The GBIF Science Symposium 2013

GBIF at work - advancing biodiversity science for a sustainable society

9 October 2013, Auditorium Friedrichstrasse, Berlin, Germany

GBIF
www.gbif.org

Programme

13:30-14:00   **Why do species occur where they do?**
Presenter: GBIF Ebbe Nielsen Prize winner 2013
Miguel Bastos Araújo (Portugal)

14:00-14:30   **PANGAEA®, data publisher for earth and environmental science: research data enters scholarly communication**
Presenter: Michael Diepenbroek (Germany)

14:30-15:00   **Use of GBIF-mediated data for *in-situ* and *ex-situ* conservation planning**
Presenter: Julián Ramírez-Villegas (Colombia)

15:00-15:30   Coffee Break

15:30-16:00   **Coupling paleodistribution modelling and statistical phylogeography to trace the history of Neotropical savannas and seasonally dry forests**
Presenter: Rosane G. Collevatti (Brazil)

16:00-16:30   **Online solutions and the 'Wallacean shortfall': What does GBIF contribute to our knowledge of species' ranges?**
Presenter: Liliana Ballesteros-Mejia (Colombia)

16:30-17:00   **Running from the heat: Can tropical forests shift their distributions to remain at equilibrium with climate?**
Presenter: Kenneth J. Feeley (USA)

17:00-17:30   Panel discussion
Chair: Leonard Krishtalka

17:30-18:30   Cocktail Reception

Introduction

Science becomes powerful when description is transformed into prediction. Embracing this power, GBIF transitioned in 2012-2013 from being a start-up megascience initiative to a high-growth science industry. The deployment of GBIF-enabled data by the scientific community experienced an almost exponential increase, resulting in 50 per cent more recorded research publications.

Three reasons. First, GBIF is the largest provider of primary biodiversity data to the scientific world. Second, these data are increasingly comprehensive and fit-for-use for complex scientific research. Third, the advent and refinement of ecological niche modelling and other research protocols enables science to analyse and transform 300 years of occurrence records of the Earth's plants and animals into potent, compelling forecasts of environmental phenomena.

Leonard Krishtalka
Chair, GBIF Science Committee

There is no better forum than the GB20 Science Symposium to demonstrate this transformation and the critical areas in which GBIF-enabled biodiversity data are being brought into currency for science and society. The subject areas range from conservation planning, to the stability and dynamics of tropical forests and savannas, to how well we can model species distributions—all under scenarios of climate change.

The first presentation, by 2013 Ebbe Nielsen Prize winner Miguel Bastos Araújo, will describe the influence of global climate change on larger patterns of biodiversity. Following, Michael Diepenbroeck will outline ICSU's PANGAEA system for acquiring and serving diverse data from the geosciences. Julián Ramírez-Villegas used extensive GBIF-based data to examine conservation strategies under present and future climate regimes for biodiversity in general, and wild relatives of food crops in particular. Using tree records from the past 12,000 years, Rosane Collevatti shows how species in Neotropical savannas retreated into a patchwork distribution, whereas those in seasonally dry forests expanded their range. Lilliana Ballesteros-Mejia is concerned with the resolution and knowledge gap in the distribution of the world's plant and animal species, such as those based on biocollections housed in museums and herbaria and mapped from GBIF-enabled records. Kenneth Feeley demonstrates that tropical plant species in the Andes, Costa Rica and the Amazon, despite their disparate habitats, show climate-driven distributional shifts, and warns of rapid rates of biodiversity loss under future scenarios. A panel discussion following the presentations will inform GBIF how it can better serve science and, ultimately, inform sustainable environmental and social solutions.

The GB20 Science Symposium is a measure of GBIF advancing knowledge discovery to address one of the grand scientific challenges of the 21st century: harnessing knowledge of Earth's biological diversity and how it shapes the global environmental systems on which all of life depends. In so doing, GBIF is advancing the mission of many international enterprises, including IPBES, the Intergovernmental Platform on Biodiversity and Ecosystem Services, and the CBD's 2011-20 Strategic Plan for Biodiversity.
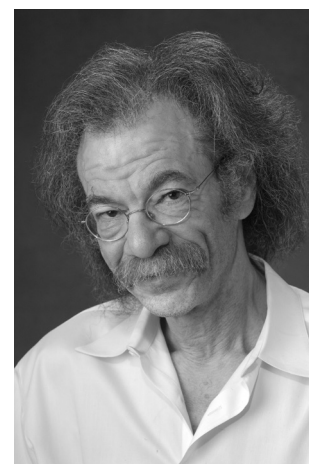
Leonard Krishtalka
Chair, GBIF Science Committee
Director, Biodiversity Institute, University of Kansas, USA

2013 Ebbe Nielsen Prize winner's presentation
Presenter: Miguel Bastos Araújo

Miguel Bastos Araújo is receiving the €30,000 Ebbe Nielsen Prize, awarded annually by the GBIF Science Committee, at the hosted dinner for the 20th GBIF Governing Board in Berlin, on 8 October 2013.

