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GLOBAL BIODIVERSITY INFORMATION FACILITY

Annual Report 2009

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GBIF Annual Report 2009

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Welcome Message

Welcome from the Executive Secretary and the Chair of the Governing Board

It is with great pleasure that we present you the GBIF Annual Report for 2009. The report provides you with the highlights of a very successful year, in which we have expanded participation, grown our profile and made important progress on delivering against our Strategic Plan 2007-11.

A significant amount of the work initiated in 2009 will continue through 2010 - the designated United Nations International Year of Biodiversity (IYB). IYB is a unique opportunity for GBIF Participants to raise the profile of biodiversity and especially the need for massive investment in biodiversity informatics, if we are to meet the growing global challenges.

We have continued to seek engagement by countries and organisations that can benefit from, and support, the GBIF mission and objectives - wider participation is crucial in ensuring geographic representation and an increase in the volume and scope of data that the GBIF network is able to mobilise.

Thus, we were delighted to welcome three new Voting Participant countries, two new Associate Participant countries, and four new Associate Participant Organisations to our growing global network (page 9). These figures brought the total number of Participants by year-end to 97 of which 54 are countries (page 9).

We also continued to build strategic partnerships. GBIF signed six new Memoranda of Cooperation with partner organisations in 2009 (page 59). We invested in a number of strategic applications to demonstrate the utility of increasing access to, and integration of, disparate datasets for improved analysis and decision-making. These included collaborative projects with the United Nations Environment Programme - World Conservation Monitoring Centre - UNEP-WCMC (page 43), the Secretariat of the Convention of Migratory Species - CMS (page 44), AquaMaps (page 45), and the International Centre for Tropical

HIGHLIGHTS

January
- Darwin Core Ratification Workshop - **p. 27**

February
- Uruguay joins GBIF - **p. 9**
- Multimedia Resources Task Group Meeting, Denmark - **p. 40**

March
- SMEBD joins GBIF - **p. 9**
- Release of the IPT Release Candidate v1.0 - **p. 25**
- IARU Conference, Denmark - **p. 16**

April
- Nomina IV Workshop, USA - **p. 34**
- North American Regional Meeting, USA - **p. 10**

May
- GBIF and IPNI sign a MoC - **p. 35**

June
- e-Biosphere Conference, UK - **p. 17**
- Content Needs Assessment Task Group, Denmark - **p. 39**
- Data Publishing Framework Task Group, Denmark - **p. 40**
- West-Africa Regional Training Workshop, Senegal - **p. 11**
- GBIF and IAIA sign a MoC - **p. 43**
- GBIF and Thomson Reuters sign a MoC - **p. 35**

July
- Metadata Implementation Framework Task Group, Denmark - **p. 27**
- Participant Reporting System launch - **p. 14**
- GSAP-NHC Taskgroup, Netherlands - **p. 39**
- Digitisation of Biodiversity Information Workshop, Tanzania - **p. 11**
- GBIF and Pensoft Publishers sign a MoC - **p. 41**

Agriculture, in Colombia - CIAT (page 46).

GBIF had a high-impact presence at a number of international fora, most notably the IARU Climate Change Science Congress in March, the e-Biosphere Conference in June, and the Fifteenth Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC CoP15) in December (page 17).

Increasing awareness of GBIF was evident with visitor numbers to the GBIF Data Portal increasing by 125%. The total number of accessible records that were mobilised through the GBIF network showed a growth of some 20% (page 33).

Our commitment to capacity building and training ensured that no less than 115 training events were conducted throughout the GBIF network during 2009. In total, close on 1,500 Participants representing 60 countries engaged in these events (page 15). We expect that the multiplier effect of these workshops will lead to an ever greater impact due to our "train the trainers" approach.

We also invested heavily in informatics, significantly increasing uptake by Participants throughout the course of the year. A particularly important achievement was the release of the Integrated Publishing Toolkit (IPT) in March 2009 (page 25).

During 2009, the new GBIF 'Checklist Bank' increased coverage of authoritative taxonomic sources and the integration with the Data Portal was initiated; early tests indicate an increase in coverage of names in the GBIF Data Portal to over 95%, significantly improving data access and interoperability (page 36).

We improved our services to Participants in areas such as response time (page 25) and performance of applications utilising the GBIF architecture (page 30) and in September also launched our new website in the form of a 'communications portal' (page 19).

We look forward to working with you further in taking our organisation forward in 2010 and beyond, and encourage you to increase your active participation in 'all things GBIF'.

Dr Joanne Daly
Chair of the Governing Board

Dr Nicholas King
Executive Secretary

August

ASEAN-Asian Centre for Biodiversity joins GBIF - **p. 9**
Mauritania joins GBIF - **p. 9**
LSID GUID Task Group, Denmark - p. 28
SINEPAD joins GBIF - **p. 9**

September

Launch of new GBIF Website - **p. 19**
IPT Helpdesk Experts Workshop, Denmark - **p. 15**
Central African Regional Training Workshop, Cameroon - **p. 12**
GBRDS Planning Workshop, Denmark - **p. 41**
ICIMOD joins GBIF - **p. 9**

October

10th Nodes Committee Meeting, Denmark - **p. 10**
Uganda joins GBIF - **p. 9**
Governing Board (GB16), Denmark - **p. 21**
GBIF Ebbe Nielsen Prize Awarded, Denmark - **p. 22**
Togo joins GBIF - **p. 9**
Release of the HIT- Early Bird- Release Candidate v. 0.9 - **p. 30**
7th GBIF Science Symposium, Denmark - **p. 22**

November

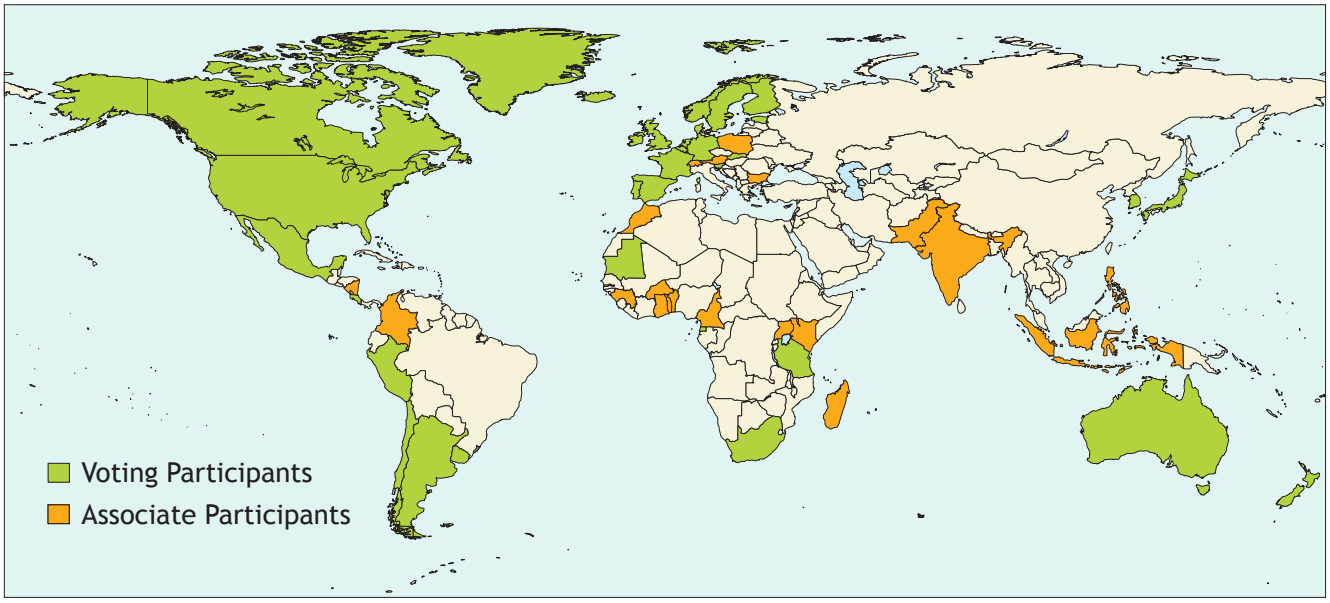
Asian Regional Meeting, Thailand - **p. 10**
Launch of DanBIF Data Hosting Centre, Denmark - **p. 39**
Indian Ocean Training Workshop, Madagascar - **p. 11**
TDWG Meeting, France - **p. 35**

December

Chile joins GBIF - **p. 9**
NPT Workshop, Canada - **p. 13**
UNFCCC CoP15, Denmark - **p. 17**

Membership

GBIF Participants



GBIF Membership, as on 31 December 2009

* New GBIF Participants 2009

Voting Participants

Argentina	September 2007
Australia	February 2001
Belgium	February 2001
Canada	March 2001
Chile*	December 2009
Costa Rica	May 2001
Denmark	January 2001
Equatorial Guinea	March 2005
Estonia	September 2003
Finland	April 2001
France	March 2001
Germany	February 2001
Iceland	June 2001
Ireland	January 2008
Japan	February 2001
Korea, Republic of	May 2001
Mauritania*	August 2009
Mexico	March 2001
Netherlands	February 2001
New Zealand	February 2001
Norway	March 2004
Peru	September 2002
Portugal	June 2001
Slovakia	August 2001
Slovenia	February 2001
South Africa	May 2003
Spain	February 2001
Sweden	February 2001
Tanzania	September 2002
United Kingdom	August 2001
United States	January 2001
Uruguay*	February 2009
Colombia	September 2003
Cuba	August 2008
Ghana	March 2001
Guinea	March 2005
India	August 2003
Indonesia	November 2004
Kenya	July 2008
Luxembourg	May 2008
Madagascar	January 2003
Morocco	June 2003
Nicaragua	June 2001
Pakistan	August 2001
Philippines	March 2005
Poland	March 2001
Switzerland	February 2001
Togo*	October 2009
Uganda*	October 2009

Associate Participants

Austria	September 2001
Benin	December 2004
Bulgaria	August 2001
Burkina Faso	January 2007
Cameroon	March 2005

Other Associate Participants

ASEAN Centre for Biodiversity (ACB)*	August 2009
BioNet-AndinoNet	October 2007
BioNET-ASEANET	October 2002
BioNet-EASIANET	October 2002
BioNET-INTERNATIONAL	May 2001
BioNet-SAFRINET	July 2003
Bioversity International	January 2007
Botanic Gardens Conservation International (BGCI)	August 2004
CABI Bioscience	September 2001
Consortium for the Barcode of Life (CBOL)	March 2005
Consortium of European Taxonomic Facilities (CETAF)	June 2007
Chinese Taipei	March 2001
Ciencia y Tecnología para el Desarrollo (CYTED)	May 2006
Discover Life	February 2008
DIVERSITAS	May 2007
Encyclopaedia of Life (EOL)	January 2008
ETI Bioinformatics	March 2001
Endangered Wildlife Trust (EWT)	August 2008
Finding Species	December 2003
FreshwaterLife	October 2003
Inter American Biodiversity Information Network (IABIN)	May 2001
International Centre for Integrated Mountain Development (ICIMOD)*	September 2009
International Centre for Insect Physiology and Ecology (ICIPE)	March 2004
International Commission on Zoological Nomenclature (ICZN)	June 2005
International Long-term Ecological Research (ILTER)	August 2008
International Species Information System (ISIS)	June 2006
Integrated Taxonomic Information system (ITIS)	March 2001
Major Systematic Entomology Facilities (MSEF)	March 2006
NatureServe	May 2001
Nordic Genetic Resource Centre (NORDGEN)	March 2004
Natural Science Collections Alliance (NSCA)	December 2004
Ocean Biogeographic Information System (OBIS)	June 2001
Pacific Biodiversity Information Forum (PBIF)	September 2004
Scientific Committee for Antarctic Research (SCAR)	February 2008
Secrétariat Intérimaire du Volet Environnement du NEPAD (SINEPAD)*	August 2009
Society for the Management of Electronic Biodiversity Data (SMEBD)*	March 2009
Species 2000	March 2001
Society for the Preservation of Natural History Collections (SPNHC)	January 2007
Taxonomic Databases Working Group (TDWG)	March 2002
United National Environment Programme (UNEP-WCMC)	May 2001
World Data Centre for Biodiversity and Ecology (WDCBE)	April 2005
World Federation of Culture Collections (WFCC)	October 2002
Wildscreen	January 2003

Engagement

Increasing Participation

The past year was one of growth and consolidation. GBIF welcomed three new Voting Participants during 2009 - Uruguay (12 February 2009), Mauritania (13 August 2009) and Chile (24 December 2009). Uganda (5 October 2009) and Togo (24 October 2009) joined as Associate Participant countries and other new Associate Participants included the Society for the Management of Electronic Biodiversity Data - SMEBD (6 March 2009), Secrétariat Intérimaire du Volet Environnement du NEPAD - SINEPAD (13 August 2009), ASEAN Centre for Biodiversity - ACB (28 August 2009) and International Centre for Integrated Mountain Development - ICIMOD (21 September 2009).

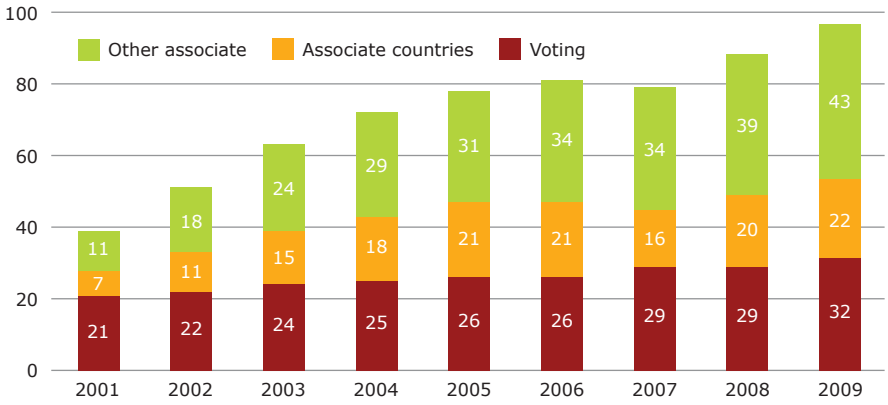


Fig. 1 GBIF Participants 2009

By the end of 2009, GBIF comprised 97 members, including 54 countries (Fig. 1). Of these, 32 were Voting Participants, 22 were Associate Participants and 43 were Other Associate Participants (international organisations and economies).[1] The strength of GBIF lies in its collective network of Participants. Growth in participation is central to achieving the aims of the organisation. GBIF will, however, only reach its full potential when this growing network of Participants functions effectively and as a whole. Regionalisation and decentralisation plays an important role in this regard - facilitating full engagement by Participants in the organisation in order for all to derive optimal benefit.

Implementing Regionalisation and Decentralisation

In 2009, the shift towards regionalisation and decentralisation, driven by the Nodes Committee, began to reap visible rewards. On a global scale, Node Managers showed improved levels of participation and engagement in GBIF-related activities. The capacity building activities carried out in 2009 resulted in the establishment of new National Biodiversity Information Facilities (BIFs) initiated by GBIF Participants. Participants benefited from a consolidation of the infrastructure, participation mechanisms and data publication activities.

Nodes and Biodiversity Information Facilities (BIFs)

Within the GBIF community, a Participant BIF refers to a network of data holders, users and other stakeholders established by a GBIF Participant to promote, facilitate, and coordinate the biodiversity data sharing activities within its domain. A Participant BIF typically includes a coordinating team, a governance structure, an informatics infrastructure, an institutional infrastructure and a framework for collaboration.

The coordinating team of a Participant BIF is called the Participant Node. A Participant Node is responsible for deploying informatics infrastructure, capacity building, promoting policies on open access to biodiversity data, supporting data holders in the process of mobilising and publishing data and coordinating the development of information products and services for target audiences. The head of a Participant Node team, known as the Node Manager, is the main technical contact point for the Participant, the Secretariat, and other GBIF Participants.

Supporting Participants

Several collaborative activities (training events and mentoring) took place between Participant Nodes within the framework of the Sud Expert Plantes - GBIF Capacity Enhancement Programme for Developing Countries (SEP-CEPDEC) collaborative project, with the support of GBIF-France.

The success of many of the activities which were initiated during 2009 may only become clear in later

years, especially with regard to the consolidation of the Nodes community as an active, collaborative network of functional BIFs worldwide.

'... this is just a thin layer of the activity of the GBIF Participant Nodes and associated national and organisational networks … It is that activity - carried out by hundreds of people around the globe - that makes GBIF a megascience endeavour'.
Dr Francisco Pando, Chair Nodes Committee

North American Regional Meeting, USA

Asian Regional Meeting and Training Workshop, Thailand

10th Nodes Committee Meeting - Copenhagen

The 10th Nodes Committee Meeting held in Copenhagen, Denmark during 2009 was the largest meeting of its kind held to date. More than 70 Node Managers and technical staff from 49 GBIF Participants engaged in the three-day programme, as part of the 16th Meeting of the GBIF Governing Board (GB16).

The programme included break-out sessions for participants from different regions, presentations by participants, a multilingual training session on the Integrated Publishing Toolkit (IPT), as well as plenary sessions discussing key activities for 2010.

Conducting Regional Activities

Regional meetings are considered to be crucial for effective planning, facilitating regional coordination and in identifying priority areas for implementation. The Nodes Committee's regional activities (initiated in 2008) were continued during 2009 with two regional meetings, one held in North America and one in Asia.

