) will develop procedures for endorsement by the community following similar decision criteria.

## New national portals



**Above:** The Netherlands Biodiversity Information Facility launched a new portal in Dutch to deliver news, events, an overview of biodiversity datasets published from the Netherlands to the GBIF network, a list of organizations and institutions in the country that manage biodiversity data, tools, and other information on publishing data online.



**Above:** GBIF Spain released its new national biodiversity data portal providing free access to more than 10 million biodiversity records from 69 Spanish institutions and projects as well as nearly another million records of biodiversity in Spain published by institutions abroad. The site builds on an open-source system originally developed by the Atlas of Living Australia (ALA).



**Above:** The GBIF national node for Brazil, SiBBr, launched a new data and information portal, developed through a mentoring project, between SiBBr and its counterpart in Colombia, SiB Colombia. It included collaboration with Canadensys, a GBIF Associate Participant, which supported Brazil in re-using the tools behind its data explorer providing digital access to Canada's natural history collections.

Also in 2014, GBIF Benin worked closely with INBio (Costa Rica's national node) to create a new national portal that displays GBIF-mediated data.

# Data access and use

## Use of GBIF-mediated data in scientific research

The Secretariat maintains an ongoing programme of literature tracking that identifies research citations and uses of biodiversity data accessed through GBIF's global infrastructure.
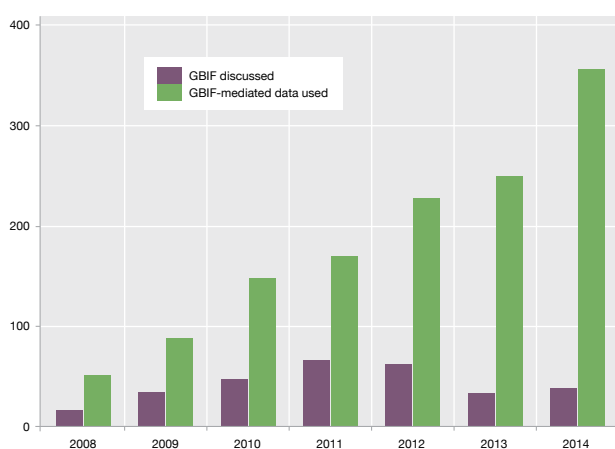


**Figure 12.** Annual totals of peer-reviewed publications citing GBIF as a source of data or discussing GBIF, 2008-2014

The examples on these pages briefly highlight a few key areas of investigation and research enhanced by free and open access to biodiversity data via GBIF. These include:

- 'Traditional' scientific applications that improve understanding about biology, ecology, conservation and protected areas

- High-priority policy issues such as invasive alien species

- Contributions that biodiversity data makes to setting human health priorities

- Potential impacts of climate change

- Demonstrations of the importance and relevance of biodiversity to human economy and livelihoods

Download the 2014 Science Review
http://www.gbif.org/2014-science-review

The 2014 *Science Review* compiles more than 350 scientific papers from peer-reviewed literature that apply data drawn from the GBIF network of Participants and publishers.
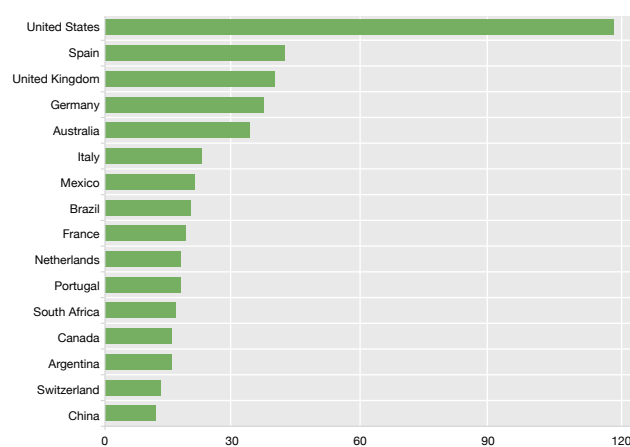


**Figure 13.** Number of peer-reviewed publications in 2014 citing use of GBIF-mediated data, ranked by country according to affiliation of authors. Top 16 countries shown.

**Reducing invasive species risks through rapid watch lists**

For many resource-poor nations, creating biosecurity schemes to prevent the introduction of potentially invasive alien species can be excessively complicated and expensive. South African researchers proposed a rapid, cost-effective method of creating invasive species watch lists based on three consistent predictors of invasion success: past precedents, environmental suitability and introduction effort. Using GBIF-mediated data on 419 invasive species combined with data from other sources, the authors demonstrate a quick, transparent and replicable technique for producing initial assessment of key invasive threats across taxa and at different national and provincial scales without substantial financial or scientific inputs.

Faulkner KT, Robertson MP, Rouget M *et al*. (2014) A simple, rapid methodology for developing invasive species watch lists. *Biological Conservation* 179: 25-32. doi:10.1016/j.biocon.2014.08.014.
Author country: South Africa

The wealth that built the Cornish town of Mevagissey derived from the success of small fishing boats that called its harbour home. By Loco Steve. Licensed under CC BY-SA 2.0 via Flickr.



Hammer-headed fruit bat (*Hypsignathus monstrosus*) with young. By Stephen C Smith. Licensed under CC BY-NC 2.0 via Flickr.

**Predicting climate impacts on the profitability of UK fisheries**

With climate change expected to lead to large-scale shifts in the distribution of marine species, researchers applied a scenario-based approach to investigate the possible impacts on UK fisheries. GBIF and other global databases supplied the occurrence data for 31 fish and vertebrate species needed to build species distribution models, which are then linked in turn to cost-benefit analyses.

Despite predictions that a few species like European sea bass and sardines may increase, the results indicate future decreases in marine productivity, total catch value and weight and, thus, the fisheries' profitability. Whether these impacts derive directly from changes in species distribution or abundance or indirectly from altered operating costs, the authors recommend increased adaptive capacity and diversification as the most effective means of minimizing the anticipated reduction in profitability.

Jones MC, Dye SR, Pinnegar JK *et al*. (2014) Using scenarios to project the changing profitability of fisheries under climate change. *Fish and Fisheries*. doi:10.1111/faf.12081
Author countries: Canada, United Kingdom

**Mapping the niche of Ebola host animals**

In 2014, as the Ebola virus disease took hold in West Africa —an outbreak that is both the largest ever recorded and the region's first— an international team of researchers sought to identify regions and countries at greatest risk from the epidemic. While uncertainty remains about the true reservoir of the virus, bats are suspected to play an important role in the life cycle of Ebola and other filoviruses. Relying on GBIF-mediated occurrence data, the researchers modelled the ranges of three species believed to be the most likely reservoirs for Ebola's transmission to humans: the hammer-headed bat (*Hypsignathus monstrosus*), little collared fruit bat (*Myonycteris torquata*) and Franquet's epauletted fruit bat (*Epomops franqueti*).

Combining these data with location data on previous zoonotic transmissions, the study identified at-risk areas across 22 countries in Central and West Africa with a combined human population of 22 million. The authors argue that these findings will help to prioritize surveillance for Ebola outbreaks and improve the diagnostic capacity in at-risk regions.

Pigott DM, Golding N, Mylne A *et al*. (2014) Mapping the zoonotic niche of Ebola virus disease in Africa. *eLife* 3:e04395.
doi:10.7554/eLife.04395
Author countries: United Kingdom, United States, Canada, Sweden

**>Users of GBIF.org**



2013
Total visits 852,478
Users 598,033

2014
Total visits 1,130,031
Users 738,649
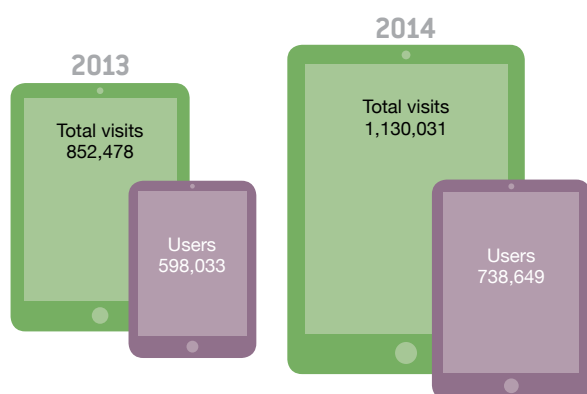
**Figure 14.** Year-by-year comparison of visitors to GBIF.org.

**>Data download requests from GBIF.org**



United States 22,525
Other 20,829
Denmark 2,491
Australia 2,635
Colombia 2,685
Costa Rica 2,764
China 2,786
United Kingdom 2,882
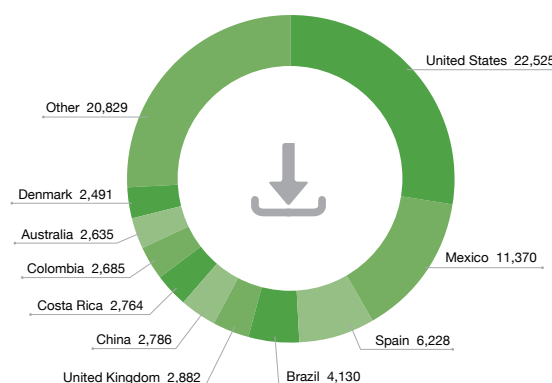Brazil 4,130
Spain 6,228
Mexico 11,370

**Figure 15.** 81,325 requests for downloads were received from users in 145 countries, islands and territories in 2014.

# Participation and collaboration

The year saw significant strengthening of GBIF's collaboration with a number of partners during 2014.