In making the selection, the GBIF Science Committee recognized Araújo's groundbreaking research in deploying biodiversity informatics to model and forecast environmental phenomena, specifically the effects of different climate change scenarios on regional and global biodiversity patterns.

Why do species occur where they do?

Abstract

Simple questions often require complex answers. Although consensus exists that species distributions are determined by a combination of biotic interactions (B), physiological tolerances to abiotic factors (A), and movement (M), the relative importance of each of these factors is still debated. An understanding of the relative contributions of B, A, and M is critical for answering basic questions in biogeography and community ecology and for predicting climate change effects on biodiversity. The presentation will summarize current understanding of the determinants of species distributions with particular emphasis on the development of predictive models of biodiversity change, while proposing a research agenda for the forthcoming years that involves greater integration between otherwise disconnected disciplines in life sciences.

Miguel Bastos Araújo holds the Chair in Integrative Biogeography at the Imperial College London, whilst keeping a joint appointment at the National Museum of Natural Sciences in Madrid. He also holds temporary academic visiting appointments at the University of Copenhagen and the University of Évora, and is member of the International Laboratory on Global Change, a research platform involving the CSIC, the Pontificia Catholic University of Chile, and the Federal University of Rio de Janeiro in Brazil.

Prof Araújo has authored over 150 publications in journals and books in the fields of biogeography, conservation biology, global change biology, and macroecology, and was recently identified as a 'highly cited' scientist by Thomson Reuters. He serves as Deputy Editor-in-Chief of Ecography, associate editor of the Journal of Biogeography, and is member of the scientific committee of DIVERSITAS' bioDISCOVERY programme. He contributed to the 2007 4th IPCC (Intergovernmental Panel for Climate Change) Assessment Report, for which the IPCC shared the Nobel Peace Prize, and has been involved in several consultancies with governmental organizations. He has been principal researcher in more than 15 research projects, including five large European funded consortiums on climate change mitigation and adaptation, and an international BBVA Foundation project to investigate climate change impacts on Latin American biodiversity. Prof Araújo has also received the IBS (International Biogeography Society) MacArthur & Wilson Award (2013), given to an individual "for notable, innovative contributions to biogeography at an early stage in their career".

Presenter: Michael Diepenbroek

PANGAEA®, data publisher for earth and environmental science: research data enters scholarly communication
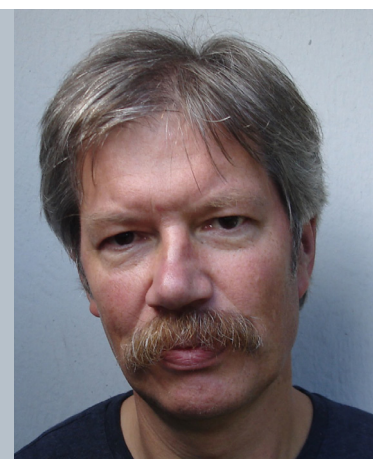
Abstract

The International Council for Science (ISCU) World Data Center PANGAEA is an information system for the acquisition, processing, long-term storage, and publication of georeferenced data relating to earth science.

Storing about half a million datasets from all areas of geosciences, PANGAEA is one of the largest archives for observational earth science data. Standard conform interfaces (ISO, OGC, W3C, OAI) enable access from a variety of data and information portals, among them the search engine of PANGAEA itself (www.pangaea.de) and GBIF. All datasets in PANGAEA are citable, fully documented, and can be referenced via persistent identifiers (Digital Object Identifier - DOI) — a premise for data publication.

In collaboration with other ICSU World Data Centers (www.icsu-wds.org) and the Technical Information Library in Germany (TIB) PANGAEA implemented a DOI-based registry for scientific data, which is now supported by a worldwide consortium of libraries (www.datacite.org). A further milestone was building strong co-operation with science publishers such as Elsevier, Springer, Wiley, AGU and Nature. A common web service allows to reference supplementary data in PANGAEA directly from an article's abstract page (e.g. Science Direct). The next step with science publishers is to further integrate the editorial process for the publication of supplementary data with the publication procedures of the journal.