North American Regional Meeting

The North American Regional Meeting was held in Washington DC, USA, from 22 to 24 April 2009. Hosted by the United States Geological Survey - National Biological Information Infrastructure (USGS-NBII), the meeting brought together around 50 representatives from the US and Canadian Nodes, as well as participants from Associate international organisations based in the region, including DiscoverLife, the Encyclopedia of Life (EoL), the Consortium for the Barcode of Life (CBOL), the Integrated Taxonomic Information System (ITIS), the Inter-American Biodiversity Information Network (IABIN), the Natural Science Collection Alliance (NSCA), NatureServe, the Ocean Biogeographic Information System (OBIS), the Society for the Preservation of Natural History Collections (SPNHC), and the Taxonomic Databases Working Group (TDWG). A training session on the Integrated Publishing Toolkit (IPT) was also scheduled during the meeting.

Asian Regional Meeting and Training Workshop

The Asian Regional Meeting and Training Workshop was successfully convened by ACB and held in Bangkok, Thailand, from 16 to 19 November 2009. The event had 43 representatives in attendance, including from ten current GBIF Participants, six ASEAN Member States and several regional partners. The meeting also provided an opportunity to discuss the consolidation of Participant BIFs in the region, and the promotion of GBIF amongst prospective Participant countries. An interim Asian Regional Nodes Committee was established during this meeting with the aim of preparing a regional agenda and action plan on GBIF-related activities.

Supporting Nodes

CEPDEC

During 2009, the GBIF Secretariat assisted various Participants in the establishment of BIFs. Capacity building activities included projects under the framework of the Capacity Enhancement Programme for Developing Countries (CEPDEC), mentoring projects, and support from the GBIF Secretariat to national level meetings and workshops.

West Africa Regional Training Workshop, Senegal

Indian Ocean Regional Training Workshop, Madagascar

SEP-CEPDEC

With support provided by GBIF France and within the context of CEPDEC, the collaboration with Sud Expert Plantes (SEP-CEPDEC) provided the framework for much activity in Africa and Asia during 2009. Four regional training events were held in Antananarivo, Madagascar; Bangkok, Thailand; Dakar, Senegal; and Yaoundé, Cameroon. 102 participants from 19 countries engaged in the training activities. An additional five national level meetings in Benin, Burkina Faso, Cameroon, Guinea, and Madagascar were also convened to launch the national biodiversity information networks.

The participation of the SEP member countries at the regional training workshops has proven a successful outreach mechanism - both raising the visibility of the GBIF Participant Nodes in the region, as well as encouraging new countries to join the GBIF network.

The use of the SEP-CEPDEC model by the GBIF Secretariat should therefore be encouraged when other projects and initiatives are considered in developing countries. SEP-CEPDEC has been able to achieve considerable outcomes through the support provided by GBIF-France and other successful partnerships that involve local organisations and various GBIF Participant Nodes.

Largely as a result of the work done by SEP-CEPDEC, strong regional networks are emerging that are crucial for enabling the necessary technology transfer, flow of expertise, and best practices that are required to successfully establish BIFs in these regions.

Regional Workshop on Digitisation of Biodiversity Information, Tanzania

During 2009, CEPDEC activities were carried out as part of a pilot project in Tanzania. To date, the project has achieved results in several areas, and has helped to consolidate the Tanzania Biodiversity Information Facility (TanBIF). The University of Dar es Salaam (Botany Department) and the National Herbarium of Tanzania initiated the digitisation of their collections using a grant scheme provided by the CEPDEC Project. A Regional Workshop on Digitisation of Biodiversity Information was also organised by TanBIF as part of the pilot project from 13 to 17 July at the Centre for Virtual Learning, University of Dar es Salaam, Tanzania. Two experts from the Royal Museum for Central Africa

in Belgium together with local experts from the Tanzanian Commission for Science and Technology (COSTECH), provided a 5-day training programme with 29 people from 7 countries (the Democratic Republic of Congo-DRC, Ethiopia, Kenya, Madagascar, South Africa, Tanzania and Uganda.)

GBIF Mentoring Programme

Under the GBIF Mentoring Programme, two new collaborative projects in Mauritania and Cuba were initiated during 2009.

Mauritania joined GBIF as a Voting Participant in August 2009. Following the Nodes Committee Meeting in October, a proposal was submitted for a mentoring project in collaboration with the Belgian Node (BeBIF). This project was based on best practice developed through previous mentoring projects. BeBIF is supporting Mauritania in the establishment of its national BIF through training visits conducted between the Nodes and by convening a Data Publishers' Workshop in Mauritania.

Central Africa Regional Training Workshop, Cameroon

Launch of GhanaBIF, Ghana

Cuba responded to an invitation to submit proposals for mentoring in 2009 with a proposal on enhancing the collaboration on capacity building with Colombia, Costa Rica and Spain. This large mentoring project focuses on the sharing of expertise, best practice and technologies for the digitisation, documentation and publication of biodiversity data and metadata. It also contributes towards the consolidation of the Cuban Biodiversity Information Network. Project activities are planned to begin during the second quarter of 2010.

The GBIF Secretariat supported several GBIF Participants' national workshops to enable them to establish or consolidate national BIFs. These included the participation of Secretariat staff and/or GBIF representatives at events in Argentina, Burkina Faso, Cameroon, Ghana, Guinea, Kenya, Madagascar, Tanzania and Uruguay. In addition to training activities, the event in Ghana also included the formal launch of a national facility (GhanaBIF) in Accra.

In 2009 GBIF published three new concept papers based on the collective experience of the Nodes Community. These provide new GBIF Participants with detailed guidance on the establishment of a Participant Node. The concept papers cover a wide range of topics, including the role

of Participant Nodes at the national level, the key factors to consider when deciding on the location of a Participant Node and issues regarding structure and staffing requirements. These documents are continually updated to include feedback from the Nodes Community and are available on the GBIF website.[2]

The Nodes Portal Toolkit (NPT)

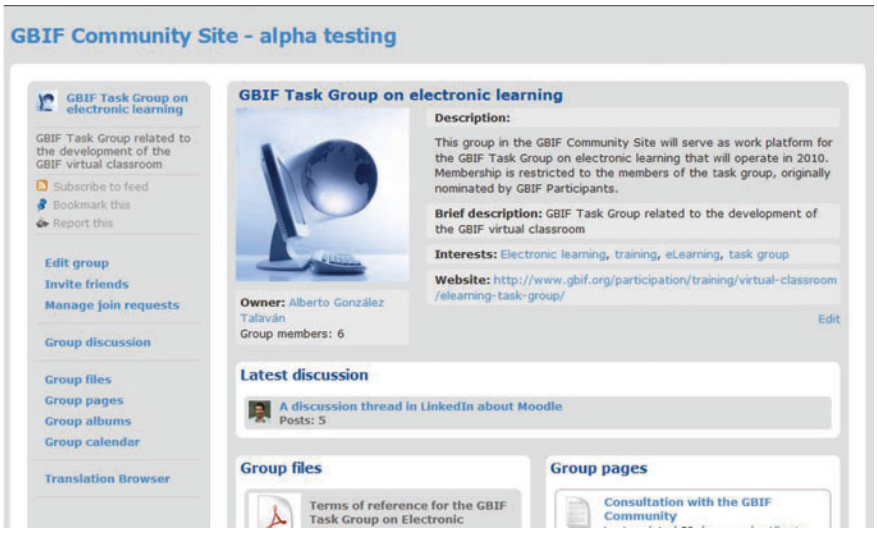
The planning and formal discussion on the development of the GBIF Nodes Portal Toolkit (NPT) was an important achievement for Participant Nodes during 2009. The NPT is intended to be a modular, flexible and expandable application that will facilitate the deployment and customisation of biodiversity Data Portal by GBIF Participants at the national, regional or thematic level. Nodes will be actively engaged in all the phases of development of the NPT. This will largely be based on collaborative projects and expert contributions from the Nodes community.

NPT Workshop, Canada

The process was initiated with a survey on Participants' needs, priorities and suggestions on how to develop the NPT. The results from this survey were presented and discussed at the 10th Nodes Committee Meeting in Copenhagen in October 2009. The meeting agreed to establish a technical working group, consisting of regional and thematic representatives from the Nodes Committee. The working group convened a technical workshop hosted by GBIF Canada and the Canadian University Biodiversity Consortium (Canadensys) in Montreal, Canada, in December that produced technical recommendations on the development of the NPT. This process is a good example of Participant engagement in the development of the GBIF Informatics infrastructure.

The GBIF Community Site

In order to improve interaction within the GBIF network, it was agreed that an appropriate and responsive online collaboration tool must be established. This tool should facilitate online discussions, announcements and provide a space for sharing of experiences in a welcoming and integrated environment. The GBIF Community Site (a social networking site) has been designed to support such interactions amongst the members of the GBIF community. The GBIF Secretariat presented an initial version to GBIF Participant Nodes at the 10th Nodes Committee Meeting. The website will be launched during 2010.[3]



GBIF Community Site - alpha testing

GBIF Participant Report 2009

The GBIF Governing Board decided that the Work Programme for 2009-2010, as a joint venture between the Secretariat and the Participants, would require activities, progress made and responses given to the required implementation of the Work Programme to be recorded in an Annual Report. In order to facilitate this reporting, the Secretariat developed an online Participant Reporting System (PRS) during 2009. The majority of Participants used the PRS to report on their activities in 2009 and a first presentation of the PRS was made available for discussion at GB16 in October (Fig. 2, 3).

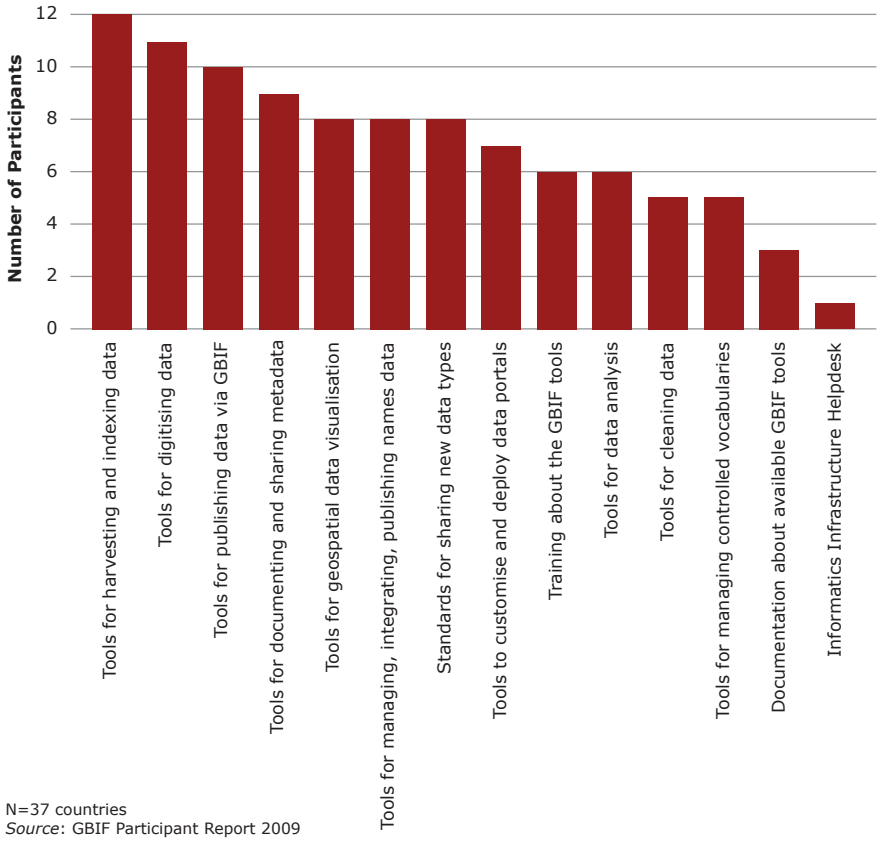
A New Approach to Training

The past year heralded a new approach to training (the GBIF Virtual Classroom) that aimed to strengthen GBIF's role in regional cooperation and empowerment. Collaboration and the mutual benefits that arise are key elements of this approach with training experts and language networks providing the means to make this possible. The first steps towards digital training have been taken and both online and offline digital material are now more freely available.

The focus during 2009, the first year of implementation of the GBIF Work Programme 2009-2010, was to build upon existing training and capacity building activities (Fig. 4). The network was able to draw on previous experiences and gained easy access to relevant materials and information.

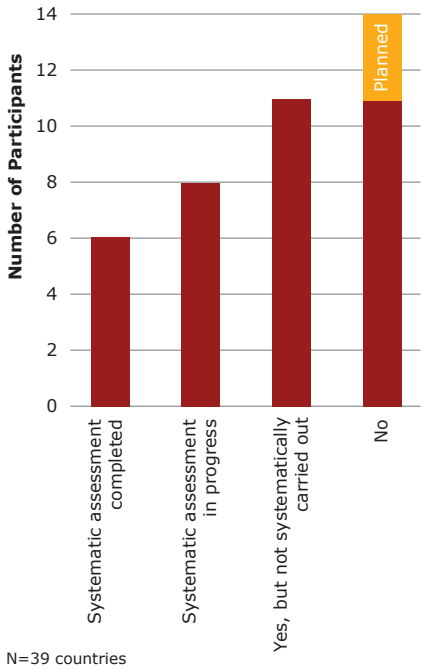
The first edition of the Online Resource Centre for Training was launched together with the new GBIF website in September 2009 and includes the following information:

- a brief description of annual training plans and strategies, organised thematically, presented in the GBIF Training Plans section and a list of planned products and events with planned release dates;[4]
- details of GBIF-related training events (since 2003) - the GBIF Training Events Database. This section also serves as a source of information for future events and upcoming opportunities and includes



N=37 countries
Source: GBIF Participant Report 2009

Fig. 2 Informatics priorities identified by Participant Nodes



N=39 countries
Source: GBIF Participant Report 2009

Fig. 3 Participant Nodes' assessment of user community biodiversity data needs

descriptions of events, contact information, targeted public resources and information about event organisers and participants;[5] and

- an easy-to-use graphic interface for browsing training resources such as manuals, booklets and CDs under the GBIF Training Resources section.[6]

The first Training Experts Network was officially launched in September 2009 as one of the outcomes of the IPT Helpdesk Experts Workshop on the GBIF Integrated Publishing Toolkit (IPT) (see page 25). The workshop participants now comprise the GBIF IPT Helpdesk and Training Experts Group. This group has started work on promoting and using the primary tool to publish biodiversity data to the GBIF Network, the IPT.

IPT Helpdesk Workshop, Copenhagen

Moving towards Internationalisation

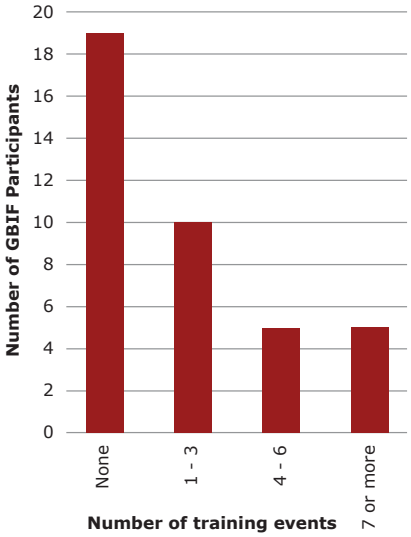
In 2009 GBIF made progress in achieving its internationalisation target by moving beyond English as a training language, through:

- the provision of a complete range of training materials in French (including events and digital material) linked to the SEP-CEPDEC project;
- organising a number of parallel sessions in English, French and Spanish during the training sessions at the Nodes Committee Meeting held in October 2009; and
- the production of a French version of the 1st GBIF Training Manual (to be released in June 2010) through collaboration of GBIF France and the Royal Museum of Central Africa (Belgium).

In 2010, these activities will be further expanded with the establishment of the Language Resources Networks, as reflected in the GBIF Work Programme 2009-2010 (for a full list of digital training materials produced in 2009, please see page 57).

IPT Helpdesk Experts Workshop

A Helpdesk Experts Workshop on the GBIF Integrated Publishing Toolkit (IPT) was held in Copenhagen from 14 to 16 September 2009. The main objective of this workshop was to provide a group of technically skilled people with extensive knowledge of the recently released GBIF IPT and to directly involve them in the development and use of the tool. At the end of the workshop they were expected to be able to act as regional technical advisors on the IPT for the benefit of their communities and regions. The event was held in English and with the support of Spanish and French speakers.



N=39 countries
Source: GBIF Participant Report 2009

The 20 countries that organised training events between October 2008 and September 2009 trained 1259 people during this period.

Fig. 4 Training events organised by GBIF member countries from Oct 08 to Sept 09

The workshop was attended by 23 people from 21 countries and organisations, including Argentina,

Belgium, Benin, Canada, Chinese Taipei, Colombia, Costa Rica, Cuba, Denmark, Endangered Wildlife Trust (EWT), France, Germany, Inter American Biodiversity Information Network (IABIN), Japan, Republic of Korea, Madagascar, Nordic Genetic Resources Centre (NORDGEN), Spain, Sweden, Taxonomic Database Working Group (TDWG) and the United States.[7]

- biodiversity data digitisation and publication;
- biodiversity data standards and protocols; and
- ecological niche modelling techniques.