### Convention on Biological Biodiversity (CBD)

The GBIF Secretariat contributed to the Fourth Global Biodiversity Outlook (GBO4), a mid-term review of progress towards the Aichi Biodiversity Targets incorporated in the Strategic Plan for Biodiversity 2011-2020. In particular, GBO4 used mobilization of data through GBIF as an indicator of progress towards Target 19 on sharing of knowledge and data. Among the recommendations of GBO4, launched at the 12th meeting of the Conference of Parties to the CBD (COP12) in Korea in October, was further mobilization of and access to primary biodiversity data.

Also at the COP12 meeting, GBIF helped launch the Global Invasive Alien Species Information Partnership (GIASIP) Gateway, a collaboration to bring together information from various sources to support decision makers in tackling the threat posed by invasive species in their countries.
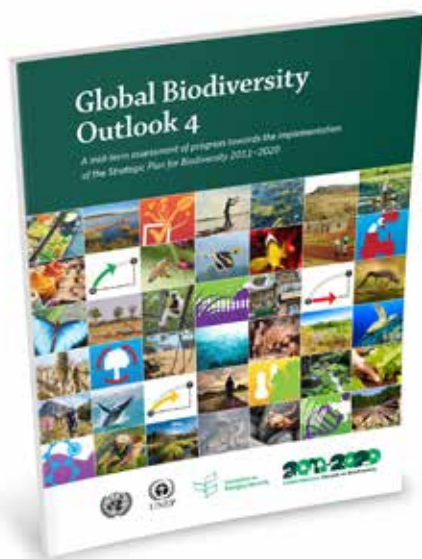
Fourth Global Biodiversity Outlook (GBO4)

### Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

During the first year of the 2014-2018 IPBES Work Programme, GBIF established links with the Task Force on Knowledge and Data, which will advise the platform on the management of data and information resources in the various assessments to be carried out in the coming period. GBIF is assisting this group with information about developments that could help IPBES in identifying, accessing and archiving relevant data, and is among candidate strategic partners to support these functions of the platform.

In addition, GBIF completed a project with the Wildlife Institute of India (WII), the Norwegian Institute of Nature Research (NINA) and the Norwegian Biodiversity Information Centre (NBIC) to demonstrate the potential for capacity building within IPBES to bring relevant data to support conservation policies. Among the products of this project were a guide on best practices in publishing data from camera traps, and publication on GBIF.org of a dataset of tiger records from camera trap images captured in India's Rajaji National Park.

### European Union Biodiversity Observation Network (EU BON)

GBIF continued its partnership within EU BON through a range of activities including development of a pilot repository for sample-based data through a prototype installation of the Integrated Publishing Toolkit (IPT), using a new extension to the Darwin Core standard submitted to Biodiversity Information Standards (TDWG) for ratification. The aim is to mobilize datasets from biodiversity monitoring projects using defined sampling protocols, including measures of species abundance.

### New GBIF Participants and Affiliates

- URUGUAY rejoined GBIF as a full Voting Participant, establishing its node at the Museo Nacional de Historia Natural in Montevideo.

- BIODIVERSITY HERITAGE LIBRARY (BHL) joined as an Associate Participant. BHL is a consortium of biodiversity-related libraries that has digitized millions of pages of taxonomic literature.

- CANADENSYS, based at the Université de Montreal, Canada, also joined as an Associate Participant. Canadensys hosts datasets from biodiversity collections across Canada, helping them to publish data through GBIF as well as on its own Canadensys Data Explorer. The group also collaborated with GBIF Brazil to support development of its national portal in November (see pg 13).

- THE DATA OBSERVATION NETWORK FOR EARTH (DataONE) signed a Memorandum of Cooperation with GBIF relating to ongoing work to support data persistence (see pg 12). The memorandum, which recognizes DataONE as a GBIF Affiliate, also supports the network's efforts to improve its own data indexing services by building on GBIF's solution for handling large-scale tabular data.

- THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC), of the United Nations Educational, Scientific and Cultural Organization (UNESCO) signed a Letter of Agreement with GBIF, focussed on improving exchange of marine data with the Oceanographic Biodiversity Information System (OBIS). Under this agreement IOC becomes a GBIF Affiliate, and GBIF an Associate Data Unit under the International Oceanographic Data and Information Exchange (IODE) programme.

- NATURALIS BIODIVERSITY CENTRE, based in Leiden Netherlands, joined as an Associate Participant. Naturalis holds a collection of more than 37 million specimens and is already a significant data publisher through the GBIF network.

# GBIF events

## 2014 GBIF Governing Board meeting

Indian Minister for Environment, Forests and Climate Change Prakash Javadekar opened the GBIF's Governing Board 21st meeting (GB21) in September, welcoming 89 delegates from 32 countries. In his address to the Governing Board, the minister reinforced India's commitment to developing a robust digital infrastructure for biodiversity data, and expressed the value to India of becoming a full Voting Participant in GBIF, moving from its current associate status.

Highlights of the week included:

- Approval of new approaches to licensing of datasets and endorsement of data publishers through GBIF (see pg 13).

- A message from the Executive Secretary of the Convention on Biological Diversity (CBD), Braulio Dias, emphasizing the critical role that GBIF has played in improving the scientific knowledge needed in order to sustain healthy ecosystems.

- Discussion of some of the successes and challenges of setting up biodiversity information facilities, through a series of presentations followed by open discussion among GBIF Participant delegations and node managers.

At the meeting, Hanna Koivula from GBIF Finland was elected as the Chair of the Nodes Committee. Delegates also elected Leonard Krishtalka as the 1st Vice-Chair of the Budget Committee, Alex Asase as the 1st Vice-Chair of the Nodes Committee, Manuel Vargas as 2nd Vice-Chair of the Nodes Committee and Mark Costello as 1st Vice Chair of the Science Committee.

Japan announced that under current conditions, it was unable to pay the full contribution required to retain voting rights at the Governing Board, and would therefore change its status to Associate Participant. However, Japan agreed to pay €156,000 to a supplementary fund supporting GBIF-related activities in the Asia region.

GB21 provided the occasion for presenting the 2014 Ebbe Nielsen Prize to Tony Rees, whose groundbreaking informatics tools have significantly advanced the delivery of biodiversity data. The 2014 Young Researchers Awards (YRA) were also presented at GB21, recognizing the work of Caoimhe Marshall, a Master's student at University College, Dublin, Ireland, helping to detect biases and identify gaps in biodiversity data and Vijay Barve, an Indian PhD student at the University of Kansas, United States, looking at the potential for social networking sites to provide valuable biodiversity data.

## GBIF public symposium

A public symposium held on 17 September, in association with the meeting of the GBIF Governing Board, highlighted examples of national-scale tools and services and shared insights from international researchers on key recent uses of GBIF-mediated data to support sustainable development.

- Staff from the Secretariat kicked off the symposium with presentations on recent developments in enriching data accessible through GBIF.org; in GBIF's capacity enhancement programme; and the network's contribution to global processes such as the CBD.

- GBIF national Participants from Ireland, Benin, the United Kingdom and Australia related examples showing how informatics investment and collaboration support national priorities on biodiversity.

- Tony Rees, winner of the 2014 Ebbe Nielsen Prize, presented an overview of four innovative biodiversity informatics tools he developed. Following a brief video update on 2013 YRA winner Emma Gomez on using GBIF to research nectar corridors for bats, attendees heard about 2014 Young Researcher Award recipients Caoimhe Marshall and Vijay Barve.

- The symposium concluded with experts from Spain, the United Kingdom, the United States and India presenting on their uses of data accessed through GBIF to support conservation, food security, public health, invasive species control, and human innovation.

## Launch of the GBIF Ebbe Nielsen Challenge

With the aim of inspiring scientists, informaticians, data modellers, cartographers and other experts to develop innovative uses of open-access biodiversity data, GBIF launched the GBIF Ebbe Nielsen Challenge on 2 December.

Named after one of GBIF's principal founders, who tragically died just before the network came into being, the Challenge recasts the Ebbe Nielsen Prize as an incentive competition aimed at encouraging new advances in biodiversity informatics.

The GBIF Ebbe Nielsen Challenge site was created to take in submissions from participants. An expert jury will judge the initial entries and select three to six finalists to receive €1,000 each while competing for a €20,000 First Prize.