PANGAEA is operated as a joint long-term facility by the Center for Marine Environmental Sciences (MARUM) at the University of Bremen and the Alfred Wegener Institute for Polar and Marine Research (AWI). More than 80 per cent of the funding comes from project data management and the implementation of spatial data infrastructures, and there have been more than 160 national and international projects in the last 15 years. (www.pangaea.de/projects).

Michael Diepenbroek, is a geologist and computer specialist with a PhD in geology from the Freie University Berlin. He works at MARUM in Bremen, where he is responsible for the coordination of the scientific information system PANGAEA®, which he conceived and implemented between 1994 and 1997. During the last 10 years Dr Diepenbroek has had a leading role in establishing PANGAEA as a global service provider for scientific data, in particular through mandates from the ICSU World Data System, the WMO Information System, and through collaborations with major science publishers. Since 2007 he has been a member of the Strategic Committee, and later Vice-Chair of the Scientific Committee of the ICSU World Data System.

Presenter: Julián Ramírez-Villegas

Use of GBIF-mediated data for *in-situ* and *ex-situ* conservation planning

Abstract

Humans are largely dependent upon ecosystems and the services they provide. Despite these intricate and critical dependencies, biodiversity is currently significantly threatened by human activities. Impacts include dramatic changes in patterns of species composition, abundance, and diversity of organisms in various ecosystems. Knowledge of species occurrence and abundance is needed to understand the environmental impacts of human activities and to plan conservation measures to safeguard biodiversity. GBIF contributes to this need, providing more than 400 million observational records for a vast number of taxa.

The talk will describe the use of GBIF-accessed data for planning *in-situ* and *ex-situ* conservation strategies under present and future climate scenarios. An overview of aspects of the GBIF database relevant for analysing biodiversity data will be provided. This will be followed by an analysis of threats and needs of *in-situ* conservation in South America, where the aim was providing policy prescriptions for conservation. A comprehensive and global analysis of *ex-situ* conservation gaps of crop wild relatives – a key source of genetic traits for adapting agriculture to climate change – will be presented, and the need for climate-smart conservation actions in the context of climate change discussed.

Photo: Geoff Gallice

Oxbow lake, Yasuni National Park, Ecuador

Julian Ramírez-Villegas is a researcher at the International Centre for Tropical Agriculture (CIAT), the University of Leeds (UK) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Dr Ramírez-Villegas worked as a research assistant from 2007 to 2010, and then moved on to a PhD programme on climate change and impacts at the University of Leeds. Funded by CCAFS, he is to be appointed a post-doctoral fellow at the University of Leeds in the autumn of 2013. Dr Ramírez-Villegas has worked in a variety of projects, ranging from the conservation of plant genetic resources and biodiversity, to the assessment of climate change impacts and adaptation options.

15:00-15:30 Coffee break

Presenter: Rosane G. Collevatti

Coupling paleodistribution modelling and statistical phylogeography to trace the history of Neotropical savannas and seasonally dry forests

Abstract

Recurrent climate oscillations throughout the Quaternary Period raise general questions about the long-term stability and dynamics of vegetation communities and the role of past climate change on their current patterns of genetic diversity and geographical distribution. Currently, coalescent analyses has been coupled with ecological niche modelling (ENM), for which the GBIF and PMIP/CMIP databases were extensively used, to trace the demographical history of tree species from Neotropical savannas and seasonally dry forests (SDFs) and to test hypotheses concerning their dynamics in response to Quaternary climate oscillations. The study's analyses follow the framework recently proposed by Collevatti et al. (2012), which, in sum, is based on coalescent simulations performed under demographic expectations from *a priori* biogeographical distribution hypotheses and potentially new hypotheses suggested by ENMs. The results from competing simulations are compared using a model selection framework. The study results showed different demographical dynamics for species from SDFs and savannas through time. The current pattern of genetic diversity found so far for SDF species is in consonance with a scenario of demographical expansion, whereas savanna species showed range retraction during the Last Glacial Maximum (LGM), leading to multiple refugia.

Photo: Rosane Collevatti

Sampling in a seasonally dry forest fragment in Amazonian Basin

Reference

Collevatti, R.G. *et al.*, 2012. A coupled phylogeographical and species distribution modelling approach recovers the demographical history of a Neotropical seasonally dry forest tree species. *Molecular Ecology*, online. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23094833.