The courses were attended by 70 people from 9 countries (Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Madagascar, South Africa, Tanzania, Uganda and Zimbabwe). Participants already are actively engaged in further activities in their countries, disseminating their knowledge and leading to a multiplier effect.

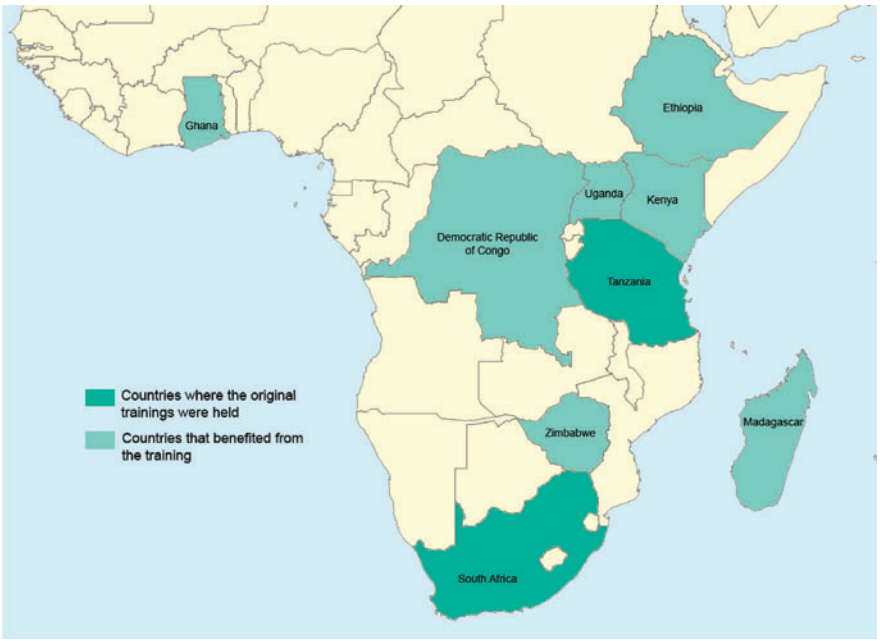


Fig. 5 Training events southern Africa 2009

A Regional Approach to Training: Southern Africa

During 2009, three GBIF Participant Nodes in southern Africa - South Africa, Tanzania and the Endangered Wildlife Trust (EWT) - successfully organised Regional Training Events, leveraging benefits far beyond their boundaries (Fig. 5). Such capacity building exercises are mutually beneficial, and in the case of southern Africa, exemplary within the GBIF network. Topics covered in these activities were:

Outreach

Outreach forms an integral part of the GBIF growth strategy and supports the positioning of the organisation within a broader context. Both the Secretariat and members of the GBIF standing committees have represented GBIF in various international meetings during the process of 2009.

Engaging with the International Community

Accreditations

During 2009, GBIF obtained accreditation to the United Nations Framework Convention on Climate Change (UNFCCC) as an intergovernmental observer organisation. GBIF also became an officially accredited inter-governmental organisation (IGO) to the Intergovernmental Panel on Climate Change (IPCC), and the Major Groups and Stakeholders of the Governing Council of the United Nations Environment Programme (UNEP). This newly acquired status allows GBIF to be officially represented at, and have input during UNFCCC, IPCC and UNEP Governing Council/ Global Ministerial Environment Forum meetings.

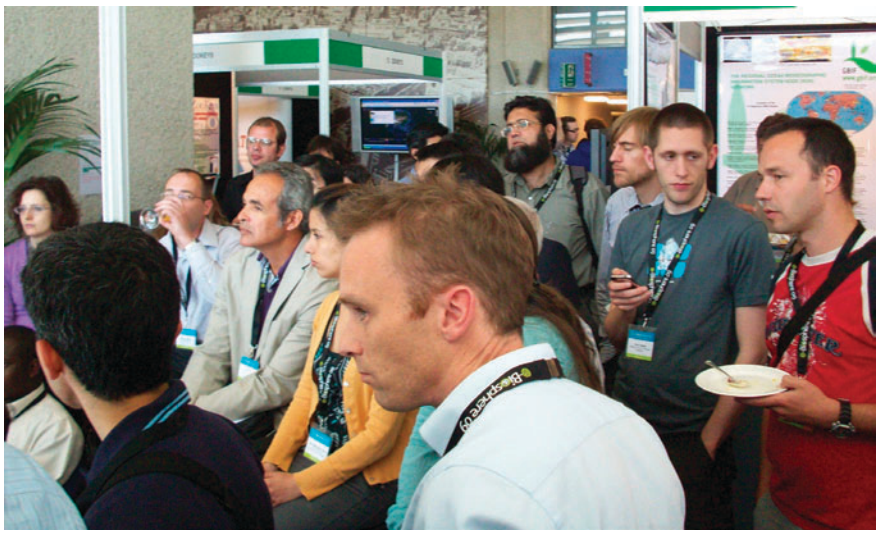
IARU Conference 2009

In March, the GBIF Secretariat and other partners participated in the International Alliance of Research Universities (IARU) Conference on Climate Change: Global Risks, Challenges and Decisions held in Copenhagen.[8] Four papers and posters were presented on work conducted by the GBIF network relevant to climate change. These included the themes (i) Adapting Coastal Zone and Marine Resources (Using GBIF to forecast climate change impacts on marine resources), (ii) Enabling Long-Term Climate Policy (Lessons from GBIF - global infrastructure, data and tools to inform climate and biodiversity policy), (iii) Adapting Future Agricultural Production to

Climate (GBIF: mobilising information for adapting agriculture to climate change), and (iv) Biodiversity: Enhancement of Resilience or Facilitating Transformation? (GBIF: Providing means for evaluating the impact of climate change on crop wild relatives). All posters may be obtained from the GBIF website.[9]

e-Biosphere Conference 2009

One of the most important biodiversity informatics events of the year was the e-Biosphere Conference that was held in London in June 2009. More than 500 delegates from the biodiversity informatics community, representing 63 countries, met to discuss common challenges and a way forward.



e-Biosphere Conference, UK

GBIF Intervention, UNFCCC CoP15, Denmark

As a co-organiser of the event, GBIF participated in the programme by making several key presentations and by organising and hosting a large exhibition area that displayed the latest developments and work in progress within GBIF, as well as enabling the showcasing of activities conducted by several GBIF country and organisation members.

The Conference provided a great opportunity for Participant Nodes to share their experiences with the international community. Participant Nodes were invited to set up a demonstration as part of the GBIF exhibition stand to showcase their work and highlight their achievements. Belgium, Cuba, Ghana, South Africa, Spain, United Kingdom, and the Netherlands, as well as OBIS, shared their experiences within this space using a variety of communication materials.

Importantly, Conference participants agreed to increase institutional collaboration in order to grow the contribution of global biodiversity informatics in solving major societal issues. A number of other recommendations and resolutions were also adopted - many of which already featured in the GBIF Work Programme 2009-2010.

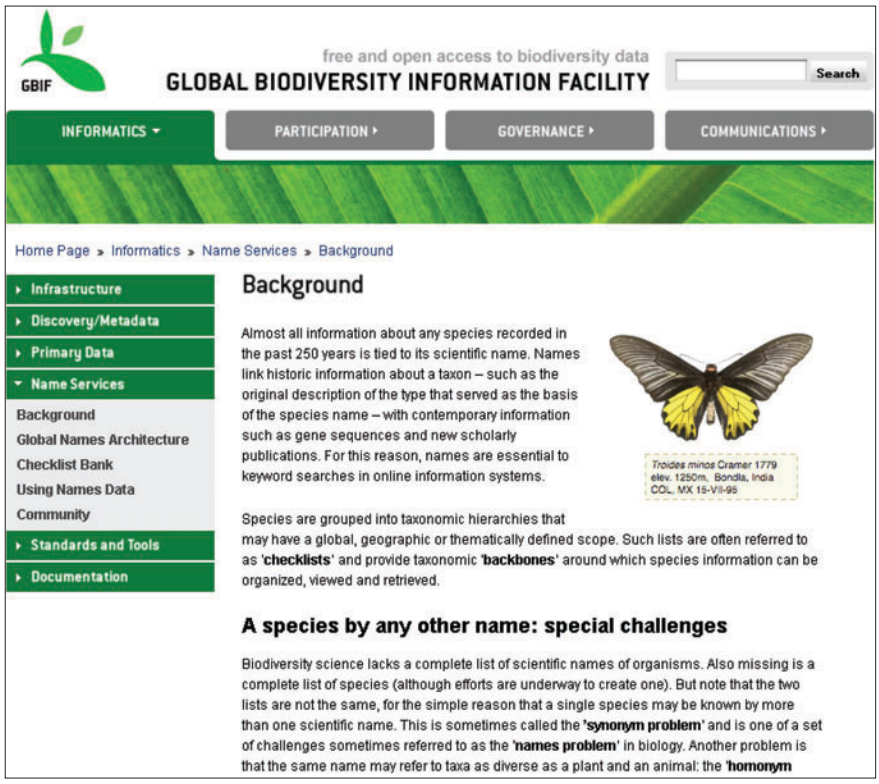
GBIF Participants' presence at the Conference was partly supported by a generous donation from the Sloan Foundation.

UNFCCC CoP15

The UNFCCC CoP15 negotiations held in Copenhagen, Denmark, during December 2009 presented GBIF with a unique opportunity to raise awareness of biodiversity and the important role that biodiversity informatics could

play in climate change mitigation and adaptation efforts. At this event GBIF, in collaboration with Bioversity International, hosted a high-level side event entitled 'Building the global biodiversity informatics commons for climate change adaptation'. The event focused on the importance of international sharing and exchange of biodiversity information for improved decision-making in climate change adaptation efforts and managing the impacts on agriculture and food security. This side event aimed to enhance GBIF's communication to a variety of new stakeholder groups, as mandated by the GBIF Governing Board. Other activities at the UNFCCC CoP15 included the implementation of a dedicated communications plan and associated outreach activities, such as various bilateral outreach meetings and an exhibition booth.[10]

GBIF Booth, UNFCCC CoP15, Denmark



New GBIF website design

Increased Collaboration

GBIF recognises the importance of collaborating with like-minded institutions, international conventions and other potential partners in order to implement activities outlined in the Work Programme and to deliver on our mandate. In this regard, formal agreements with key institutions have been concluded, many of which are likely to provide benefits to the organisation far beyond 2009 (for a full list of MoCs signed in 2009, please see page 59).

Campaigns

At the Governing Board Meeting held in October 2007, four campaigns proposed by Participants were approved. These included the Global Pollinator Species Campaign (GPSC), the World Register of Marine Species (WoRMS) Campaign, the Amazon Basin Biodiversity Information Facility (ABBIF) Campaign and the GBIF and the 2010 Biodiversity Target Campaign. (More details on these campaigns may be found in the GBIF Annual Report 2008).[11]

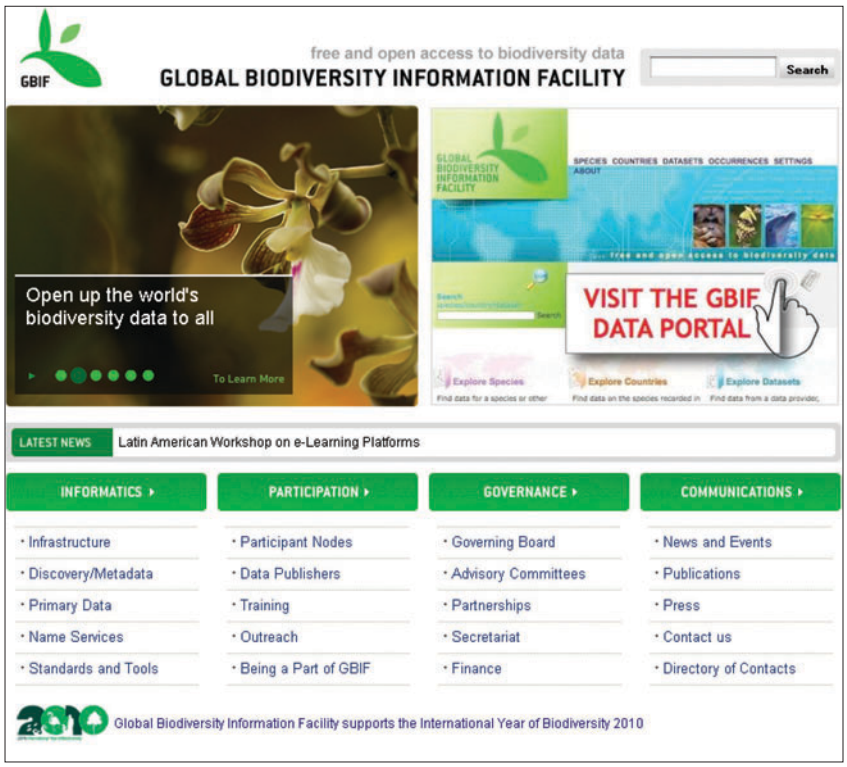
Upon decision of the Governing Board, no new campaigns were to be initiated during 2009 and 2010. This allows for an assessment to be made by the GBIF

Science Committee of the effectiveness of the existing campaigns. Criteria that will be used in this assessment include the ability of the campaign to:

- generate additional funding,
- mobilise additional data relevant to the GBIF mission, and
- mobilise new Participants in the GBIF network.

Launch of the new GBIF Website

The GBIF Secretariat launched the redesigned GBIF website on 3 September 2009. The new restructured website is more user-friendly, easier to navigate and makes finding and accessing relevant information easier. Improvements include a new home page that contains links to the GBIF Data Portal as well as to key articles, a news channel displaying the latest news and four main entry points to key areas, i.e. Informatics, Participation, Governance and Communications. The launch of the new website was met with a positive response from Participants. These responses also included suggestions on further improvements that will be considered and taken onboard in future.[12]



New GBIF website design

END NOTES

1. http://www.gbif.org/governance/governing-board/
2. http://www.gbif.org/participation/participant-nodes/resources/how-to-establish-a-participant-node/
3. http://Community.gbif.org
4. http://www.gbif.org/participation/training/plans/
5. http://www.gbif.org/participation/training/events/
6. http://www.gbif.org/participation/training/resources/
7. http://www.gbif.org/participation/training/events/training-event-details/?eventid=70
8. http://www.climatecongress.ku.dk
9. http://www.gbif.org/communications/publications/posters/
10. http://www.gbif.org/communications/news-and-events/showsingle/article/gbif-closing-statement-in-main-plenary-room-at-cop15/
11. http://www2.gbif.org/annual_report_2008.pdf
12. http://www.gbif.org

Governance

Annual Meeting of the GBIF Governing Board 2009

The 16th meeting of the GBIF Governing Board (GB16) took place at the University of Copenhagen, Denmark from 6 to 8 October 2009. One hundred and thirty eight delegates and observers from 36 countries and 18 international organisations attended.

Among the associated events that took place during this time were a 3-day meeting of the Nodes Committee, meetings of GBIF's Advisory Standing Committees and the Annual GBIF Science Symposium. The Symposium (which was open to the public) included a poster exhibition on GBIF and focussed on major issues relevant to member countries such as climate change and implications for biodiversity.

At the 15th Governing Board meeting in Arusha, Tanzania in 2008, the Governing Board agreed on a strategic road- map to move GBIF into its post-2011 phase, when the current agreement (2007-2011) expires. As part of the plan, two task teams were established by the Executive Committee in mid-2009. The first (Review Team) was established to carry out an independent review of GBIF performance and the second (Forward-looking Team) was charged with providing visionary inspiration for the future direction of GBIF after the current GBIF Memorandum of Understanding (MoU) expires.

During the meeting, the Board received a letter from the Rector of the University of Copenhagen assuring GBIF of the willingness of the University to continue the Secretariat Host Agreement (between GBIF and the University) after 2011; i.e. after expiry of the current agreement. Among its regular business decisions, the Board also approved the GBIF Financial Report 2008, the GBIF Budget Proposal for 2010 and the hosting of future Governing Board meetings (GB 17, 18 and 19 in the Republic of Korea, Argentina and Norway, respectively). The Board approved minor changes to the Terms of Reference for the Ebbe Nielsen Prize and agreed on the establishment of a GBIF Incentive Programme for Biodiversity Informatics Research that would be available to students at the Masters and PhD degree level.

Finally, the Board elected a number of new officers for the Board and for the standing committees. Dr Joanne Daly, Head of Delegation from Australia, was elected as Chair of the Governing Board. The Board thanked the outgoing Chair, Dr David Penman, for his four years as Chair of the Board.

GBIF Governing Board 16, Denmark

Rewarding Excellence: The 8th Ebbe Nielsen Prize 2009

The 8th GBIF Ebbe Nielsen Prize was awarded to Dr Andy Jarvis of the International Center for Tropical Agriculture (CIAT), Colombia, on 6 October 2009 in the Ceremonial Hall at the University of Copenhagen.

Dr Jarvis trained as a geographer at King's College London and is a Senior Scientist at CIAT and Bioversity International in Colombia. His expertise in environmental modelling, geographic information science and tropical ecology has made him an acknowledged leader in international projects in agro-biodiversity. Dr Jarvis focuses on environmental modelling to improve the conservation and use of species related to agriculture and food security, and in particular to predict the impacts of climate change.