> " *I… appeal, not only to this forum but also within the CBD constituency, to recognize the benefits of a viable, active and strong GBIF, primarily to benefit countries in having access to information to guide their own sustainable development agenda.*"

– Braulio Dias, Executive Secretary of the CBC, in his message at GB22

# Developing capacity for data-sharing

## Capacity enhancement support programme

Building on its successful mentoring and regional training support programmes, GBIF initiated a new programme on capacity enhancement in 2014. The programme's integrated approach enables Participants to seek support for mentoring and regional training activities while combining these with support for developing documentation and for advocacy.

For 2014, GBIF awarded capacity enhancement grants to five projects, engaging 31 partners – 29 countries and two international organizations. The €40,000 investment from GBIF core funds in these projects is matched by €70,000 in co-funding from other sources.

**The projects to receive support were:**

- A Latin American initiative led by SiB Colombia to introduce systematic improvements to the quality of biodiversity data published through the GBIF network

- Another Latin American effort—headed by CYTED (The Iberoamerican Programme for Science and Technology for Development)—to expand capacity for digitizing and publishing data from scientific literature, images and multimedia

- Mentoring led by Mexico's CONABIO to increase the quality and interoperability of GBIF-mediated data through the use of the Plinian Core Standard for species information

- Bilingual training and exchange to establish coordinated early warning and response network for invasive alien species across sub-Saharan Africa, guided by GBIF Mauritania

- An intensive open-source 'hackathon' organized by Species 2000 targeted at enhancing the skills and capacity of GBIF's European Participants to produce national species checklists

The overall approach of the programme is explained in the GBIF capacity enhancement framework, which was drafted during 2014.

## Results of 2013 mentoring projects

Three projects, which received support in 2013 to build capacity for publishing and use of biodiversity information, ended in 2014.

**Colombia-Brazil**
The Information System for Brazilian Biodiversity (SiB Brazil), with support from SiB Colombia and Canadensys, developed and launched the national biodiversity portal in 2014 (see pg 13). Additionally, the development of scientific workflows has benefited both SiB Colombia and Brazil in providing analysis services. A tutorial on the Metacat repository for data and metadata helped both teams to improve their capacity in managing ecological data.

**Belgium-Togo-Mauritania**
GBIF Togo and GBIF Mauritania installed the Integrated Publishing Toolkit (IPT) and published a total of 12 occurrence datasets and checklists with information on algae, fungi, plants and animals in the two countries. The IPT installations are hosted by the French and Belgian nodes respectively.

Two workshops trained 36 scientists and data managers in using the GBIF portal and the IPT, and in cleaning datasets.

As a result of the mentoring programme, the Togolese node entered into discussions with the Ministry of Higher Education and Research on Togo becoming a Voting Participant of GBIF.

**Spain-France-Portugal**
GBIF Spain, France and Portugal benefited from each other's skills in a three-way mentoring programme. GBIF Spain shared their data quality workflow and tools for GBIF France and Portugal to run on new datasets. The node also demonstrated its use of e-learning tools and created two environments in the platform for use by the French and Portuguese nodes. GBIF Spain also trained the two nodes on publishing data papers using the GBIF IPT and shared its experience in implementing the Spanish national biodiversity data portal using the ALA code (see pg 13).

GBIF Portugal presented their use of the Google Refine tool to improve datasets, while GBIF France shared its statistics tools and its experience in crowdsourcing digitization of collections via the volunteer platform Les Herbonautes. GBIF Portugal has translated the code into Portuguese for future implementation.

# GBIF in Africa



Voting Participants
Associate Country Participants

See pg 6 for information on Non-country Participants.

GBIF nodes in the region developed a two-year work plan in 2014 to realize GBIF-Africa's vision, "A world in which Africa's biodiversity information is freely and universally available, in service to science, economy and the public good for a sustainable future in Africa". The first African Science Committee meeting was held to advise regional node managers on the strategic direction for the work plan.

Two workshops were organized in 2014 in the context of the JRS-funded regional project 'Mobilizing Africa's policy-relevant biodiversity data'. At the workshops, participants identified nine priority themes for mobilizing biodiversity data and training needs for key stakeholders.

>Events

**GBIF Africa regional meeting**
2-4 July 2014, Cotonou, Benin

**Strategic meeting of the partners of the JRS project**
'Mobilizing Africa's policy and decision-making relevant biodiversity data'
25-27 March 2014, Pretoria, South Africa

**Workshop on data papers and data use**
Belgium-Mauritania-Togo GBIF mentoring project 2013
18-19 June 2014, Lomé, Togo

**Workshop on data publication and cleaning**
Belgium-Mauritania-Togo GBIF mentoring project 2013
2-3 September 2014, Nouakchott, Mauritania
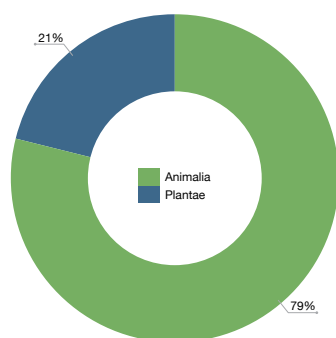


**Figure 16.** Data published by GBIF Participants in Africa by kingdom
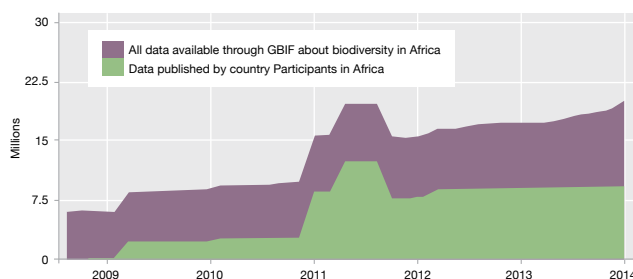


**Figure 17.** Trend in data relating to Africa

# GBIF in Asia



Voting Participants
Associate Country Participants
Participants with signature of 2012 MOU pending

See pg 6 for information on Non-country Participants.
Japan moved from Voting Participant to Associate Participant status in December 2014 (see pg 17).
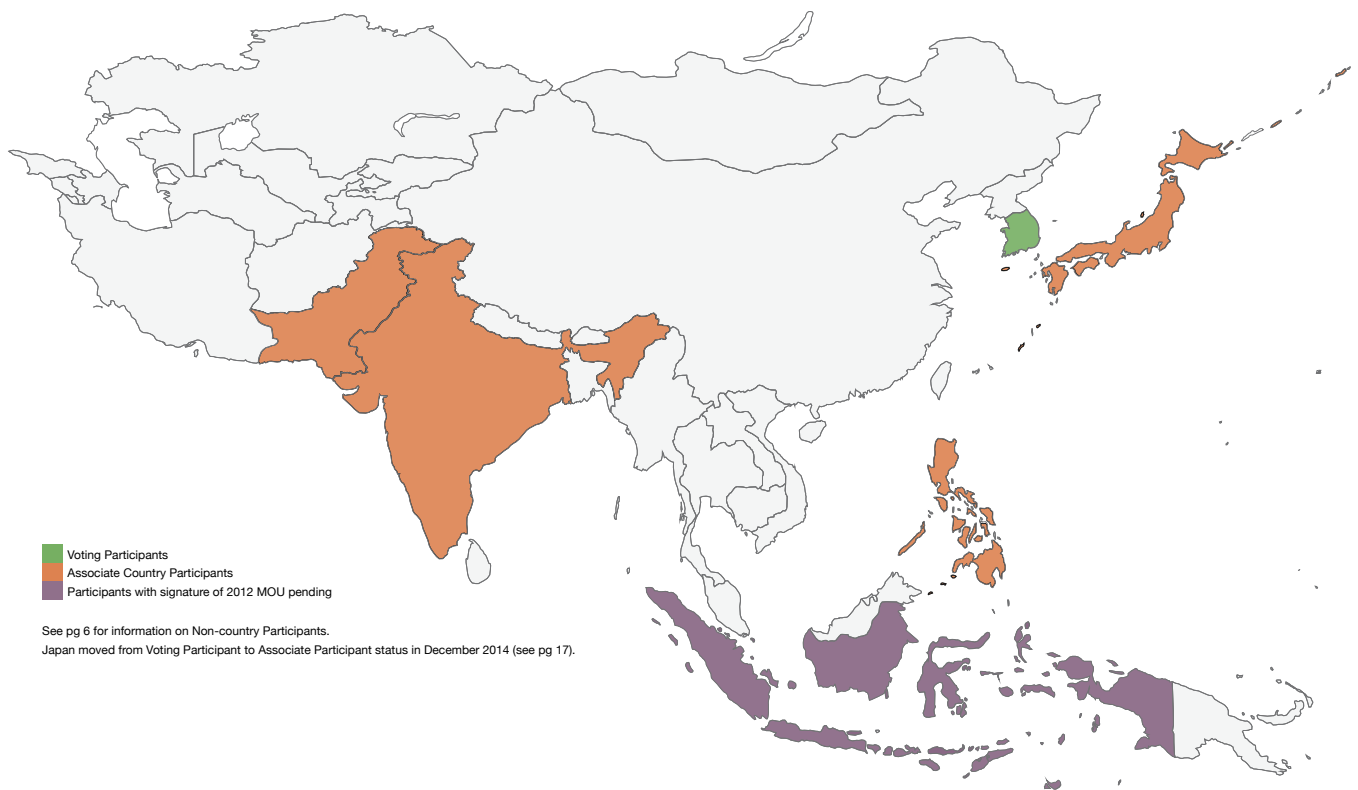
Participant nodes in Asia identified collectively that there is a lack of biodiversity information about the region. To start to address this gap, nodes in the region have started collaborating for the mobilization of species checklists. The work to date has included a first assessment of Red list and invasive species checklists, and a scoping of checklists on freshwater and marine fishes and their endangered status.