Rosane G. Collevatti is an evolutionary geneticist and professor at the University Federal de Goiás, Brazil. She has a PhD in ecology from the University of Brasilia. Prof Collevatti focuses her research on population genetics of Neotropical trees, with particular emphasis on phylogeography, genetic structure and geographical patterns in neutral, quantitative and adaptative variation in Cerrado tree species.

Presenter: Liliana Ballesteros-Mejia

Online solutions and the 'Wallacean shortfall': What does GBIF contribute to our knowledge of species' ranges?

Abstract

Detailed knowledge of species distributions is fundamental to research in macroecology, biogeography, as well as biodiversity conservation. However, for most organisms, particularly invertebrates, such information is not available despite manifold data in natural history collections. Many online applications have been devised recently to facilitate access to and processing of such data. The Global Biodiversity Information Facility (GBIF) is currently the largest databank for digitized data from museum collections. It is therefore a key system to help in closing the aforementioned knowledge gap. The study presented used European hawkmoths (Lepidoptera, family Sphingidae) as a model taxon to investigate the information content of GBIF-mediated data, compared with an independent compilation of distributional data from natural history collections and other sources. The research team found that GBIF provided many more distribution records compared to independent compilation efforts, but contributed less information on range filling, range extent and climatic niches of species. Although GBIF contributed relevant additional information, it is not yet an alternative to manual compilation and databasing of distributional records from collections and literature sources, at least in lesser-known taxa such as invertebrates. The presenter discusses possible reasons for the findings, which may help in shaping GBIF strategies for providing more informative data.

Photo: Lucarelli

Willowherb Hawkmoth (*Proserpinus proserpina*)

Reference

Beck,J. *et al.*,(2013). Online solutions and the 'Wallacean shortfall': what does GBIF contribute to our knowledge of species' ranges? *Diversity and Distributions*, 19: 1043–1050. doi: 10.1111/ddi.12083.

Liliana Ballesteros-Mejia studied ecology and evolutionary biology at the University of Groningen, the Netherlands. At the time she also worked with the Smithsonian Tropical Research Institute in Panama on indirect interactions among large-seeded trees. She has a PhD from the University of Basel and her research focused on species distribution modelling and biodiversity patterns of insects in the Old World. Dr Ballesteros-Mejia is currently a lecturer at the Universidad EAN, a private university in Bogotá, Colombia.

Presenter: Kenneth J. Feeley

Running from the heat: Can tropical forests shift their distributions to remain at equilibrium with climate?

Abstract

Global climate change is predicted to drive changes in species' geographic distributions. These changes will have implications for the extinction risks of individual species, as well as for patterns of local biodiversity. In order to better understand and predict these changes it is important to have baseline information on the past and current distributions and ecological niches of species, information that is lacking for the vast majority of tropical plant species. By combining the vast database of historical natural history and collection records available through the Global Biodiversity Information Facility (GBIF) with modern forest inventory data, the presenter shows that tropical plant species from Costa Rica, the Andes Mountains and the lowland Amazon, all show evidence of climate-driven distributional shifts. These 'migrations' have generally been slower than required for the species to remain at equilibrium with climate and have been driven primarily by dieback in the lower, hotter, portions of species' ranges. Forecasting into the future, we predict rapid rates of biodiversity loss and biotic attrition throughout much of the tropics unless steps are taken to immediately and dramatically reduce rates of climate change and facilitate the expansion of species' ranges into newly-suitable habitats.

Flooded forest in the Amazon

Photo: CIFOR

Kenneth J. Feeley is an Assistant Professor in the Department of Biological Sciences at Florida International University (FIU) in Miami, Florida, USA. Dr Feeley received his PhD in biology from Duke University in 2005 in recognition of his investigations into the effects of logging and habitat loss on tropical forests. He then worked as a researcher for Wake Forest University and Harvard University's Center for Tropical Forest Science before joining the faculty at FIU in 2009. Feeley's current research is focused on revealing and predicting the complex responses of tropical forests to global climate change with a particular emphasis on the potential shifts in species' geographic ranges. Feeley's work combines large-scale empirical analyses and modelling with field-based observations and experiments, with the fieldwork concentrated primarily in the high-elevation tropical cloudforests of the Peruvian Andes. More information about Kenneth Feeley and his work is available at: http://www2.fiu.edu/~kfeeley

Panel discussion

Chair: Leonard Krishtalka

17:30-18:30 - Cocktail reception

The Science Symposium takes place at
Auditorium Friedrichstrasse (in Quartier 110), Friedrichsstrasse 180, 10117 Berlin, Germany

The Symposium is open to the public but pre-registration is necessary on:
http://gb20.gbif.org/GB20/

Organized and hosted by:

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