Ebbe Nielsen Prize Winner Dr Andy Jarvis and Dr Katherine Richardson, Vice Dean of the University of Copenhagen

Dr Andy Jarvis and Dr David Penman, Chair of the Governing Board

Driving Science: The 7th Annual GBIF Science Symposium 2009

In 2009, the 7th Annual GBIF Science Symposium addressed the topic of: 'Marine Biodiversity and Climate Change - Integrating Marine Biodiversity Datasets for Improved Understanding of Climate Change Effects on Marine Biodiversity'.[1] Climate change can seriously impact marine ecosystems and biodiversity via changing ocean acidity, precipitation, sea level, high water events, storminess, ocean circulation patterns, species composition and health of functionally-linked neighbouring ecosystems.

These changes can occur over a relatively short period of time. Therefore, increased international collaborative research is needed to discover the processes involved, to measure the effects and to predict the most likely future consequences for the ecosystems and society as a whole. An important prerequisite is access to relevant marine biodiversity data. Several participatory institutions and organisations within the GBIF network already publish marine biodiversity data via the GBIF infrastructure for use in forecasting and risk assessment studies.

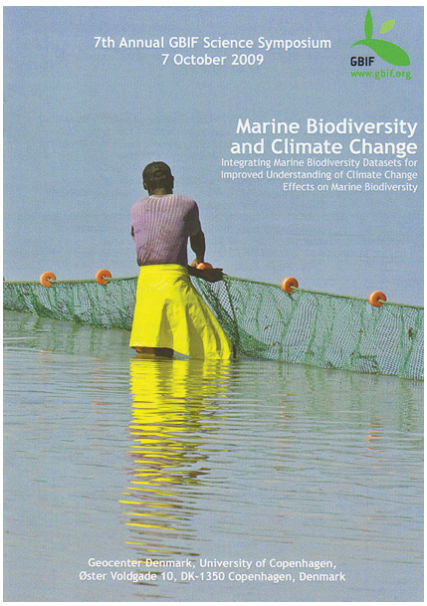
The Symposium was opened with a keynote speech by Dr Andy Jarvis, the 2009 Winner of the Ebbe Nielsen Prize, and was attended by 170 members of the Governing Board and the Danish

scientific community.

Other speakers included:

- Dr Katherine Richardson: 'Ocean Primary Production, Biodiversity and Climate Change';[2]
- Dr Keith Brander: 'Climate, Fisheries and Impacts on Biodiversity';[3]
- Dr Milani Chaloupka: 'Combining GBIF-mediated data, environmental niche modelling and expert knowledge to explore marine megafauna responses to climate change';[4]
- Dr Bo Riemann (replacing Dr Joan Kleypas): 'Environmental Quality and Biodiversity in the Baltic Sea';[5]
- Dr Edward Vanden Berghe: 'Ocean Biogeographic Information System, Census of Marine Life, and World Register of Marine Species Contributions to Understanding Climate Change Effects on Marine Biodiversity';[6] and
- Dr Damon Stanwell-Smith: 'Lessons Learned in Tracking the 2010 Biodiversity Target: Data Gaps Highlighted During the Global Indicator Development Process.'[7]

Science Symposium, Interview Session with Dr Nick King



7th GBIF Science Symposium Programme

GB16 Plenary Session, Denmark

End Notes

1. http://www.gbif.org/communications/news-and-events/gbif-symposia-and-workshops/
2. http://www2.gbif.org/ss7richardson.pdf
3. http://www2.gbif.org/ss7brander.pdf
4. http://www2.gbif.org/ss7chaloupka.pdf
5. http://www2.gbif.org/ss7riemann.pdf
6. http://www2.gbif.org/ss7vandenberghe.pdf
7. http://www2.gbif.org/ss7stanwellsmith.pdf

Informatics: Architecture & Standards

Improving Response Time

In 2009, the GBIF Secretariat upgraded the performances of IT services in order to improve response times and the performance of external portals and applications relying on GBIF architecture. For example, access to the GBIF index through web services represents between 40% and 50% of all traffic. Such access enables the execution of services for the discovery and retrieval of primary biodiversity data from the index on a GBIF infrastructure. In 2009, these services have been upgraded in order to be both faster and more reliable. Table 1 shows a comparison of key GBIF web services in terms of response time. In the case of data retrieval for a given scientific name the services have increased response time 26 fold.

Table 1 Improvement in Web Services response time

Web Services response time improvement		
Original Webservice		
Mode	# Requests	# Time spent (ms)
scientificname=*Passer domesticus* (KML)	100 sequential requests	1194.66 ms
scientificname=*Passer domesticus*	100 sequential requests	16500.32 ms
dataresourcekey=*300* (KML)	100 sequential requests	4287.79 ms
dataresourcekey=*300*	100 sequential requests	16868.18 ms
New Release		
Mode	# Requests	# Time spent (ms)
scientificname=*Passer domesticus* (KML)	100 sequential requests	154.06 ms (7.75 x quicker)
scientificname=*Passer domesticus*	100 sequential requests	632.41 ms (26.09 x quicker)
dataresourcekey=*300* (KML)	100 sequential requests	151.27 ms (28.3 x quicker)
dataresourcekey=*300*	100 sequential requests	640.32 ms (26.34 x quicker)

Supporting Participants in Data Publishing

GBIF Participants require a comprehensive publishing framework to facilitate efficient sharing of metadata, checklists and primary biodiversity data.

As planned in the GBIF Work Programme 2009-2010, the public release of the Integrated Publishing Toolkit (IPT) took place on 31 March 2009. The IPT is an open source software platform developed by the Secretariat to facilitate efficient biodiversity data publishing to the internet by all Participants in the GBIF network.

One of the main technical challenges to the GBIF-distributed IT architecture is to remove constraints to data publishing and flow (Fig. 6). The new IPT offers simple interfaces to transfer complete data stores efficiently in order to simplify the publishing process and reduce the delay between data publication and discovery through the GBIF indexes.

This Java-based tool accommodates three main data types: taxonomic primary occurrence data, taxonomic checklists and resource metadata. Through the IPT, users can publish data from local databases, upload existing files, and access central services to make use of standardised controlled vocabularies. Extensions such as common names, species descriptive data or multiple identifications can be defined and shared amongst the IPT-user community. The IPT also acts as an outreach tool, as it includes a web application that allows for browsing and searching of published data, along with basic mapping services (Fig. 7).

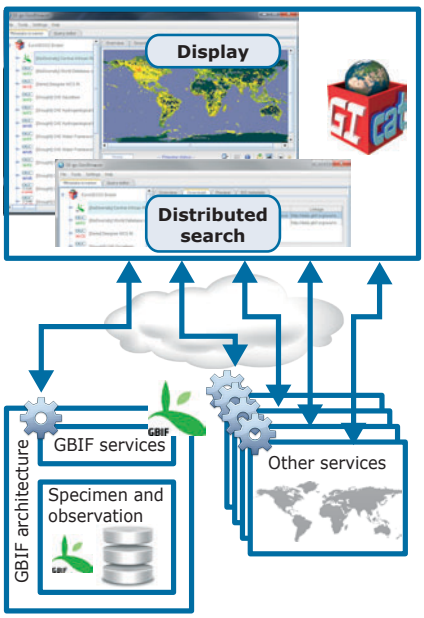


Fig. 6 GIcat distributed searches

The GBRDS Registry and Vocabulary Repository were also further developed in 2009 and work will continue through 2010. These improvements will strengthen the capacity of the community to better locate resources and will also map a range of community-supported vocabularies. Rapid access to newly published resources is also a critical issue that requires attention (see HIT page 30).

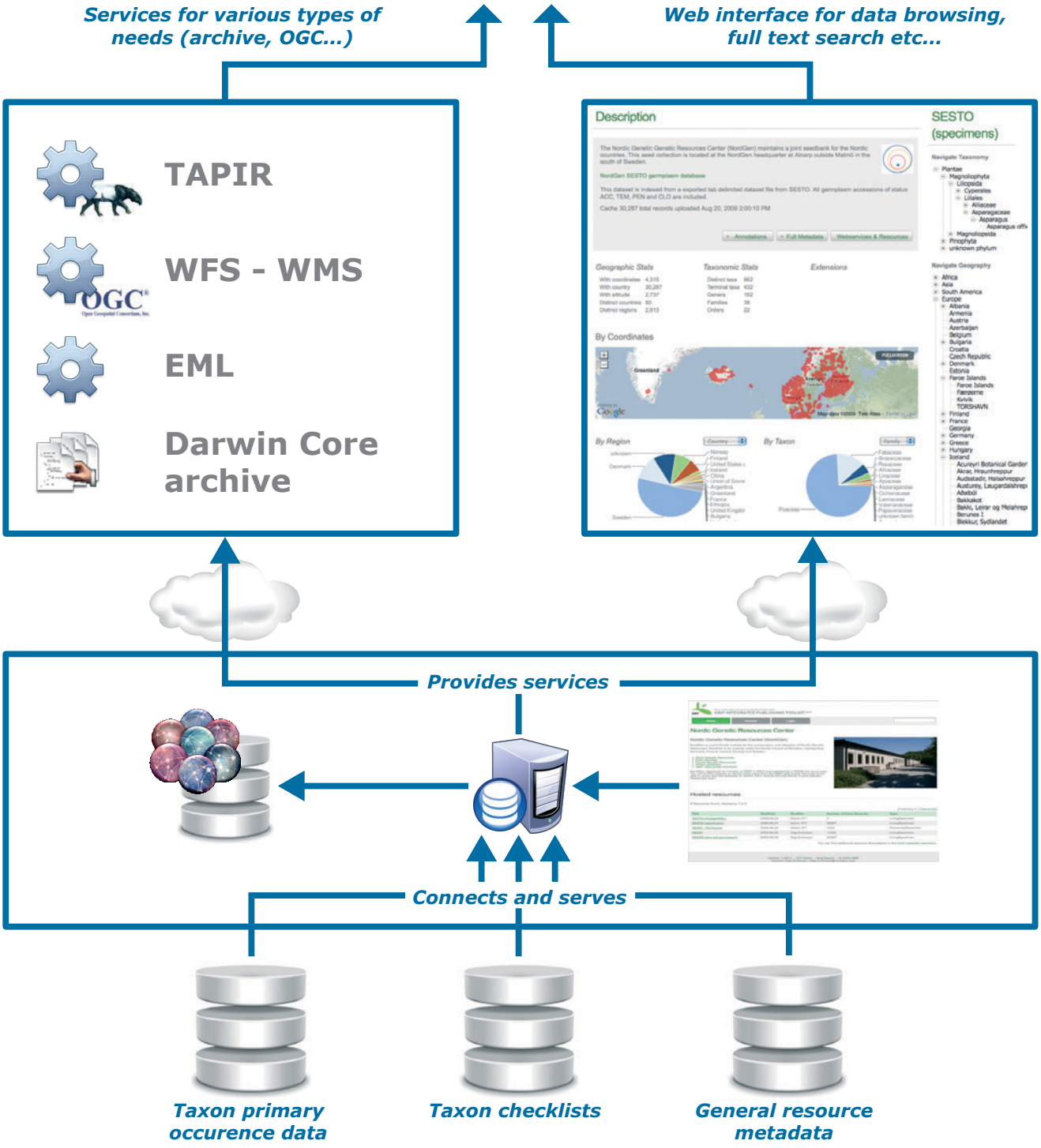
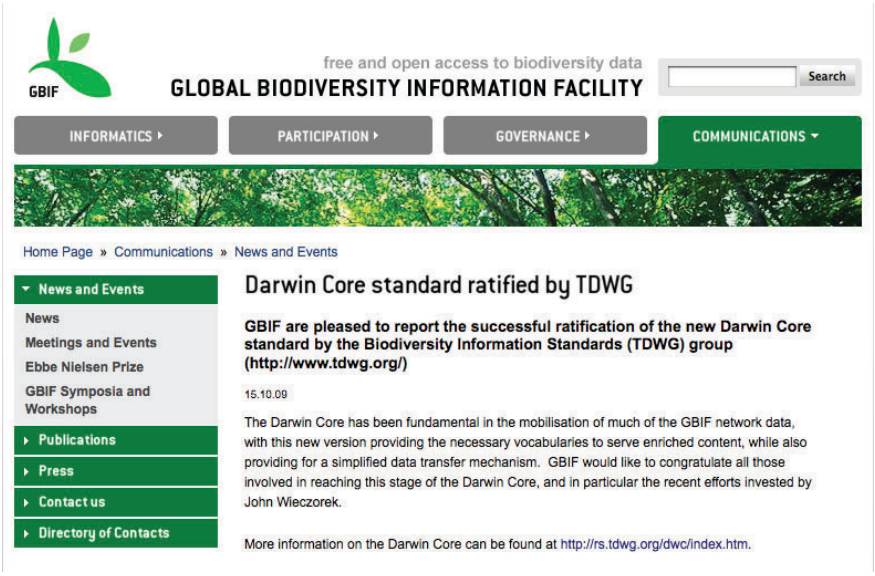


Fig. 7 IPT main specifications

Metadata Supporting Discovery

During 2009 developments in metadata focused on the planned construction of strong infrastructure to enable discovery of biodiversity resources across both the GBIF and other networks. The Metadata Implementation Framework Task Group delivered a report containing a rich set of recommendations on how GBIF can build a distributed metadata system (Fig. 8). These recommendations are now being used to inform development activities for GBIF into the future.[1]

Fig. 8 GBIF distributed metadata system



Ratification of the Darwin core standard

Partly based on the Task Group recommendations, Metacat was chosen as the metadata catalogue platform for the GBIF Data Portal.

GBIF Grants for Metadata Catalogues

In November 2009, GBIF launched a request for proposals from GBIF Participants that would enable them to connect their own metadata catalogues to the GBIF network. A total of nine awards were issued. The catalogues developed by the awardees will be amongst the first to be linked to the GBIF network and will also be accessible through the GBIF Data Portal. The portal aims to provide a virtual, unified catalogue of all metadata from participating organisations. It will also enable the GBIF network to connect to other global clearinghouses such as the Global Earth Observation System of Systems (GEOSS) GEO Portal.

2009 recipients of these small grants were:

- DanBIF, Denmark;
- The Endangered Wildlife Trust, South Africa;
- ETI BioInformatics / NLBIF, The Netherlands;
- The Finnish Museum of Natural History, Finland;
- Instituto de Investigaciones Ambientales del Pacifico, Colombia;
- The National Biodiversity Data Centre, Ireland;
- The Global Mountain Biodiversity Assessment, Austria;
- The Ocean Biogeographic Information System, USA; and
- Secrétariat Permanent du Conseil National pour l'Environnement et le Développement Durable, Burkina Faso.

Biodiversity Informatics Standards

2009 was a significant year for Biodiversity Informatics standards with both the Darwin Core (DwC) Information Exchange Standard

and the TDWG Access Protocol for Information Retrieval (TAPIR) being successfully ratified by Biodiversity Information Standards (TDWG). The Darwin Core has been crucial for the mobilisation of GBIF network data. This new version, which is incorporated in the GBIF IPT provides the necessary vocabularies to serve enriched content including taxonomic data, while also providing for a simplified data transfer mechanism. A workshop was hosted by GBIFS in January 2009 for a small group of technical experts. GBIF Informatics staff and the DwC TDWG Interest Group convenor, John Wieczorek, helped to put the final touches to the proposed standard before its submission to TDWG. TAPIR was designed to unify and extend the older BioCASe and DiGIR protocols that are widely used on the GBIF network. A version of TAPIR is packaged with the IPT.

Persistent Identifiers for Biodiversity Informatics

GBIF convened a Task Group to provide advice on persistent identifiers for biodiversity informatics (Fig. 9). The principal objective of the group was to provide recommendations and guidelines on deployment of Life Science Identifiers (LSIDs) and other Globally Unique Identifiers (GUIDs) on the GBIF network, with particular reference to the potential role of GBIF as a stable, long-term provider of GUID resolution services.