An approach to contribute to improving the GBIF taxonomic backbone has been agreed upon.

>Events
**GBIF regional meeting of Asian nodes**
17-18 July 2014, Tsukuba, Japan



51%
2%
1%
46%

Animalia
Plantae
Fungi
Bacteria
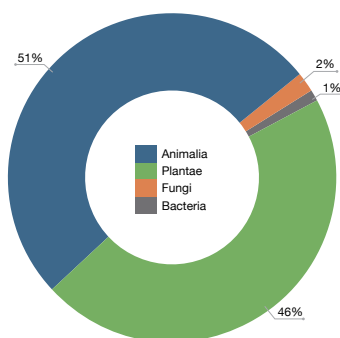
**Figure 18.** Data published by GBIF Participants in Asia by kingdom



All data available through GBIF about biodiversity in Asia
Data published by country Participants in Asia
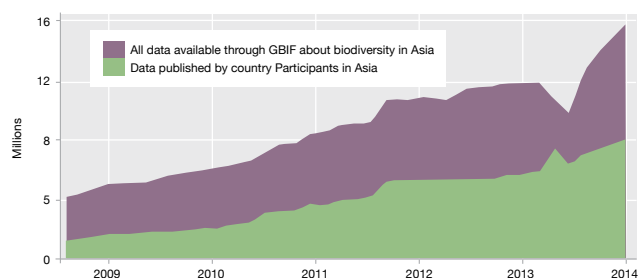
**Figure 19.** Trend in data relating to Asia

# GBIF in Europe



Voting Participants
Associate Country Participants
Participants with signature of 2012 MOU pending

See pg 6 for information on Non-country Participants.

GBIF nodes in Europe identified mobilization of European forest and vegetation data as a priority to support the European Environment Agency. GBIF Belgium, Spain and Netherlands published data related to freshwater invasive alien species in 2014.

**6th GBIF European Nodes Meeting**
8-10 April 2014, Brussels, Belgium

**Symposium on the Digitization of Swedish Natural History Collections**
9 Jan 2014, Stockholm, Sweden

**1st workshop France-Portugal-Spain GBIF mentoring project 2013**
21-23 January 2014, Madrid, Spain

**V eLearning workshop on data quality in biodiversity databases**
19 February – 5 March 2014, online
Organized by GBIF Spain

**Course on biodiversity data quality, use, and publication by GBIF France and BioVeL**
24-25 March 2014, Paris, France

**2nd workshop France-Portugal-Spain GBIF mentoring project 2013**
28-30 April 2014, Lisbon, Portugal

**IV eLearning workshop on data digitization for natural history collection staff**
7-21 May 2014, online. Organized by GBIF Spain

**II eLearning georeferencing workshop using GEOLocate**
8-29 October 2014, online. Organized by GBIF Spain.

**Training course on the use of GPS and collecting species occurrence data**
13-14 October 2014, Oslo, Norway
Organized by GBIF Norway for the ForBio Research School in Biosystematics

**3rd workshop France-Portugal-Spain GBIF mentoring project 2013**
14-16 October 2014, Paris, France

**GBIF Information Day seminar series**
1-19 December 2014, six cities in Portugal (Faro, Évora, Lisbon, Coimbra, Porto, Vila Real). Organized by GBIF Portugal

**Training for Norwegian scientists on publishing data papers**
2-3 December 2014, Oslo, Norway
Organized by GBIF Norway and the Belgium Biodiversity Information Facility



**Figure 20.** Data published by GBIF Participants in Europe by kingdom

Animalia
Plantae
Chromista
Fungi
Protozoa
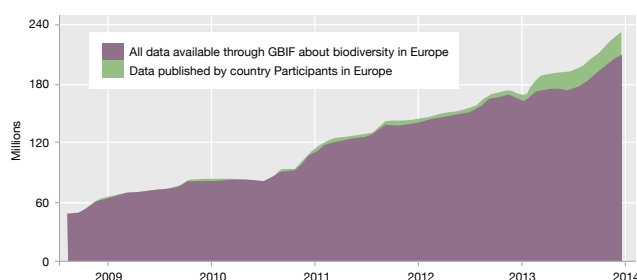


**Figure 21.** Trend in data relating to Europe

# GBIF in Latin America



Voting Participants
Associate Country Participants
Participants with signature of 2012 MOU pending

See pg 6 for information on Non-country Participants.
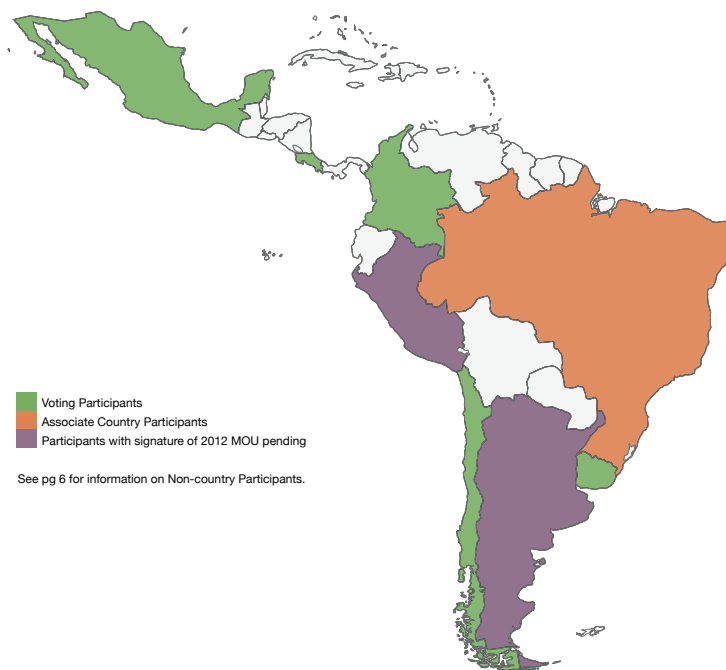
GBIF nodes in Latin America collaborated on a number of projects in the region, with support from the GBIF capacity enhancement programme, resulting in the development of the Brazilian national biodiversity portal and in improvements in data publishing and quality (see pg 18).

Additionally, nodes developed and submitted three project proposals for funding. Of these, the proposal to collaborate with the Atlas of Living Australia on developing national portals was funded.

## >Events

**4th GBIF Latin American Nodes Meeting**
1-3 September 2014, Petrópolis, Brazil

**3rd meeting Brazil-Colombia GBIF mentoring project 2013**
10-14 February 2014, Bogotá, Colombia

**I3B Workshop: Foundations, evaluation and future of species distribution models**
2-6 June 2014, Tepoztlán, Mexico

**4th meeting Brazil-Colombia GBIF mentoring project 2013**
25-29 September 2014, Petrópolis, Brazil

**Bogotá data quality workshop**
18-21 November 2014, Bogotá, Colombia

**SiBBr launch event**
24-25 November 2014, Brasília, Brazil
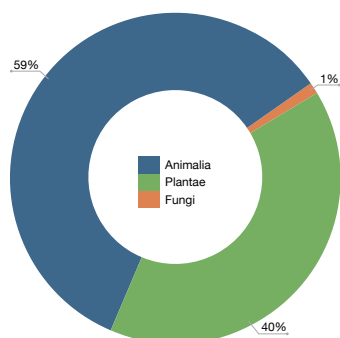


**Figure 22.** Data published by GBIF Participants in Latin America by kingdom
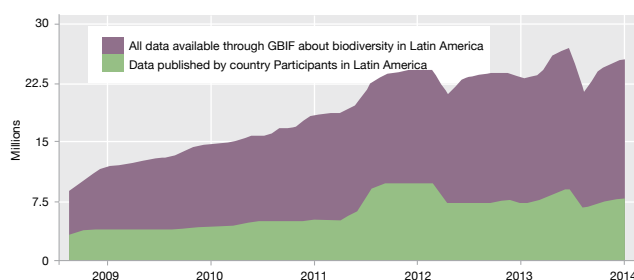


**Figure 23.** Trend in data relating to Latin America

# GBIF in North America



Voting Participants
Associate Country Participants

See pg 6 for information on Non-country Participants.
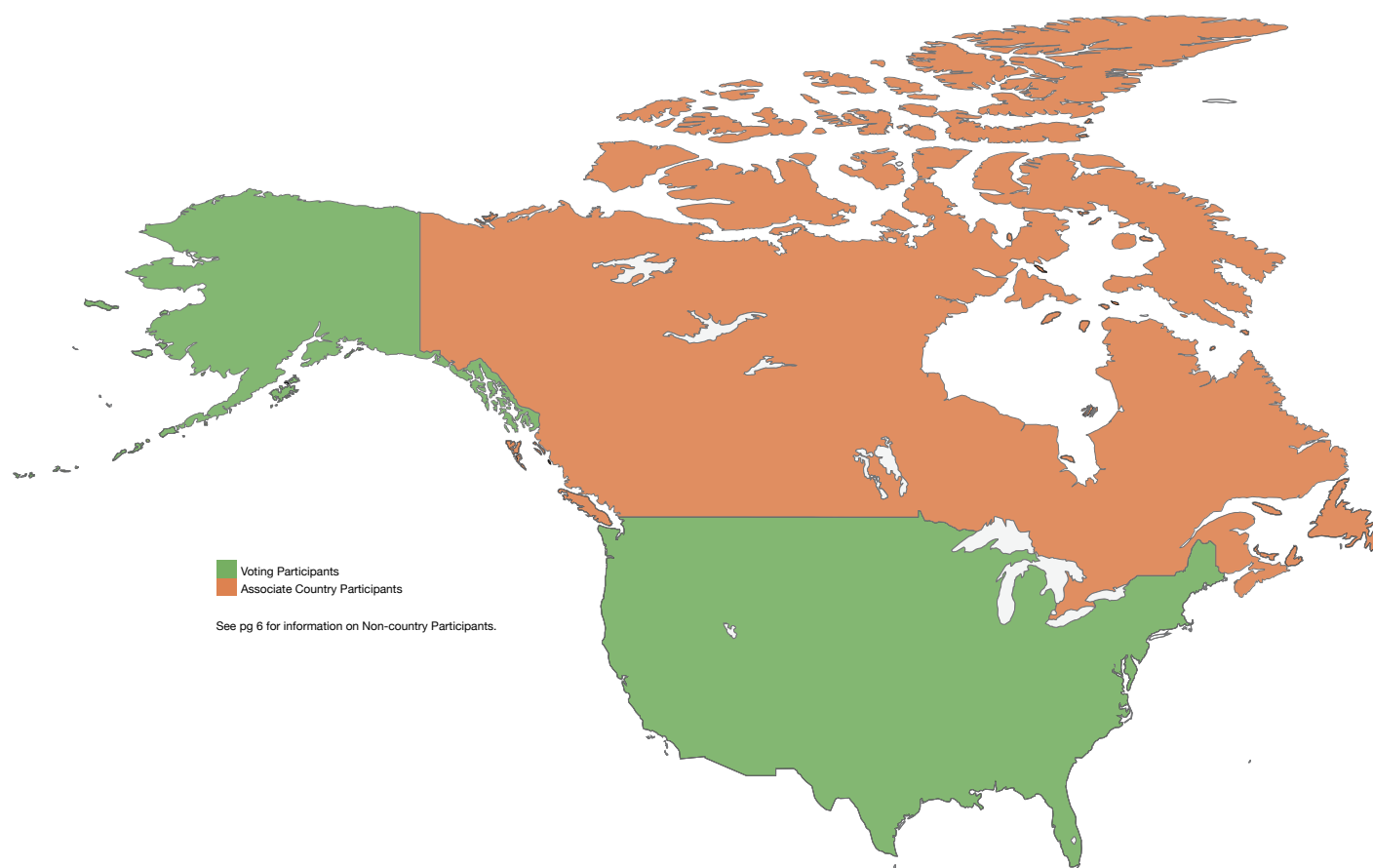
Two regional projects have been identified for North America —
investigating the potential of an invasive species project between
USA and Canada, and inclusion of DNA barcoding data in GBIF and
the linkage with specimen collection records.

>Events
**GBIF regional meeting: North American nodes**
21-22 July 2014, Guelph, Canada



Animalia
Plantae
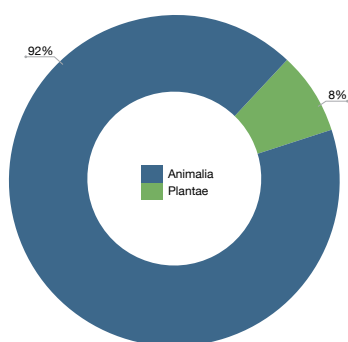
**Figure 24.** Data published by GBIF Participants in North America by kingdom



All data available through GBIF about biodiversity in North America
Data published by country Participants in North America
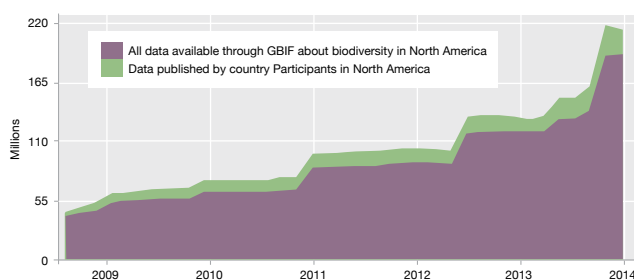
**Figure 25.** Trend in data relating to North America

# GBIF in Oceania



Voting Participants

See pg 6 for information on Non-country Participants.

The Oceania nodes work together to share relevant technology and expertise that support the development and use of the region's national biodiversity infrastructure. In 2014, the Atlas of Living Australia (ALA) simplified and shared its successful web application for reuse by GBIF nodes. GBIF Spain's new data portal uses the technology and is the first of several results expected from the ALA collaboration.

> Events

**Developers' workshop**
21-21 July 2014, Canberra, Australia



33%
1%
66%

Animalia
Plantae
Fungi
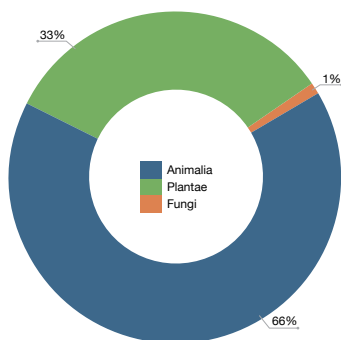
**Figure 26.** Data published by GBIF Participants in Oceania by kingdom



All data available through GBIF about biodiversity in Oceania
Data published by country Participants in Oceania