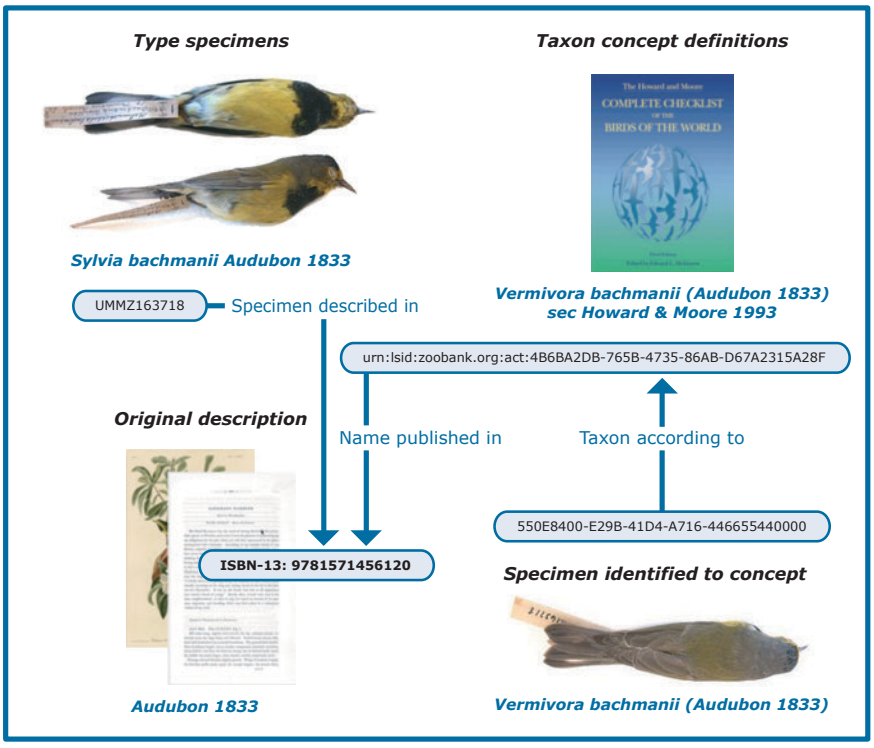


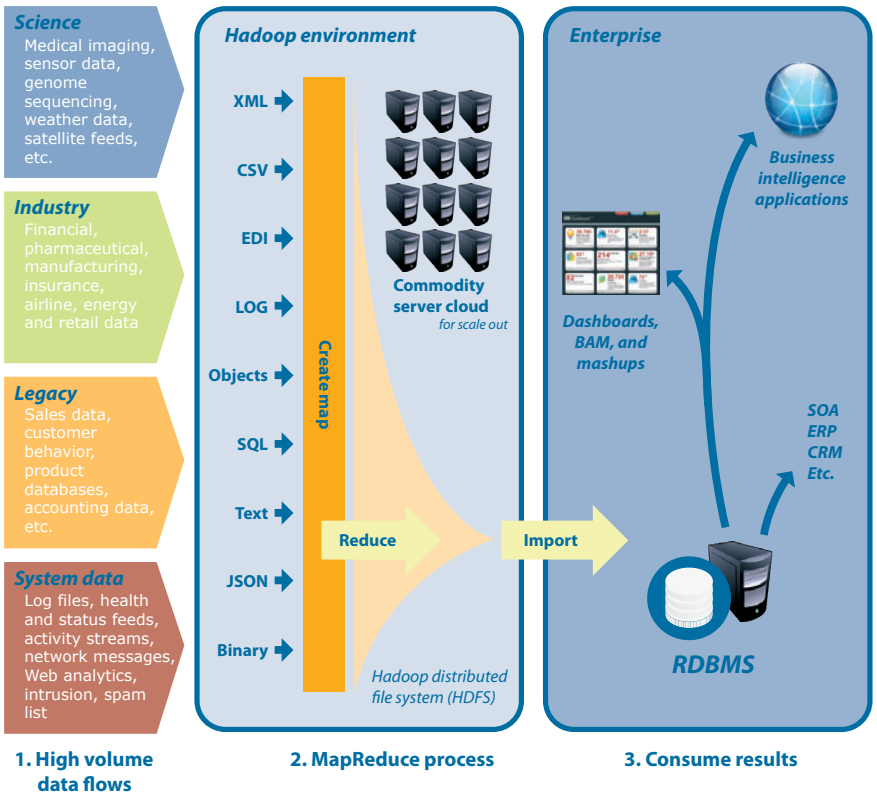
Fig. 9 Persistent identifiers can be used to identify taxon concepts, specimen and associated literatures in a unique manner

In their report, the Task Group emphasised that effective identification of data objects through use of persistent identifiers was essential for linking the world's biodiversity data, and that GBIF can support this through leadership, education, training and outreach, and through provision of practical services. The recommendations of the Task Group are helping GBIF to implement a strategy for global deployment of persistent identifiers.[2]

GEOSS

The Global Earth Observation System of Systems (GEOSS) has identified biodiversity as one of nine Societal Benefit Areas that would benefit from an integrated system for monitoring and forecasting environmental change on a global scale. In 2009 GBIF, in line with the recommendations of the Governing Board, has continued to take an active role in the biodiversity arm of GEOSS, the Group on Earth Observations Biodiversity Observation Network (GEO BON). In addition to serving on its steering committee, GBIF co-chairs the working group on Data Integration and Interoperability has been awarded a grant from GEO to develop a web-based GIS client for visualising information from disparate sources delivered through standards-based web services. As a partner in the EU 7th Framework Project, EuroGEOSS[3], which started in May, GBIF is contributing to the implementation of a distributed metadata catalogue system for biodiversity resources and providing standards-based web services for species occurrence data in support of the management and assessment of protected areas. In 2009, GBIF received € 46,000 to fund participation in this collaborative project.

GEO-BON website



Source: http://www.ebizq.net/blogs/enterprise

Fig. 10 Hadoop MapReduce technology can be used to consume a large data volume

Future Research: Unmanageable Data Volumes?

Companies such as Google, Yahoo and Amazon have infrastructure capable of rapidly indexing and mining huge volumes of data in a manner tolerant of hardware failure and accommodating continued growth of data and traffic. Until recently, the underlying technologies were not in the public domain, but emerging open source projects such as Hadoop (Fig. 10), HBase and Hypertable now allow for cost-effective research into the applicability of these technologies for the collection and scientific analysis of biodiversity data. GBIF, in collaboration with partner organisations, has initiated investigations into the use of emerging scalable technologies for rapid indexing, analysis, annotating and efficient serving of primary biodiversity data.

In 2009, the focus of research was on the Hadoop family of products, and more specifically in optimising the monthly processing required for the GBIF Data Portal index rollover. Following promising test evaluations, this research has moved onto the second phase of implementation and is moving progressively towards being incorporated into the monthly processing of occurrence data, taxonomic information and preparing data for various mapping solutions.

Informatics Architecture

2009 was also a critical year for the GBIF Informatics (Fig. 11), since a large hardware upgrade was completed with the addition of a new database, computing and hosting capacities.

A further upgrade of the GBIF architecture was achieved in 2009 with the release of the Early Bird Release Candidate 0.9 of the Harvesting and Indexing Toolkit (HIT). This tool provides user-friendly management for the indexing of multiple resources published through various protocols and standards.

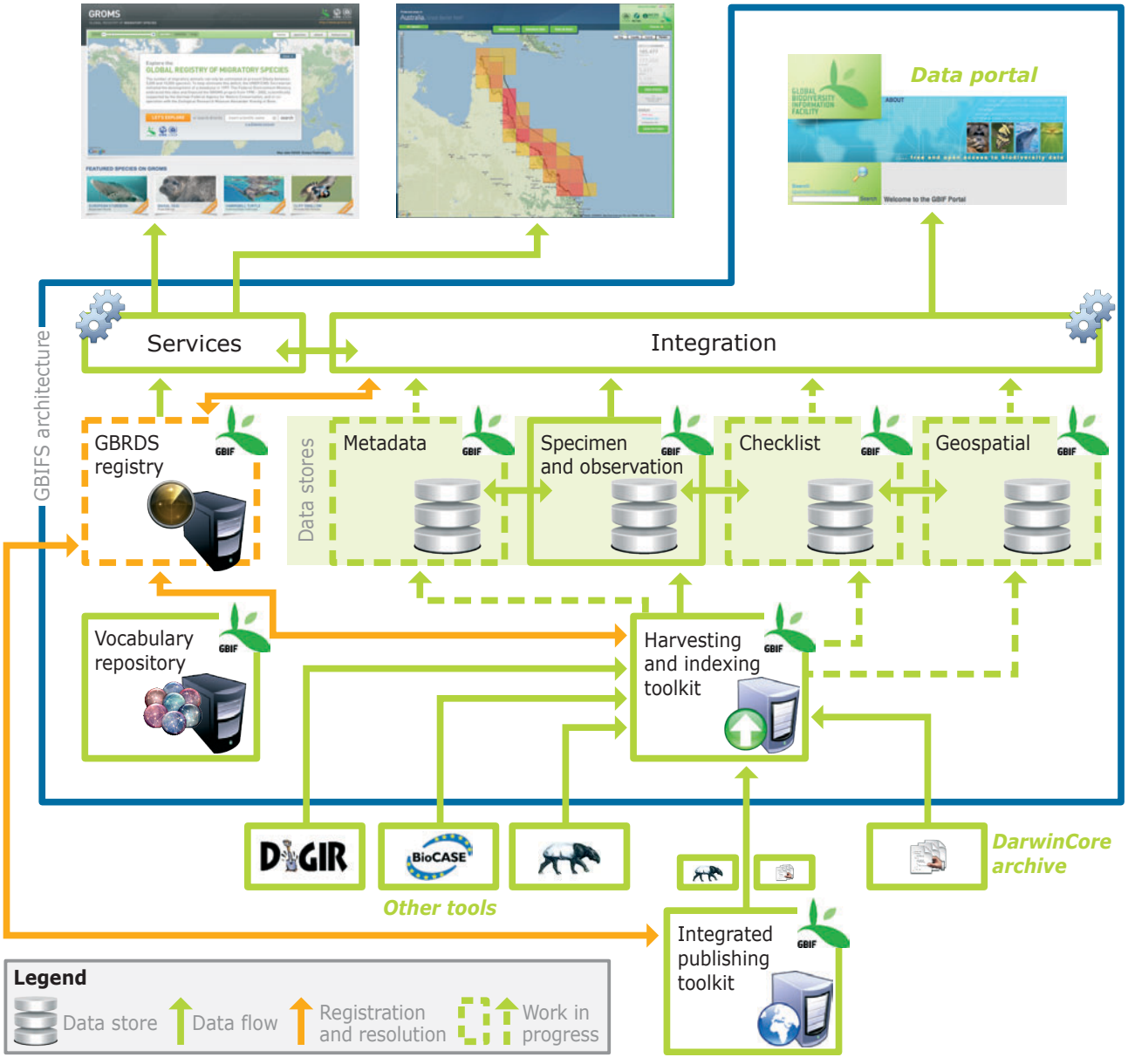
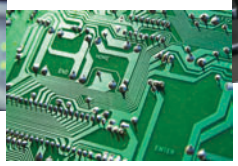


Fig. 11 Components and linkages GBIF Informatics Architecture 2009



GBIF
www.gbif.org
...free and open access to biodiversity data

GBIF Data Portal

Fig 1. Home Page of the GBIF Data Portal

Fig 2. Visitor statistics

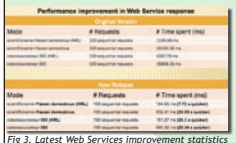


Fig 3. Latest Web Services improvement statistics

Overall Description
The GBIF Data Portal, launched in 2007, was a proof of the concept that a worldwide-distributed network of biodiversity data publishers could be linked together and made searchable from a single point of access. The GBIF Data Portal allows complex searches on any taxon, country or dataset, or on a combination of these parameters.

Overview
Since 2008, a series of critical improvements to the existing Portal were made in response to user needs. For example, searches by altitude, depth and images are now integrated within the existing search filter. Other improvements such as the availability of Open Geospatial Consortium (OGC) Mapping Services (web mapping service (WMS) and web feature service (WFS) have been incorporated into the GBIF Portal.

In 2009, the GBIF infrastructure is being upgraded so that two fully dedicated servers will be assigned as database backend to the Data Portal and Web services. One additional powerful server will handle the geospatial services to meet the exponential demand from the user community. Finally, with the release of the Harvesting and Indexing Toolkit (HIT) a more robust infrastructure is now in place to enable fast and easy indexing of data publishers in a more frequent and distributed manner.

The Data Portal and Web Services usage statistics (Fig 2) showed a constant and rapid growth in terms of visit (+135% since January 2009). An important percentage of visitors are using the GBIF Data Portal on a more regular basis such as returning for 10-50 visits/year, which indicates that the level of user loyalty is also increasing for a large portion of the GBIF Data Portal.

New Features
- Upgraded the map user interface to GeoServer.
- Several graphical user interface enhancements made based on user feedback.
- New statistics about data publishers included.
- Inclusion of new content from the World Database on Protected Areas (WDPA).
- Web Services performance improvement with faster response times.
- More (see: http://data.gbif.org/version.htm)

Resources
http://code.google.com/p/gbif-dataportal/
Project Home Site: documentation, downloads, source code, bug reporting, etc.

Schedule
New requirements gathering November-December 2009
GBIF Data Portal new release: April 2010

GBIF Contacts
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Systems Architect, Tim Robertson, trobertson@gbif.org

Developer, Jose Cuadra, jcuadra@gbif.org

Training Officer, Alberto González-Talaván, atalavan@gbif.org

About GBIF

GBIF makes digital biodiversity data openly and freely available on the Internet for everyone, and endorses both open source software and open data access.
www.gbif.org

GBIF provides scientific biodiversity data for decision-making, research endeavours and public use.
data.gbif.org

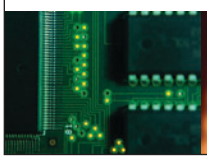
GBIF is a network of data publishers who retain ownership and control of the data they share. Linked datasets provide a more robust representation of biodiversity than any single dataset.

GBIF provides access to primary biodiversity data held in institutions in developed and developing countries. Data shared through GBIF are repatriated data.

GBIF is a dynamic, growing partnership of countries, organisations, institutions and individuals working together to mobilise scientific biodiversity data.

GBIF invites you to download species occurrence data freely and openly from http://data.gbif.org

GBIF invites you to join the GBIF network and share your biodiversity data, as well as participate in developing new tools and services.



All GBIF posters at: http://www.gbif.org/communications/resources/posters/

END NOTES

1. http://www2.gbif.org/GBIF-MIFTG-Report.pdf
2. http://www2.gbif.org/Persistent-Identifiers.pdf
3. http://www.eurogeoss.eu

Biodiversity Science: Content & Use

Access, Status and Trends

Growth in Data Mobilisation

The total number of accessible records in the GBIF network increased by 20% in 2009, from 163 million in December 2008, to 196 million in December 2009. The current rate of data discovery and mobilisation across the GBIF network therefore continues to show linear growth.

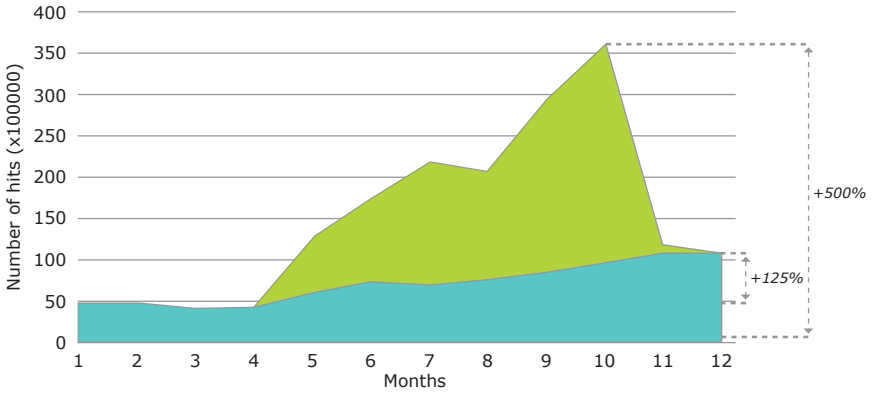


Fig. 12 Total number of hits 2009

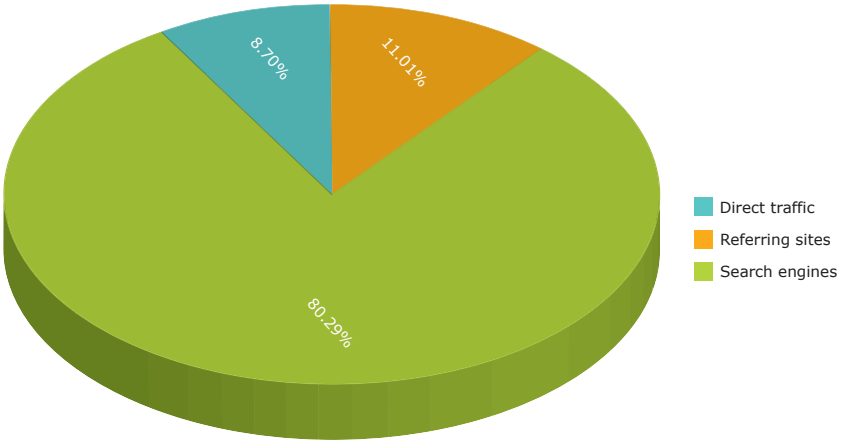


Fig. 13 Access gained to GBIF Data Portal 2009

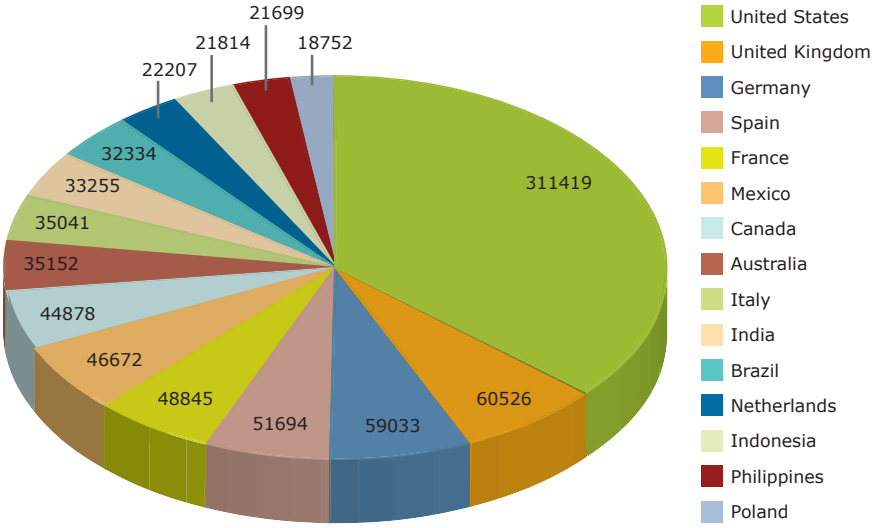


Fig. 14 Site visits by country / territory 2009

Increase in Website Visitor Numbers

In 2009, 80% of regular visitors have reached the GBIF website through search engines. Crawling by search engines such as 'Google', for example, increased by 500% in 2009 (Fig. 12). Access to the GBIF website (Fig. 13, 14) has shown an overall increase of 125% from January to December 2009 (Fig. 15). The improvement of existing web service performance, combined with the development of a geospatial repository have enabled us to provide useful Internet applications (e.g. World Database on Protected Area, Global Register of Migratory Species) and services (e.g. EOL maps) to the wider GBIF community.