Millions

50
37.5
25
12.5

2009  2010  2011  2012  2013  2014

**Figure 27.** Trend in data relating to Oceania

# Appendix 1

>Records published through GBIF, by endorsing Participant node

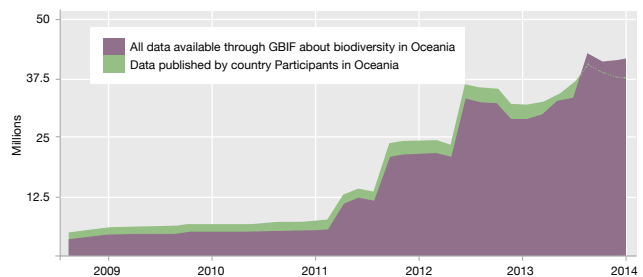| Node | Total | With coordinates | Publishers | Datasets |
|---|---|---|---|---|
| **Voting Participants** | | | | |
| Andorra | 81,816 | 78,008 | 1 | 7 |
| Argentina | 886,073 | 446,474 | 9 | 141 |
| Australia | 36,653,791 | 21,853,994 | 30 | 108 |
| Belgium | 6,593,580 | 6,062,892 | 9 | 77 |
| Benin | 95,881 | 87,282 | 1 | 10 |
| Burkina Faso | 8,658 | 8,552 | 2 | 2 |
| Chile | 15,541 | 14,238 | 2 | 7 |
| Colombia | 1,890,440 | 1,583,316 | 49 | 170 |
| Costa Rica | 3,206,744 | 3,145,072 | 5 | 10 |
| Denmark | 9,070,022 | 8,892,863 | 23 | 177 |
| Estonia | 316,093 | 245,099 | 2 | 4 |
| Finland | 18,443,592 | 18,170,453 | 12 | 57 |
| France | 17,395,604 | 10,301,998 | 42 | 149 |
| Germany | 18,168,637 | 15,158,973 | 30 | 9729 |
| Ghana | 93,346 | 51,420 | 1 | 2 |
| Iceland | 458,705 | 438,505 | 1 | 4 |
| Ireland | 2,534,189 | 2,534,155 | 1 | 106 |
| Korea, Republic of | 1,924,225 | 2,445 | 31 | 116 |
| Madagascar | 18,748 | 6,285 | 3 | 3 |
| Mauritania | 1,812 | 1,493 | 2 | 5 |
| Mexico | 2,757,667 | 2,406,412 | 4 | 390 |
| Netherlands | 20,606,464 | 18,027,864 | 20 | 124 |
| New Zealand | 1,361,258 | 884,764 | 4 | 12 |
| Norway | 16,944,587 | 16,599,910 | 4 | 87 |
| Peru | 77,131 | 8,401 | 4 | 6 |
| Portugal | 161,728 | 55,814 | 8 | 14 |
| Slovakia | 115,151 | 2,716 | 1 | 1 |
| Slovenia | 266,295 | 140,931 | 3 | 5 |
| South Africa | 8,973,006 | 8,063,926 | 2 | 22 |
| Spain | 10,184,958 | 7,962,849 | 71 | 184 |
| Sweden | 47,325,772 | 46,099,111 | 7 | 36 |
| Tanzania | 10,034 | 9,459 | 3 | 12 |
| UK | 47,171,388 | 45,873,767 | 12 | 497 |
| USA | 205,702,157 | 185,919,821 | 115 | 358 |
| | | | | |
| **Associate Country Participants** | | | | |
| Austria | 3,249,994 | 2,958,903 | 12 | 13 |
| Brazil | 602,034 | 323,393 | 7 | 49 |
| Canada | 4,407,101 | 3,498,518 | 22 | 127 |
| Guinea | 493 | 468 | 1 | 1 |
| India | 7,683 | 5,660 | 1 | 7 |
| Israel | 433,463 | 433,463 | 1 | 22 |
| Japan* | 3,667,892 | 865,557 | 3 | 278 |
| Luxembourg | 933,394 | 902,874 | 1 | 1 |
| Pakistan | 853 | 176 | 1 | 3 |
| Poland | 1,625,043 | 1,317,005 | 28 | 97 |
| Switzerland | 1,558,889 | 1,321,691 | 11 | 18 |
| Togo | 7,983 | 7,983 | 1 | 7 |
| | | | | |
| **Other Associate Participants** | | | | |
| ASEAN Centre for Biodiversity | 175 | 0 | 4 | 13 |
| Bioversity International | 1,980,963 | 641,444 | 2 | 4 |
| Canadensys | 3,253 | 3,253 | 3 | 11 |
| Chinese Academy of Sciences | 530,542 | 530,280 | 1 | 9 |
| Ciencia y Tecnología para el Desarrollo | 131,642 | 106,011 | 1 | 1 |
| Consortium of European Taxonomic Facilities | 175,689 | 8,771 | 3 | 9 |
| Inter American Biodiversity Information Network | 70,087 | 43,766 | 1 | 1 |
| International Centre for Insect Physiology and Ecology | 3,939 | 3,909 | 1 | 3 |
| NatureServe | 896,704 | 0 | 1 | 1 |
| Nordic Genetic Resource Center (NORDGEN) | 37,641 | 6,093 | 1 | 1 |
| Ocean Biogeographic Information System (OBIS) | 11,909,277 | 11,548,752 | 7 | 188 |
| Pacific Biodiversity Information Forum (PBIF) | 2,487 | 2,382 | 1 | 2 |
| Scientific Committee on Antarctic Research (SCAR) | 290,742 | 290,640 | 2 | 83 |
| Society for the Management of Electronic Biodiversity Data (SMEBD) | 306,378 | 306,210 | 3 | 12 |
| Chinese Taipei | 1,156,908 | 879,346 | 5 | 37 |
| VertNet | 4,400 | 3,279 | 1 | 1 |
| World Federation for Culture Collections (WFCC) | 48,913 | 0 | 1 | 19 |

* Moved to Associate Country Participant status in December 2014

# Appendix 2

| Publisher | GBIF Node | Datasets | Record count |
|---|---|---|---|
| Asociación Bogotana de Ornitología | Colombia | 2 | 1,998 |
| Botanical Garden Meise | Belgium | 1 | 29,787 |
| Botanical Garden of Barcelona | Spain | 1 | 2,994 |
| Botanisches Institut, Universität zu Köln | Germany | 1 | 1,614 |
| Cabildo Verde de Sabana de Torres | Colombia | 1 | 525 |
| CBGP (UMR INRA, Cirad, IRD, Montpellier SupAgro) | France | 1 | 5,262 |
| CFE - Centre for Functional Ecology, Department of Life Sciences, University of Coimbra | Portugal | 1 | 4,024 |
| Chinese Academy of Sciences (CAS) | Chinese Academy of Sciences | 9 | 530,542 |
| City of Amsterdam | Netherlands | 1 | 26,811 |
| Colecciones naturales de la Asociación BIGA para el estudio del patrimonio natural de Galicia: FBIGA y ABIGA. | Spain | 2 | 9,545 |
| Corporación San Jorge | Colombia | 1 | 51 |
| Costa Rica Bird Observatories | Costa Rica | 1 | 27,290 |
| Dutch Foundation for Botanical Research (FLORON) | Netherlands | 1 | 599,260 |
| Ecole Normale Supérieure de Lyon | France | 1 | 581 |
| European Molecular Biology Laboratory (EMBL) | UK | 1 | 4,661,554 |
| Friedrich-Alexander University of Erlangen-Nürnberg | Germany | 1 | 16,060 |
| Fundación Bosques y Humedales | Colombia | 1 | 2,012 |
| Fundación El Refugio | Colombia | 2 | 0 |
| Fundación Trópico | Colombia | 1 | 1,003 |
| GBIF Portugal | Portugal | 1 | 0 |
| Gouvernement du Québec | Canadensys | 1 | 3,240 |
| Herbiers Universitaires de Clermont-Ferrand (CLF) | France | 1 | 1,914 |
| Institut National de la Recherche Agronomique (INRA) | France | 10 | 2,494 |
| Institut Ruđer Bošković, Center for Marine Research | Consortium of European Taxonomic Facilities (CETAF) | 1 | 52 |
| Institute of Biodiversity, Animal Health and Comparative Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow | UK | 1 | 21 |
| Instituto Boto Cinza | Brazil | 1 | 15 |
| Jeju Biodiversity Research Institute of Korea (JBRI) | Korea, Republic of | 1 | 3,000 |
| Kathryn Kalmbach Herbarium (Denver Botanic Gardens) | USA | 1 | 56,302 |
| Laboratoire EDB "Evolution et Diversité Biologique" | France | 2 | 2,068 |
| Laboratorio de Recursos Naturales y Vida Silvestre (LARNAVISI). Universidad Nacional de Costa Rica (UNA) | Costa Rica | 1 | 8,928 |
| Laboratory of Ecology and Evolution of Plants, at Universidade Federal de Vicosa | Brazil | 21 | 3,310 |
| Le Parc National du Banc d'Arguin | Mauritania | 1 | 0 |
| Moscow University Herbarium (MW) | GBIF Participant Node Managers Committee | 1 | 22,625 |
| Museu Nacional / UFRJ | Brazil | 2 | 68,740 |
| Museum TwentseWelle | Netherlands | 1 | 1,440 |
| National Museum in Prague | Consortium of European Taxonomic Facilities (CETAF) | 10 | 68,080 |
| Natural Heritage Center of Administration (NHCA) | Korea, Republic of | 2 | 204 |
| Natural History Museum of Alava (Museo de Ciencias Naturales de Álava) | Spain | 1 | 85,449 |
| Natural History Museum of Denmark | Denmark | 3 | 2,581 |
| naturgucker.de | Germany | 1 | 4,286,173 |
| Observatoire PELAGIS, UMS 3462 Système d'Observation pour la Conservation des Mammifères et Oiseaux Marins, Université de la Rochelle-CNRS | France | 3 | 26,834 |
| Ohio University, Invertebrate Paleontology Collection | USA | 1 | 2,412 |
| Parques Nacionales Naturales de Colombia | Colombia | 3 | 8,294 |
| POLLICHIA – Verein für Naturforschung und Landespflege e.V. | Germany | 1 | 181,698 |
| Sam Mitchel Herbarium of Fungi (Denver Botanic Gardens) | USA | 1 | 17,400 |
| Société Québécoise de Bryologie | Canadensys | 2 | 3,253 |
| SP/CONEDD-DCIME | Burkina Faso | 1 | 979 |
| The Virtual Museum of Life | Spain | 1 | 193 |
| Universidad Industrial de Santander | Colombia | 1 | 23,845 |
| Universidad Pedagógica y Tecnológica de Colombia | Colombia | 1 | 3,010 |
| Universidad Tecnológica del Chocó | Colombia | 4 | 11,595 |
| Université d'Aix-Marseille | France | 1 | 1,004 |
| University of Bergen | Norway | 2 | 362,939 |
| University of Lethbridge | Canada | 1 | 21,749 |
| Vanderbilt University | USA | 1 | 3,633 |
| | | **Total** | **11,206,387** |

# Appendix 3

>GBIF Participants in 2014

| Voting Participant | Member as of |
|---|---|
| Andorra | September 2010 |
| Argentina* | March 2002 |
| Australia | February 2001 |
| Belgium | February 2001 |
| Benin | December 2004 |
| Burkina Faso | January 2007 |
| Chile | December 2009 |
| Colombia | September 2003 |
| Costa Rica | May 2001 |
| Denmark | January 2001 |
| Estonia | September 2003 |
| Finland | April 2001 |
| France | April 2001 |
| Germany | February 2001 |
| Ghana | March 2001 |
| Iceland | June 2001 |
| Ireland | January 2008 |
| Kenya | July 2008 |
| Korea, Republic of | May 2001 |
| Madagascar | January 2003 |
| Mauritania | August 2009 |
| Mexico | March 2001 |
| Netherlands | February 2001 |
| New Zealand | February 2001 |
| Norway | February 2004 |
| Peru* | September 2002 |
| Portugal | June 2001 |
| Slovakia* | August 2001 |
| Slovenia* | February 2001 |
| South Africa | April 2003 |
| Spain | February 2001 |
| Sweden | February 2001 |
| Tanzania | September 2002 |
| Uganda | October 2009 |
| United Kingdom | August 2001 |
| United States | January 2001 |
| Uruguay | Rejoined in October 2014 |