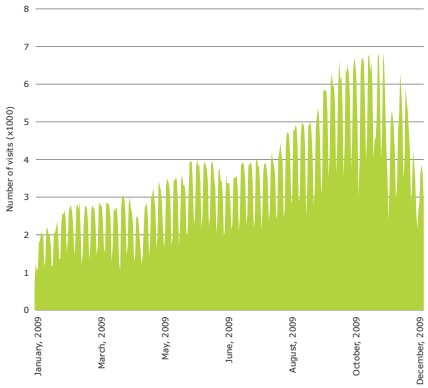
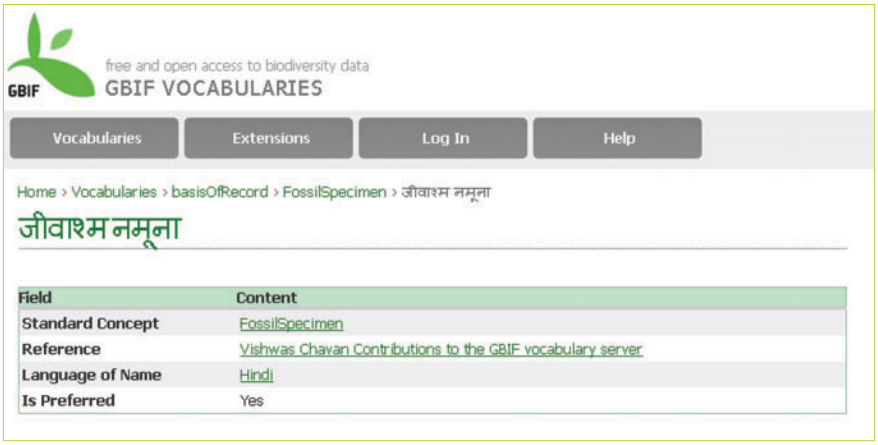


Fig. 15 Monthly visits to the GBIF website 2009

Name Services

Overcoming Language Barriers

As an international, multicultural network of people, participating countries and organisations, GBIF encompasses a diverse array of languages and regional perspectives.



GBIF Vocabulary Server

English is currently GBIF's primary working language but it is recognised that the use and uptake of the GBIF network depends on providing tools, infrastructure and data standards in all languages. GBIF initiated the development of an internationalisation strategic plan in 2009 that aims to overcome existing language barriers. It does so by enabling simple and easy adoption of GBIF infrastructure, tools, data and services via particular national or regional language settings.

The development of the GBIF vocabulary server is an example of how this is being achieved. This system provides a web interface with associated services for GBIF Participants and other users that enable them to draft, publish and access all the controlled vocabularies supported in the GBIF network in any language. For example, it allows a Node Manager in India to find the Hindi names for terms such as 'fossil specimen', 'observation' or 'species' so that these terms can be understood and properly transposed when data are transferred between countries. It also enables information originating with names such as 'España', 'Spania', 'Spanien, to be linked to the same country (i.e. Spain). The vocabulary server goes some way to ensure that the GBIF network becomes a truly international biodiversity data publishing and accessing system.[1] According to Vincent Smith, a cyber-taxonomist with the Natural History Museum London, *'the GBIF vocabularies site is central to helping us harmonise metadata across different Scratchpad user communities (…) we will be rolling these services out to all Scratchpad users, helping us integrate biodiversity data across more than 150 biodiversity research communities.'*

Processing Scientific Names

The GBIF network serves to publish and integrate biodiversity information, i.e. information about species. Taxonomic names are a key component to such integration as all information regarding a species is invariably tied to a name in one form or another. In 2009 GBIF invested heavily in workshops and technical initiatives in order to address some of these complexities.

Nomina IV Workshop

In April, GBIF co-hosted the Nomina IV workshop with the Encyclopedia of Life (EOL) in Wood's Hole,

Nomina IV Workshop, USA

Massachusetts, USA. The workshop brought together a group of expert technical developers from around the world with experience in creating tools and services to locate scientific names in full-text documents. The tools dramatically reduced the amount of time taken to generate species lists from publications, match misspelled names to correctly-spelled ones, improve accuracy and match complex scientific names with recognised scientific elements, a key aspect of matching names to taxonomic authority files.

The workshop participants made a commitment to maintain a high degree

of coordination in their future work together. They resolved to develop a common interface, and a single point of access to the various tools and services presented. GBIF presented these outcomes at the annual TDWG Biodiversity Data Standards Meeting in Montpellier, France, in November 2009.

Name Finding Tools

TaxaMatch is a tool developed by GBIF in 2009 and used for processing taxonomic names. Originally developed by Tony Rees of OBIS, it is an open source PHP web service allowing flexible matching of scientific names.

'The World Register of Marine Species incorporates the TaxaMatch system developed through GBIF to improve our very popular species checklist matching service.'
Ward Appeltans, Data Manager, World Register of Marine Species

'GBIF plays a central role in coordinating the refinement and uptake of software tools for use in biodiversity informatics. GBIF's leadership role in enhancing taxonomic name finding tools is a critical activity of benefit to the Biodiversity Heritage Library and its community of users. By partnering with repositories as well as developers, GBIF helps ensure that the products they enhance have direct application within biodiversity endeavours.'
Chris Freeland, Technical Director, Biodiversity Heritage Library

Increasing Taxonomic Content

In 2009, a number of initiatives that GBIF collaborates with made significant contributions to the network. The Catalogue of Life, a GBIF Participant, provides the largest single and unified taxonomic resource and serves as a significant basis for the authoritative taxonomic backbone used in the GBIF Data Portal. In 2009, many other resources also made significant contributions, such as those contained in agreements with:

- The International Plant Names Index (IPNI), an important source for authoritative plant names and synonyms used within the GBIF website;
- The World Register of Marine Species (WoRMS) provides authoritative taxonomy, synonymy, and nomenclature for over 200,000 marine species within the GBIF website; and
- The Thomson Reuters Index of Organism Names that provides a comprehensive classification for improving the overall organisation of specimen and observation data within the GBIF occurrence index.

GBIF provided reciprocal benefits to the Catalogue of Life network through the seed money programme that supported the development of new global species datasets.

Checklist Bank

The current draft Checklist Bank serves as an integrated catalogue of authoritative species checklists published through the GBIF network. As a name services brokerage, Checklist Bank provides uniform discovery and access to multiple taxonomic sources. It will collate and integrate hundreds of data sources and serve as the largest index of taxonomic, nomenclatural and vernacular name information (Table 2).

Table 2 Checklist Bank Metrics

Checklist Bank Metrics	
Statistics from the GBIF Checklist Bank taxonomic IndexTaxonomic records	20,333,779
Unique names	11,454,896
Canonical names (distinct names without authorship)	4,612,444
Orthographic groups (groups of unique names determined to be equivalent)	4,862,772
Vernacular names	760,853
Number of different languages vernacular names)	90
Index Resources Checklist Bank Taxonomic catalogues (source authority files)	14
Nomenclatural Lists	3
Thematic species Checklists	2
Vernacular species lists	64
Occurrence of data classifications stored in Checklist Bank	5,800

In 2009, Checklist Bank formed the basic checklist repository and processing tool for reconciling taxonomic information from multiple overlapping sources to create management taxonomic classifications for both the GBIF Data Portal and the Atlas of Living Australia.

'Checklist Bank is being used to manage and reconcile the taxonomic information from multiple overlapping sources. It will help produce a management classification which will underpin ALA's data management of species information.'
Dave Martin, System Architect, Atlas of Living Australia.

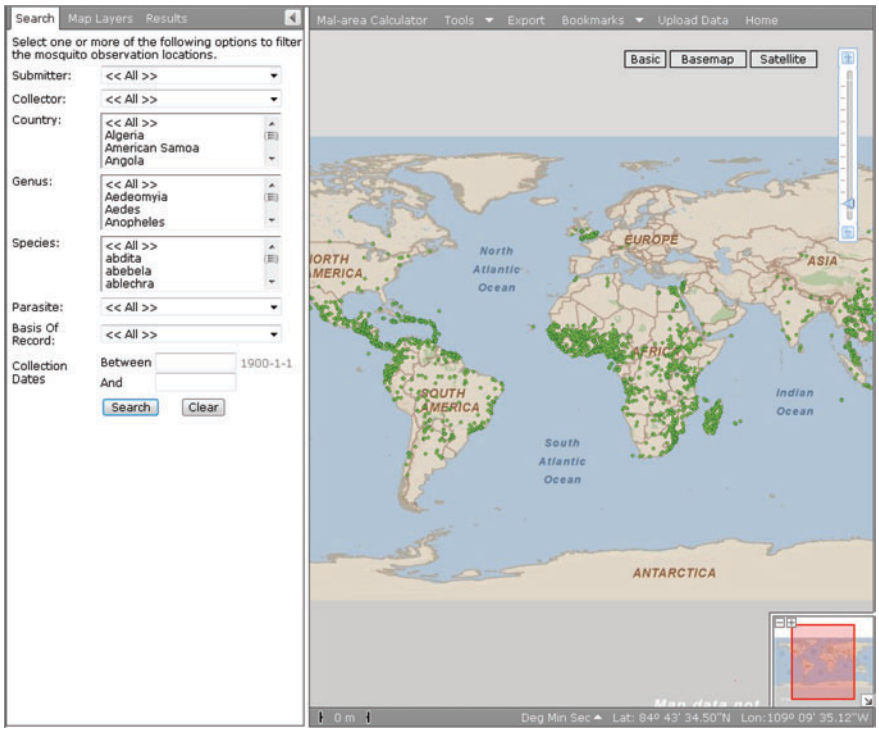
GBIF Checklist Bank Milestone

The taxonomic datasets currently indexed through the GBIF Checklist Bank, enable the organisation to reconcile over 95% of the 5 million scientific names in the GBIF index of primary data to an authoritative resource. This is a significant milestone and one that is done through direct matches and the use of the name processing tools developed in 2009.

This achievement contributes to a major restructure of the complex process of rebuilding the GBIF taxonomic backbone that will continue into 2010. It also sets the stage for GBIF to make major improvements in its delivery of accurate species information into the future.

Outcomes of GBIF 2007-2008 Seed Fund Grants in 2009

Early Land Plants Today (ELPT): Uniting Taxonomy, Nomenclature and Geography is a GBIF-sponsored project recognising that liverworts (Marchantiophyta) and hornworts (Anthocerotophyta) are pivotal in the understanding of early land plant evolution. The objective of the project was to unify the vastly scattered biological literature and data on liverwort and hornwort taxonomy, nomenclature, and geography. The unification of nomenclatural, taxonomic, and geographical data has many implications and useful applications, including the study of species richness, patterns of diversity, and conservation.



Filtered mosquito observation locations (Mosquito Map)

During the course of the project, almost 5000 publications have been processed to obtain data and information. The project provided a unique opportunity to enhance capacity building and increase synergistic activities between two projects funded by the US National Science Foundation, various international collaborative research and database efforts, and collaboration with the Encyclopedia of Life (EOL) and the Biological Heritage Library (BHL). Over 12,500 bibliographic records have been shared with BHL to date (6500 mosses/ferns/lichens records were also shared). The project also contributed a global checklist of liverworts to the Catalogue of Life.[2]

GBIF seed funds also supported MosquitoMap, a geospatially referenced clearinghouse for mosquito collection records and distribution models. GBIF supported the collection of the primary data that underpins MosquitoMap which is useful for identifying areas relevant to the study of mosquito biogeography, evolution and biodiversity and developing predictions about the potential spread of invasive mosquito species, which could potentially support the achievement of the UN Millennium Development Goals.[3]

Eudocima homaena (Hubner, 1823)
Female
27-XI-2008, Siianjiyen,
Sindian, Taipei City, Taiwan
Identified by: Bettaman

Refining the GBIF Taxonomic Backbone

By the end of 2009, the GBIF index of primary occurrence data reached close to 200 million records. This set of records is represented by over 5 million distinct scientific names arranged into numerous different taxonomic classifications. These names also include anomalies such as names no longer in use, names that are incorrectly spelt, variations of correctly spelled names, as well as processing artefacts that contain numbers, abbreviations, etc. A primary role of the GBIF Data Portal is to ensure that information for any particular species or group of species can be accessed and retrieved with a level of precision and recall that makes taxonomic sense. One reason for GBIF to promote and develop name processing tools and the Global Names Architecture is therefore to increase the mobilisation and access to authoritative information about names that can achieve the goal of authoritatively treating all names in the GBIF Data Portal.

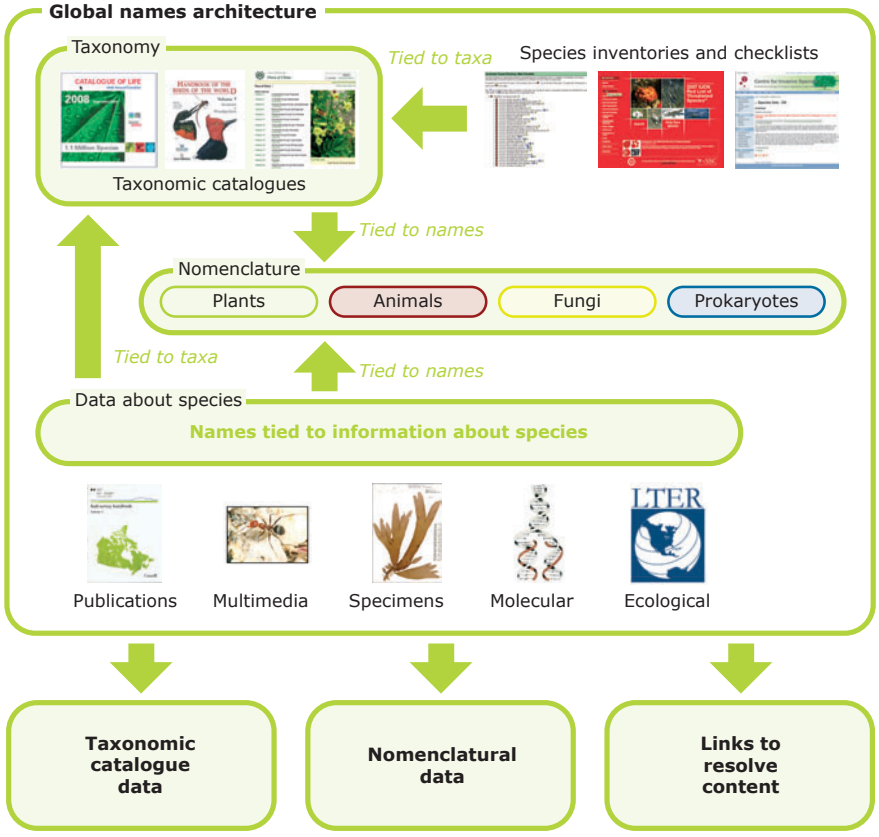


Fig. 16 GBIF Global Names Architecture

2009 was the year in which GBIF made significant headway in data mobilisation through the establishment of core data standards and infrastructure to allow rich annotated species checklists to be easily published through the GBIF Data Portal. This progress was achieved in partnership with other organisations and initiatives that work on the continual development of content.

Developing a Global Names Architecture

GBIF played a leading role in the development of the framework for the Global Names Architecture (GNA) during 2009 - an effort to coordinate the sharing and resolution of taxonomic names and concepts among a wide range of initiatives and GBIF Participants that publish or utilise taxonomic information. The framework will make it possible to globally access and assess the widest range of published taxonomic datasets. It also provides the means to tie the basic atoms of taxonomy, i.e. names to a common and authoritative 'dictionary' of verified nomenclature.

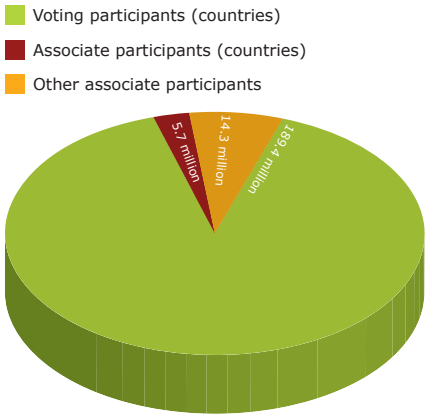
Throughout the year, GBIF continued work begun previously to develop a consolidated nomenclatural infrastructure through the funding of a joint project, called the Global Names Usage Bank. This project will, for the first time, bring together global nomenclatural databases representing different nomenclatural codes under a common infrastructural umbrella and is a critical step in providing a common nomenclatural dictionary for all biodiversity data - a key to enabling true integration of species information.