* Participants that had yet to sign the 2012 Memorandum of Understanding

| Associate Country Participant | Member as of |
|---|---|
| Austria | September 2001 |
| Brazil | October 2012 |
| Canada | March 2001 |
| Central African Republic | March 2011 |
| Congo, Republic of | May 2011 |
| Guinea | March 2005 |
| India | July 2003 |
| Indonesia* | October 2004 |
| Israel | April 2013 |
| Japan | February 2001, moved from Voting Participant to Associate Country Participant in December 2014 |
| Luxembourg | April 2008 |
| Pakistan | August 2001 |
| Philippines | March 2005 |
| Poland | March 2001 |
| Switzerland* | February 2001 |
| Togo | October 2009 |

| Other Associate Participants | Acronym | Member as of |
|---|---|---|
| Albertine Rift Conservation Society | ARCOS | January 2010 |
| ASEAN Centre for Biodiversity | ACB | August 2009 |
| Biodiversity Heritage Library | BHL | August 2014 |
| BioNet-AndinoNet | | October 2007 |
| BioNET-INTERNATIONAL | | May 2001 |
| Bioversity International | | January 2007 |
| Botanic Gardens Conservation International | BGCI | August 2004 |
| Canadensys | | August 2014 |
| Chinese Academy of Science | CAS | September 2013 |
| Chinese Taipei | | March 2001 |
| Ciencia y Tecnología para el Desarrollo | CYTED | April 2006 |
| Consortium for the Barcode of Life | CBOL | March 2005 |
| Consortium of European Taxonomic Facilities | CETAF | June 2007 |
| Discover Life | | February 2008 |
| DIVERSITAS | | May 2007 |
| Encyclopedia of Life | EOL | January 2008 |
| Endangered Wildlife Trust | EWT | July 2008 |
| European Environment Agency | EEA | September 2010 |
| ICLEI - Local Governments for Sustainability | ICLEI | October 2010 |
| Integrated Taxonomic Information System | ITIS | March 2001 |
| Inter-American Biodiversity Information Network | IABIN | May 2001 |
| International Barcode of Life Project | iBOL | April 2011 |
| International Centre for Insect Physiology and Ecology | ICIPE | March 2004 |
| International Centre for Integrated Mountain Development | ICIMOD | September 2009 |
| International Long Term Ecological Research | ILTER | July 2008 |
| Natural Science Collections Alliance | NSCA | December 2004 |
| Naturalis Biodiversity Center | | July 2014 |
| NatureServe | | June 2001 |
| Nordic Genetic Resource Center | NordGen | March 2004 |
| Pacific Biodiversity Information Forum | PBIF | August 2004 |
| Scientific Committee on Antarctic Research | SCAR | February 2008 |
| Society for the Management of Electronic Biodiversity Data | SMEBD | March 2009 |
| Society for the Preservation of Natural History Collections | SPNHC | January 2007 |
| Species 2000 | | March 2001 |
| Taxonomic Databases Working Group | TDWG | March 2002 |
| United Nations Environment Programme – World Conservation Monitoring Centre | UNEP-WCMC | May 2001 |
| VertNet | | August 2013 |
| Wildscreen | | January 2003 |
| World Federation for Culture Collections | WFCC | October 2002 |

| Affiliate | Acronym | Member as of |
|---|---|---|
| Data Observation Network for Earth | DataONE | August 2014 |
| Intergovernmental Oceanographic Commission of the United Nations Educational Scientific and Cultural Organisation | UNESCO (IOC) | October 2014 |

# Appendix 4

>Preliminary 2014 financial statement, in EUR

| Income statement | Realized in 2014 (EUR) | Budget 2014 (EUR) |
|---|---:|---:|
| **Income** | | |
| Received basic financial contribution | 2,878,400 | 2,918,000 |
| Received basic financial contribution former years | 587,800 | 586,000 |
| **Total income** | **3,466,200** | **3,504,000** |
| | | |
| **Expenditure** | | |
| Work Programme 2014: | | |
|   - Informatics, Stream 1 | -102,348 | -120,000 |
|   - Engagement, Stream 2 | -128,354 | -150,000 |
|   - Content, Stream 3 | 0 | 0 |
|   - Implementation | -1,490,768 | -1,477,000 |
| Governance - Committee costs and awards | -94,930 | -125,000 |
| Staff expenditure | -795,755 | -754,000 |
| Running expenditure | -158,760 | -180,000 |
| Secretariat facilities | -81,105 | -80,000 |
| **Total expenditure** | **-2,852,019** | **-2,886,000** |
| | | |
| **Financial income** | | |
| Changes in foreign exchanges rates | 2,150 | 0 |
| Interest | 4,618 | 5,000 |
| **End of the year result** | **620,949** | **623,000** |

| Balance sheet | 2013 (EUR) | 2014 (EUR) |
|---|---:|---:|
| **Assets** | | |
| Other receivables and VAT | 20,592 | 84,370 |
| Cash and cash at bank | 1,048,714 | 2,056,680 |
| **Total assets** | **1,069,306** | **2,141,050** |
| | | |
| **Net capital and liabilities** | | |
| Net capital (equity) | 30,994 | 654,444 |
| Provisions | 56,299 | 44,963 |
| Supplementary funds | 527,176 | 646,991 |
| Prepayments re. 2015-2016 | 439,234 | 766,700 |
| Other payables | 15,603 | 27,952 |
| **Total equity and liabilities** | **1,069,306** | **2,141,050** |
| | | |
| **GBIF Supplementary Fund** | | |
| Balance at 1 January | 347,504 | 527,176 |
| Exchange rate dif. at January 1 | 0 | 1,080 |
| Income 2014 | 580,552 | 473,869 |
| Expenditure | -400,879 | -355,133 |
| **Balance at 31 December** | **527,176** | **646,991** |

>Externally Received Grants 2014

| For supplementary funds | DKK | EUR |
|---|---:|---:|
| University of Copenhagen (IT Equipment)[1] | 170,000 | 22,834 |
| I4Life | 247,491 | 33,242 |
| Eye on Earth | 1,776,724 | 392,006 |
| OpenUp | 17,250 | 2,317 |
| EU Bon | 0 | 0 |
| GIASIP, CBD | 3,456 | 464 |
| EMODnet Biology 2 | 44,572 | 5,987 |
| VIBRANT | 453,667 | 60,934 |
| CBD - GBO4 | 205,387 | 27,587 |
| **Total external funding** | **2,918,547** | **545,371** |

[1] University of Copenhagen in addition, annually provide in kind contributions, such as accountancy services, free office space incl. electricity, landline telephone/fax.

# Appendix 4 continued...

>Contributing agencies for 2014

| Voting Participants | Financial Contributors |
|---|---|
| Andorra | Institute d´estudis Andorrans |
| Argentina | CONICET - Consejo Nacional de Investigaciones Científicas y Técnicas |
| Australia | Atlas of Living Australia, CSIRO National Research Collections Australia |
| Belgium | Belgian Federal Science Policy Office (belspo) |
| Benin | Laboratoire des Science Forestieres |
| Chile | Comision Nacional del Medio Ambiente (CONAMA) |
| Colombia | Instituto de Investigación de Recursos Biológicos Alexander von Humboldt |
| Costa Rica | Asociación Instituto Nacional de Biodiversidad (INBio) |
| Denmark | The Danish Agency for Science, Technology and Innovation |
| Estonia | Ministry of Environment |
| Finland | Academy of Finland |
| France | Direction Générale pour la Recherche et l´Innovation (DGRI) |
| Germany | Deutsche Forschungsgemeinschaft (DFG) |
| | German Aerospace Center, BMBF |
| Ghana | Council for Scientific and Industrial Research (CSIR) |
| Iceland | Ministry for the Environment and Natural Resources |
| Ireland | National Parks & Wildlife Service |
| Kenya | National Museums of Kenya |
| Madagascar | Centre National de Recherches sur l´Environnement (CNRE) |
| Mauretania | L´Ecole Normale Supérieure de Nouakchott |
| Mexico | Consejo Nacional de Ciencia y Tecnologia (CONACYT) |
| Netherlands | Ministry of Education, Culture and Science |
| New Zealand | Ministry of Business, Innovation and Employment |
| Norway | The Research Council of Norway |
| Portugal | Foundation for Science and Technology |
| Republic of Korea | Ministry of Education, Science and Technology |
| Slovak Republic | Ministry of the Environment |
| Slovenia | Ministry of Higher Education, Science and Technology |
| South Africa | Department of Science and Technology |
| Sweden | Swedish Research Council |
| Tanzania | Tanzania Commission for Science and Technology (COSTECH) |
| Uganda | Uganda National Council for Science and Technology |
| United Kingdom | Department for Environment, Food and Rural Affairs (DEFRA) |
| | Natural Environment Research Council (NERC) |
| | Royal Botanic Gardens, Kew |
| | Natural History Museum, London |
| | Joint Nature Conservation Committee |
| USA | National Science Foundation |
| | Smithsonian Institution |
| | U.S. Department of State |
| | U.S. Department of Agriculture |