'GBIF's contributions to the development of the Global Names Usage Bank have been pivotal. In addition to financial support for several key organisational meetings and proof-of-concept pilot projects, GBIF has helped keep forward momentum on this important initiative.'
Richard Pyle, Developer of ZooBank and Commissioner, ICZN.

Discovery and Mobilisation of Primary Biodiversity Data

Institutionalisation of Data Publishing Frameworks

The GBIF Secretariat works to establish the necessary technical, social and political mechanisms needed to help Participants mobilise the required volume, depth and density of primary biodiversity data - often beyond specimen and observation records (Fig. 17).



N=42 countries; 26 organisations
Source: GBIF Participant Report 2009, Primary occurrence records as of December 2009

Fig. 17 Primary occurrence records

This allows for the credible use of the GBIF Data Portal and web services in the analysis (Fig. 18).

In order to achieve this objective, GBIF aims to facilitate the institutionalisation of data publishing frameworks, which raises the profile of data publishing to the same level as scholarly publishing. In October 2009, the Governing Board adopted the recommendation on 'Data Discovery and Mobilisation of Primary Biodiversity Data'. This recommendation calls on scientific publishers, editors, research councils, funding agencies, private foundations, scientists and data aggregators to recognise data discovery as a first step towards data publishing.

The recommendation promotes the use of the GBIF Global Biodiversity Resources Discovery System (GBRDS) together with Metadata Catalogues as mechanisms to discover biodiversity data resources.

Primary Occurrence Records Statistics

In 2009, taxon coverage of GBIF mobilised data is still dominated by vertebrate observations (Fig. 19). It is clear that support for the discovery and publishing of data records from Asia, Africa, Oceania, South America, and Antarctic should remain a priority in future (Fig. 20). Currently, 84% of the data records are published by institutions in Europe (44%) and North America (40%) (Fig. 20). Marine data records comprise just 8% of data mobilised (Fig. 21).

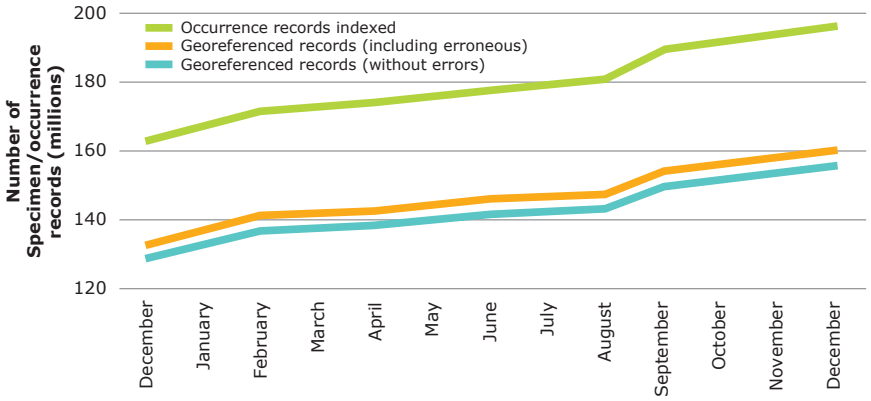


Fig. 18 Trend of monthly increase of records accessible through the GBIF network

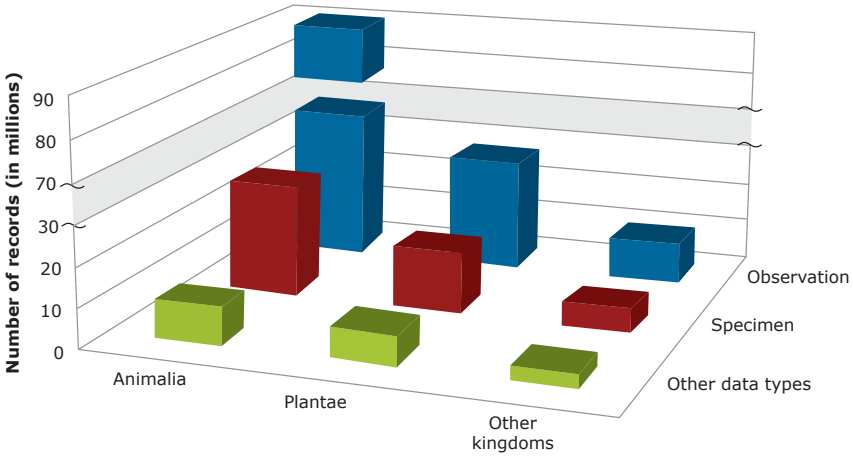


Fig. 19 Primary biodiversity records by taxon types

Data Mobilisation and Strategic Planning

Consultations on data discovery and mobilisation strategies were conducted with 25 Participants during 2009, the outcomes of which were presented to GB16. Participants pointed out the need for a systematic Content Needs Assessment that would influence strategies that are developed around data discovery and mobilisation (Fig. 20). Demand-driven action plans in this regard should therefore be put in place as a matter of priority. Participants also highlighted the need for a comprehensive Data Publishing Framework. Participants included: Argentina, Austria, Belgium, Canada, Costa Rica, Denmark, Finland, Germany, Iceland, Japan, Mexico, New Zealand, Norway, Republic of Korea, Sweden, The Netherlands and the United Kingdom (Voting Participants); Colombia and Poland (Associate Participants); and Chinese Taipei, Discover Life, the Endangered Wildlife Trust, NatureServ, OBIS and SCAR (Associate Organisations).

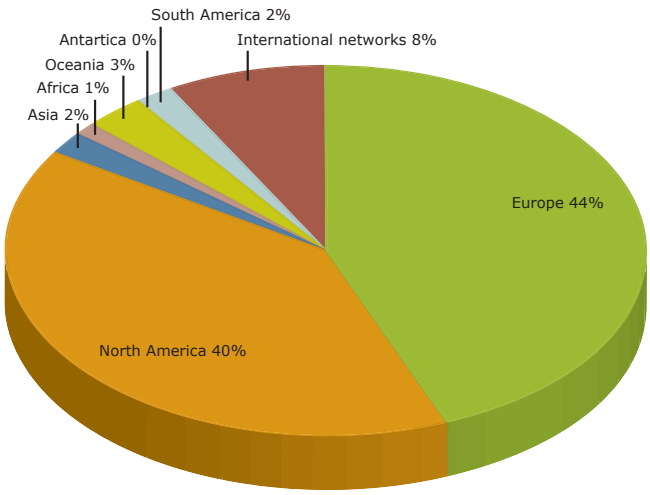


Fig. 20 Location of institutions serving digital records

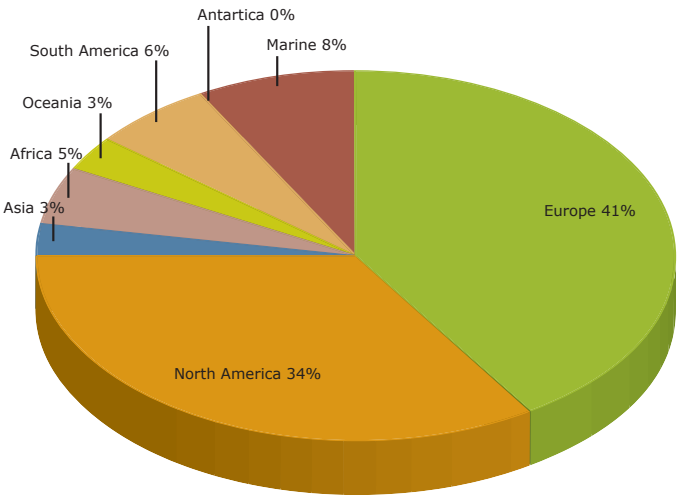


Fig. 21 *In situ* location of species occurences

Digitising and Mobilising Natural History Collections Data

The GBIF Task Group on the Global Strategy and Action Plan for Digitisation and Mobilisation of Natural History Collections Data (GSAP-NHC) continued its work throughout 2009. The activities of the Task Group included: a meeting in Leiden, Netherlands, on the sidelines of the Annual Conference of the Society for the Preservation of Natural History Collections in July 2009, community consultations held through focused workshops at the conference; and at the TDWG Annual Conference 2009 (Montpellier, France); and a survey on "Natural History Specimens Digitisation: Challenges and Concerns" which yielded over 200 responses globally.

Content Needs Assessment Task Group

The objective of the Content Needs Assessment Task Group is to:

- assess the biodiversity data needs for various analysis; and
- identify areas of biodiverity data enabled through GBIF and which are in need of further improvement.

In response, the group conducted a Global Content Needs Assessment survey in May 2009. The survey was launched in 5 languages (Chinese, English, French, Russian and Spanish) and yielded 750 distinct responses from 77 countries. The Content Needs Assessment Task Group met in June 2009 to consider these responses. A report will be published during the first half of 2010.

DanBIF Data Hosting Centre

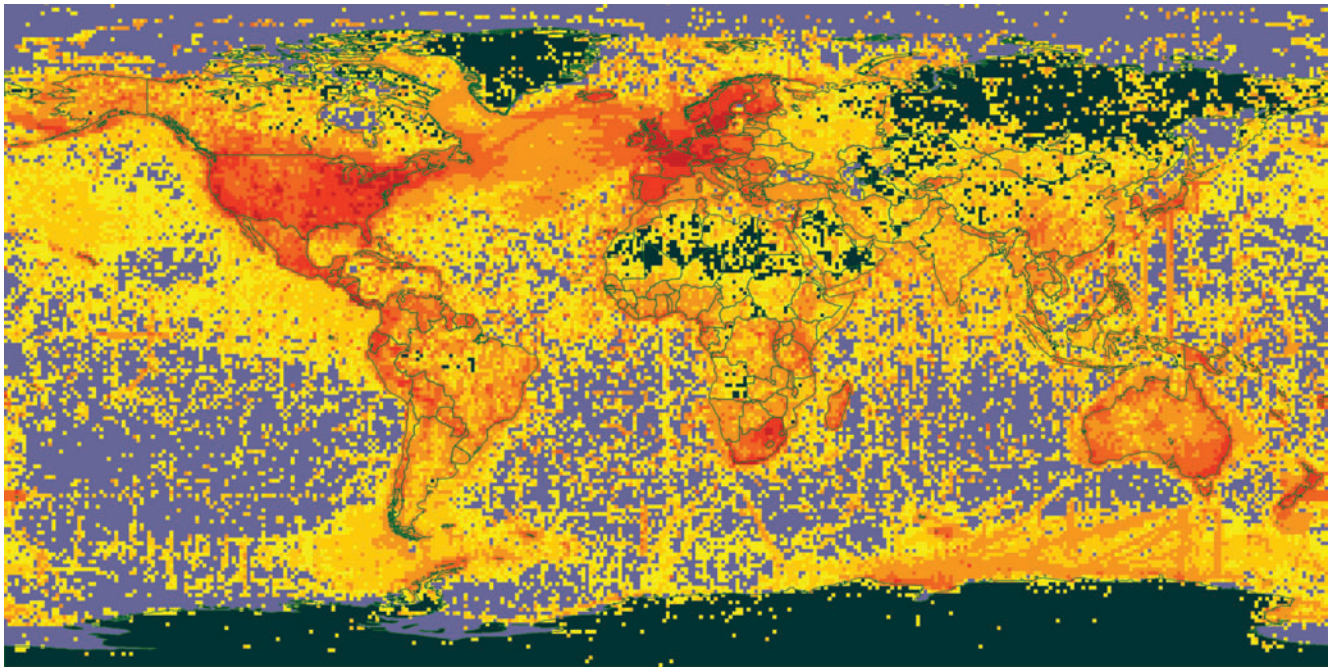
GBIFS, in close cooperation with DanBIF, launched the DanBIF Data Hosting Centre on 19 November 2009. This centre was established to overcome the shortcomings in the discovery and publishing of biodiversity data by small publishers. It also provides an opportunity for thousands of holders of small datasets from across the globe to publish their biodiversity data, thereby earning visibility and recognition for their efforts as well as enabling free and open access to datasets.[4]

Multimedia Resources

Upon the advice of the GBIF Science Committee, the Multimedia Resources Metadata Schema (MRTG schema) drafting team met in February 2009 to prepare a second draft of the schema. Community consultations were held during the TDWG Annual Conference 2009. On the basis of the feedback received, the MRTG schema will be finalised and submitted for ratification by TDWG during the first quarter of 2010. It will also be implemented as an extension to the Darwin Core, so that it may be used with the IPT.

Data Publishing Framework Task Group

The GBIF Task Group on Data Publishing Framework was established in recognition of the need to address the social, technical and political concerns of data publishers.



Geo-referenced map of GBIF-mobilised records

MRTG Schema Development Meeting, Denmark

This group met for the first time in June 2009 to consider these issues and to recommend possible solutions. The initial outcomes of the Task Group were presented at the e-Biosphere Conference that took place in London in June 2009. The Task Group is expected to submit its report during the first half of 2010.

Supporting Scholarly Publishers

A Memorandum of Cooperation (MoC) was signed with Pensoft Publishers in 2009 that would institutionalise the publishing of data papers by incentivising efforts in authoring rich metadata documents ultimately leading to the efficient discovery of data resources. Following a peer review process, Pensoft plans to publish rich metadata documents as data papers in Zookeys, PhytoKeys, and BioRisk. The first data paper will be published by October 2010. Using GBIF infrastructure, a framework for the simultaneous discovery and access to primary biodiversity data for the use by scholarly publishers was developed and promoted in collaboration with Zookeys.

Data Publishing Framework Task Group Meeting, Denmark

GBRDS Stakeholders Planning Workshop, Denmark

Global Biodiversity Resources Discovery System (GBRDS)

Providing innovative ways of discovering and accessing all relevant information and data resources still remains a major challenge. To address this issue, the GBIF Secretariat developed the Global Biodiversity Resources Discovery System (GBRDS) Summary Paper in August 2009. In order to assess the scope of the system and the needs of the community, a GBRDS Stakeholders Planning Workshop was held in Copenhagen in September 2009 that led to the establishment of the GBRDS.[5]

A GBRDS Implementation Steering Committee (GISC) has been established to ensure that community requirements are met. The development of the GBRDS Registry is in progress and will be launched during 2010.

END NOTES

1. http://vocabularies.gbif.org
2. http://www.early-land-plants-today.org/
3. http://wrbu.si.edu/mosqMap/index.htm
4. http://www.gbif.org/communications/news-and-events/showsingle/article/danbif-offers-a-data-hosting-centre-for-biodiversity-data/
5. http://www2.gbif.org/GBRDSWorkshopReport-Final.pdf

Strategic Partnerships & Uptake

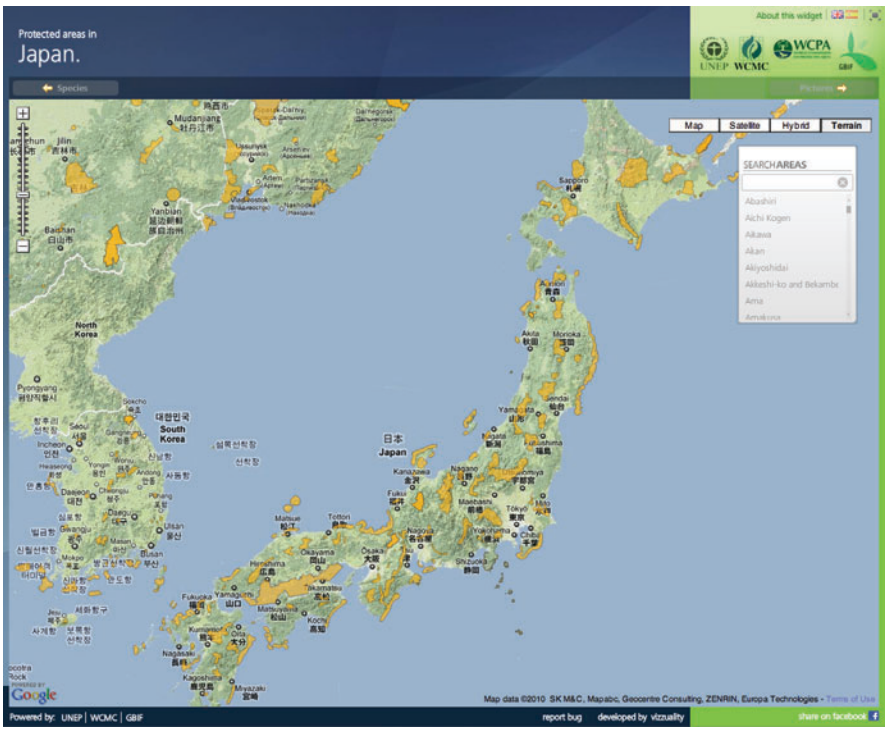
Strategic Partnerships

GBIF and managing protected areas

In collaboration with the International Union for Conservation of Nature (IUCN) and the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC), a flash-based widget was developed to provide access to GBIF-enabled data specific to the protected areas contained in the World Database of Protected Areas (WDPA).