# Appendix 5

>GBIF Governing Board and Standing Committees 2014

**Executive Committee**

| | |
|---|---|
| Chair | Peter Schalk |
| 1st Vice Chair | Jorge Sóberon |
| 2nd Vice Chair | Motomi Ito |
| 3rd Vice Chair | Claude-Anne Gauthier |
| Committee Chairs | |
| Science | Roderic Page |
| Budget | Walter Berendsohn |
| Nodes | Stephen Wilkinson (until September 2014) |
| | Hanna Koivula (from September 2014) |
| Ex-officio | |
| Executive Secretary | Donald Hobern |

**Standing Committee**
**Science Committee**

| | |
|---|---|
| Chair | Roderic Page |
| Vice Chairs | Mark Costello |
| | Arturo Ariño |
| | Jean Cossi Ganglo |
| Members | Elizabeth Arnaud |
| | Guy Cochrane |
| | Kathy Willis |
| Ex-officio | |
| Chair Governing Board | Peter Schalk |
| 1st Vice Chair Governing Board | Jorge Sóberon |
| 2nd Vice Chair Governing Board | Motomi Ito |
| 3rd Vice Chair Governing Board | Claude-Anne Gauthier |
| Executive Secretary | Donald Hobern |

**Budget Committee**

| | |
|---|---|
| Chair | Walter Berendsohn |
| 1st Vice Chair | Eli van der Heide (until September 2014) |
| | Leonard Krishtalka (from September 2014) |
| 2nd Vice Chair | Selwyn Willoughby (until June 2014) |
| Members | Eric Chenin (from September 2014) |
| | Joanne Daly |
| | James Holborow (from October 2014) |
| | Patricia Koleff |
| | Ben Wheeler |
| Ex-officio | |
| Chair Governing Board | Peter Schalk |
| Executive Secretary | Donald Hobern |

**Node Managers Committee**

| | |
|---|---|
| Chair | Stephen Wilkinson (until September 2014) |
| | Hanna Koivula (from September 2014) |
| 1st Vice Chair | Alex Asase |
| 2nd Vice Chair | Manuel Vargas |
| Members | All Node Managers |

**Nodes Steering Group**

| | |
|---|---|
| Chair | Stephen Wilkinson (until September 2014) |
| | Hanna Koivula (from September 2014) |
| 1st Vice Chair | Alex Asase |
| 2nd Vice Chair | Manuel Vargas |

**Regional Node Representatives**

| | |
|---|---|
| Africa | Hulda Gideon |
| Asia | Sheila Vergara (until July 2014) |
| | Tsuyoshi Hosoya (from July 2014) |
| Europe | André Heughebaert |
| Latin America | Luiz Gadelha |
| North America | Robert Hanner |
| Oceania | *Pending* |

# Appendix 6

>GBIF Affiliations

| GBIF affiliations | Status |
|---|---|
| Biodiversity Indicators Partnership (BIP) | Partner |
| Biodiversity Knowledge Network for the European Union (KNEU) | Member, Dialogue group |
| Convention on Biological Diversity (CBD) | Observer |
| Convention on Migratory Species | Observer |
| Encyclopedia of Life (EOL) | Council |
| European Biodiversity Observation Network (EU BON) | Participant |
| Eye on Earth Biodiversity Special Initiative | Partner |
| Global Genome Biodiversity Network (GGBN) | Member, Steering committee |
| Global Invasive Alien Species Information Partnership (GIASIP) | Partner |
| Global Partnership for Plant Conservation (GPPC) | Partner |
| Group on Earth Observations (GEO) | Participant |
| Group on Earth Observations Biodiversity Observation Network (GEO-BON) | Member, Advisory Board |
| Intergovernmental Platform on Biodiversity & Ecosystem Services (IPBES) | Observer |
| IOC-UNESCO International Oceanographic Data and Information Exchange/ Ocean Biogeographic Information System (IODE/OBIS) | Associate data unit |
| LifeWatch | Member, Policy & Science Board |

# Appendix 7

>GBIF-commissioned publications in 2014

- Publishing sample data using the GBIF IPT, Jun 2014
- The GBIF Integrated Publishing Toolkit: facilitating the efficient publishing of biodiversity data on the Internet. PLoS ONE 9(8): e102623. doi:10.1371/journal.pone.0102623
- Draft for public review: GBIF communication strategy, Aug 2014
- Draft for consultation: Establishing an effective GBIF Participant Node. Concepts and general considerations, Sept 2014
- Publishing camera trap data, a best practice guide, Sept 2014
- Data refinement using the BioVeL Portal, Oct 2014
- GBIF brochure, 2014 edition in French, Portuguese and Spanish
- Draft for public review: GBIF Capacity Enhancement Framework, Dec 2014

# Appendix 8

>GBIF Secretariat staff

| GBIF Secretariat Staff as of December 2014 | |
|---|---|
| **Management group** | |
| Donald Hobern | Executive Secretary/Director |
| Tim Hirsch | Deputy Director and Head of Participation |
| Anne Mette Nielsen | Head of Administration |
| Tim Robertson | Head of Informatics |
| Andrea Hahn | Programme Manager |
| | |
| **Secretariat staff** | |
| Sampreethi Aipanjiguly | Communications Officer |
| Maheva Bagard Laursen | Communications Officer (maternity replacement, from 1 June) |
| Olaf Bánki | Senior Programme Officer for Participation |
| Kyle Braak | Developer |
| Søren Bundgaard-Jensen | Financial Officer |
| Andrei Cenja | System Administrator |
| Kyle Copas | Science Writer (from 12 May) |
| Marlene Dalsgaard Nielsen | Administrative Assistant (from 1 March) |
| Alberto González-Talaván | Senior Programme Officer for Training |
| Burke Chih-Jen Ko | Informatics Liaison |
| Jan Krzysztof Legind | Data Manager |
| Siro Masinde | Programme Officer for Content Mobilization (from 1 September) |
| Federico Mendez Hernandez | Developer |
| Oliver Meyn | Developer |
| Éamonn Ó Tuama | Senior Programme Officer for Interoperability |
| Mélianie Raymond | Senior Programme Officer for Node Development |
| Dmitry Schigel | Programme Officer for Content Analysis and Use (from 15 October) |
| Susanne Lønstrup Sheldon | HR Manager & PA to the Director |
| Ciprian Vizitiu | Webmaster and Network Administrator |
| | |
| **Staff departures** | |
| Vishwas Chavan | Senior Programme Officer for Data Mobilisation (until 30 June) |
| Samy Gaiji | Senior Programme Officer for Science and Scientific Liaison (until 6 February) |

## New staff at the GBIF Secretariat

**Dmitry Schigel**, Adjunct Professor of Mycology, University of Helsinki, Finland, joined as the new Programme Officer for Content Analysis and Use. Originally from Russia, Dmitry previously acted as taxonomy coordinator for the ICT team at the LUOMUS-Finnish Museum of Natural History, host of the GBIF national node for Finland, and ran research and education projects on dead wood, fungi and insects at the university's Metapopulation Research Group.

**Kyle Copas** started as the Secretariat's Science Writer, focused on creating content for GBIF.org and other communication platforms, as well as crafting and leading implementation of GBIF's communication strategy. Kyle contributes experience across the realms of biodiversity conservation and sustainability, having spent the past seven years in a variety of content, communications, and strategy roles at NatureServe, a U.S.-based Associate Participant in the GBIF network.

**Maheva Bagard Laursen** joined as Communications Officer, as maternity-leave replacement for Sampreethi Aipanjiguly. Maheva has worked in communications, networking and project management in Europe and in China, most recently as an outreach communication consultant at the European Environment Agency (EEA).

**Marlene Dalsgaard Nielsen** joined the GBIF Secretariat as Administrative Assistant. Trained at the Ministry of Foreign Affairs in Copenhagen, Marlene worked at the Royal Danish Embassy and European Medicines Agency (EMA) in London, and most recently worked in Copenhagen for Novo Nordisk.

**Siro Masinde**, the new Programme Officer for Content Mobilization was previously senior research scientist and head of the botany department at the National Museums of Kenya, which includes the East African Herbarium and Nairobi Botanic Garden. Siro has extensive experience in digitization and databasing, including as African regional coordinator for JSTOR/ITHAKA, for which he helped develop the Global Plants Initiative.

**GBIF** | Global Biodiversity
Information Facility