With an initial focus of just three countries (Madagascar, Spain and Tanzania), GBIF scaled this application up to all countries and protected areas worldwide in 2009. This was done by using a mix of technologies and Application Programming Interfaces (APIs), most notably PostGIS, Java, AMF, Hadoop, Flex, Google Maps, Geoserver and Geowebcache.

'This project is a great demonstration of the advantages in combining GBIF primary biodiversity data with other data resources.'
Craig Mills, WDPA Project Manager



GBIF / UNEP-WCMC widget developed by GBIFS to display the integration of GBIF network data with the UNEP-WCMC World Database on Protected Areas

The widget is now visible on a variety of protected areas websites including the World Database on Protected Areas website[1] the marine protected areas website[2] and a site for the Inter-American Biodiversity Information Facility[3]. Work will be ongoing in 2010, with a focus on making innovative GBIF technology freely available and fostering further collaboration with relevant organisations.

'It is my firm belief that the sharing of technological innovation plays a key role in shaping the future of biodiversity; this partnership can help lead the way.'
Craig Mills, WDPA Project Manager

Mobilising biodiversity data from EIAs

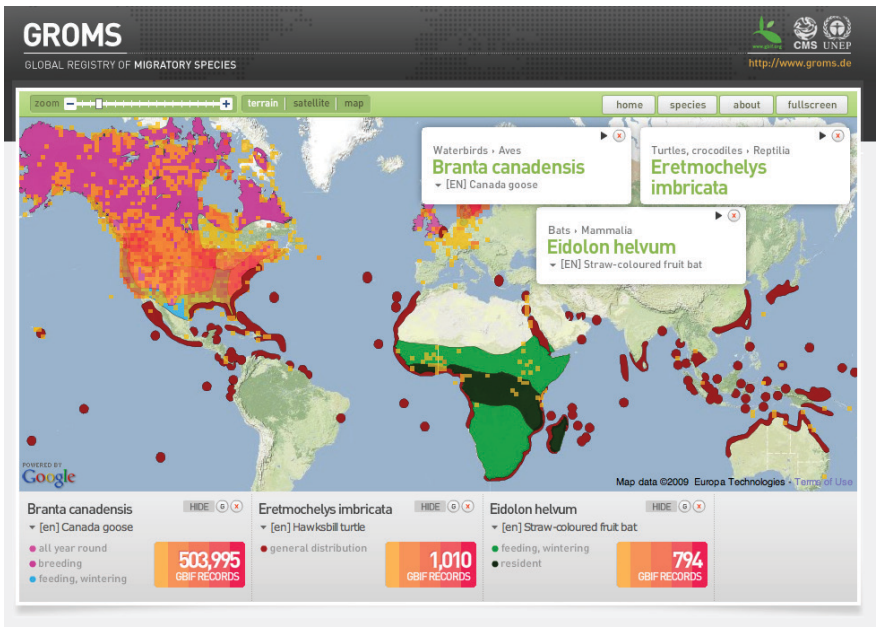
Environmental Impact Assessments (EIA) generate biodiversity records with almost every project being assessed. However, these data are mostly captured in forms and formats that make them inaccessible for further use, raising doubt about reliability and verifiability, as well as credibility of the studies concerned, thus hampering free and open access to primary data.

In June 2009, GBIF signed a Memorandum of Cooperation with the International Association of Impact Assessment (IAIA) to provide a technical, infrastructural, socio-cultural and policy framework that would make the publishing of impact assessment-associated biodiversity data a mainstream activity. As a result, GBIF's strategic application on EIA biodiversity data mobilisation was conceptualised.

A position paper was released for community-wide consultation in November 2009. In December 2009, a contract was signed with the South African National Biodiversity Institute (SANBI), the organisation also hosting SABIF, the South African Node of GBIF. This contract commissioned the first pilot project internationally in South Africa, with the objective to scope EIA biodiversity data mobilisation.

GBIF and migratory species

Based on a Memorandum of Cooperation (MOC) between the Convention on Migratory Species (CMS) and GBIF, a Rich Internet Application (RIA) or widget, linking the Global Register of Migratory Species (GROMS) database with the GBIF network data was developed. During the first phase of the project, GBIF undertook an in-depth evaluation of the GROMS database in order to assess the range of data available for existing migratory species in both the GBIF and GROMS platforms, respectively. The goal of the project was to develop a single widget accessible over the Internet and through a conventional web browser.



GROMS widget developed by GBIFS to display the integration of GBIF network point data with the Global Register of Migratory Species.

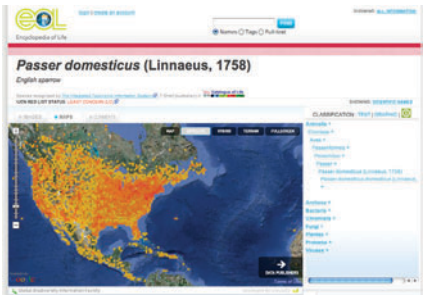
The widget builds on the GBIF geospatial computing capacity which was upgraded in 2009 in order to meet the growing demand from various applications. The GBIF/CMS widget provides an intuitive mechanism to visualise the distribution of migratory species as well as to integrate this view with observation data from the GBIF network. This development is aimed at demonstrating the strategic importance of linking multiple data sources into a coherent and innovative visualisation tool. Using GBIF primary biodiversity data as a means of validating and/or refining distribution areas of migratory species will immediately enrich the GROMS content. It also provides opportunities for the integration of migratory species information into the GBIF Data Portal.

This project paves the way for a wider collaboration with key organisations and environmental conventions through linking multiple information resources in support of the conservation of biological diversity. GBIF plans to address this challenge in 2010 with the development of a global spatial repository linking GBIF primary biodiversity data with relevant geospatial resources.

'The CMS Secretariat is delighted to have had the opportunity to cooperate with the Global Biodiversity Information Facility (GBIF) in giving GROMS a highly beneficial overhaul, a vibrant new look, an excellent home on the internet amongst illustrious other information resources on the GBIF Data Portal, and thereby exposure to a much wider audience.'
Convention on Migratory Species Secretariat[4]

GBIF and species mapping services

The mapping representation of GBIF network occurrence data on the Encyclopedia of Life (EOL) website was upgraded in 2009. The update includes a new flash-based mapping solution that uses Google Maps. Other improvements include a dynamic clustering of data, as the user zooms in on the map.



EOL website

'With EOL focusing on taxonomic reconciliation, and GBIF providing an enhanced mapping visualisation, we were able to greatly improve the display of GBIF network occurrence maps on EOL species pages.'
Cynthia Parr, Species Pages Component Leader, Encyclopedia of Life (EOL)

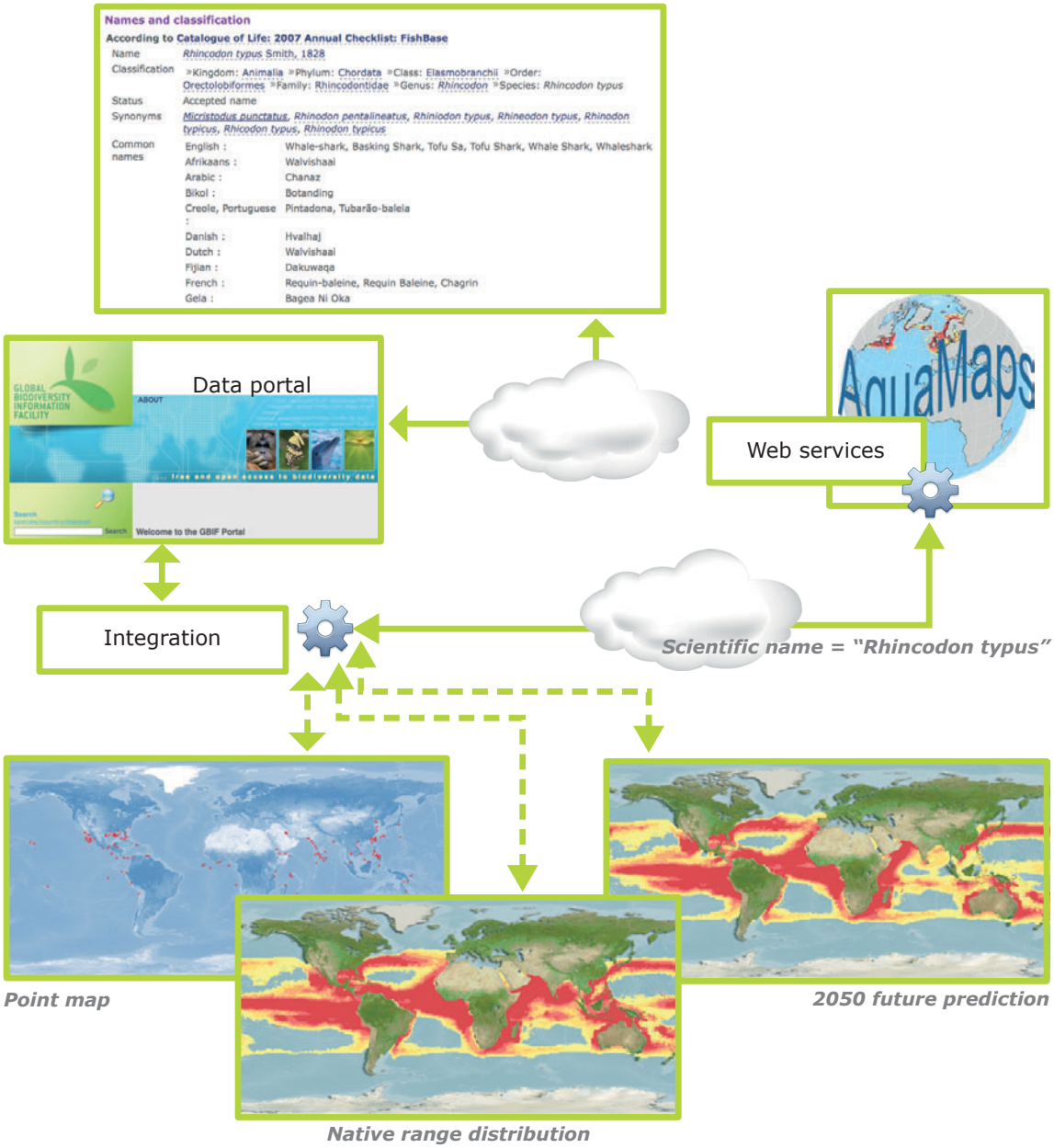


Fig. 23 AquaMaps services integration into the GBIF Data Portal

GBIF and modelling marine species distributions

In collaboration with AquaMaps (Fig. 23), interactive mapping functions were developed for modelling marine species distributions, based on external modelling predictions of 2050 climatic, oceanic and other ecological parameters. The maps and map data generated from this collaborative work are now available for use on the GBIF Data Portal.[5] In 2010, efforts will focus on the integration of these new services into the GBIF Data Portal.

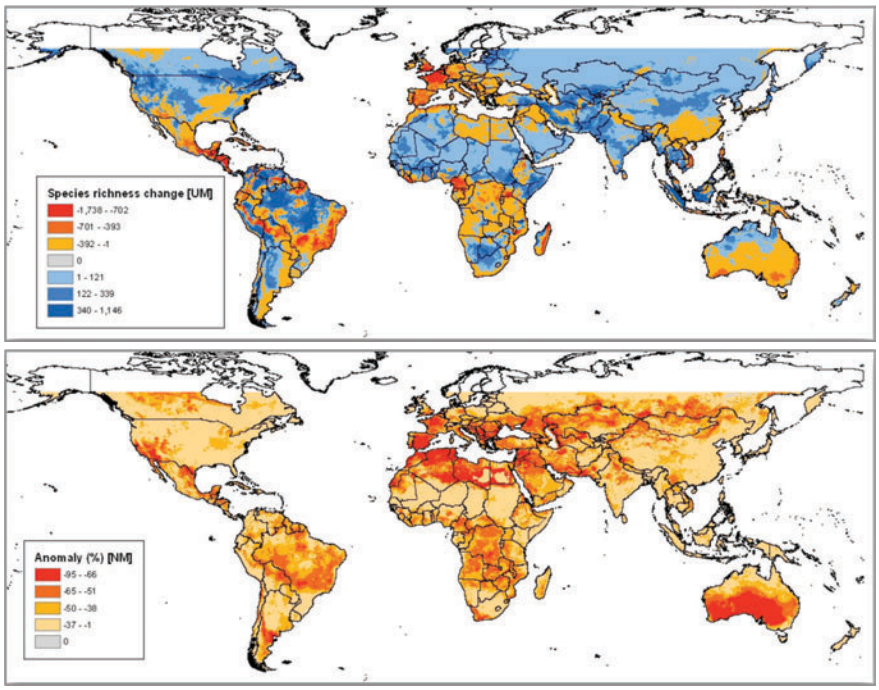
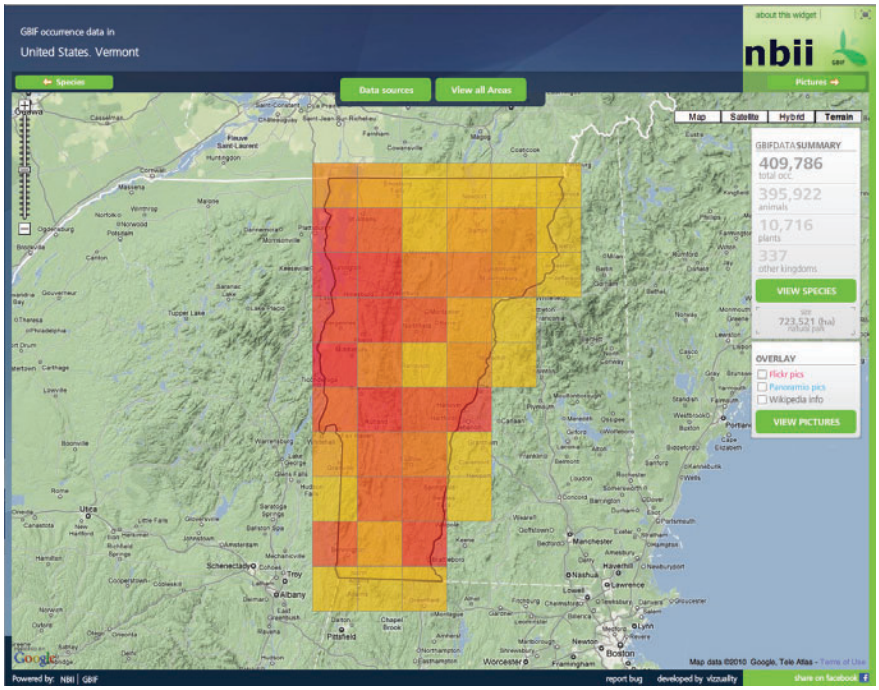


Fig. 25 Percentage anomaly illustrated under different climate change scenarios



GBIF widget customised by the US Node for the Vermont Invertebrate Data Alliance

GBIF and verifying data fitness-for-use in modelling climate change impacts on biodiversity

The GBIF Secretariat initiated a project with the International Centre for Tropical Agriculture (CIAT) to evaluate the usefulness of GBIF occurrence data to answer some of the key questions facing conservation decision makers today (Fig. 25), e.g. what levels of species loss are we expecting to occur over the next century, and what are the most effective conservation policy decisions to curb this loss?

A first phase of the project focused on the evaluation of the quality of the terrestrial data available through the GBIF Data Portal. The outcome of this research demonstrated that from all terrestrial data extracted, 88.5% have correct coordinates.

Following this critical phase of data extraction and checking of data quality, the project explored the use of predictive models to look at how plant species shift in geographic range with climate change, and used these results to identify potential 'refugia' for species conservation. Beyond providing species specific information on range shifts, the project also looked at the aggregate impacts on thousands of species.[6]

Uptake by Participants

Customising mapping functions: The Vermont Invertebrate Data Alliance

'The U.S. Node to GBIF, in cooperation with technical staff at the GBIF Secretariat, customised the GBIF/WCMC developed widget[7] in support of local U.S. data visualisation. The widget was modified to allow for display of relevant collections

and specimens for a specific U.S. State (Vermont). The Vermont Invertebrate Data Alliance (VIDA) brings together Vermont invertebrate records from private and public collections, published literature and in some cases observational records. All of the records will be unified within a distributed information architecture that will be constantly growing and available to anyone via the Internet for science, conservation and education purposes. VIDA is working in partnership with the U.S. National Biological Information Infrastructure.[8]
Mike Frame, US Node Manager
National Biological Information Infrastructure (NBII).

The Plant Genetic Resources Community

Bioversity International and the Nordic Genetic Resources Centre (NORDGEN) joined efforts in 2009 to further enrich the Darwin Core standard to meet the needs of the genebank community (Fig. 26). The genebank community, in close collaboration with the GBIF Secretariat developed a germplasm extension in order to provide a means to publish richer content such as phenotypic traits.[9]

The implementation of these common gene bank terms as a Darwin Core extension enables a closer integration of genebank data with other domains of biodiversity information. The germplasm extension was implemented for the GBIF Integrated Publishing Toolkit (IPT) and the Global Biodiversity Resources Discovery System (GBRDS). The experience from the initial uptake of the GBIF IPT by the genebanks was reported together with the Darwin Core Germplasm extension at the TDWG Annual Conference in Montpellier, France, during November 2009.

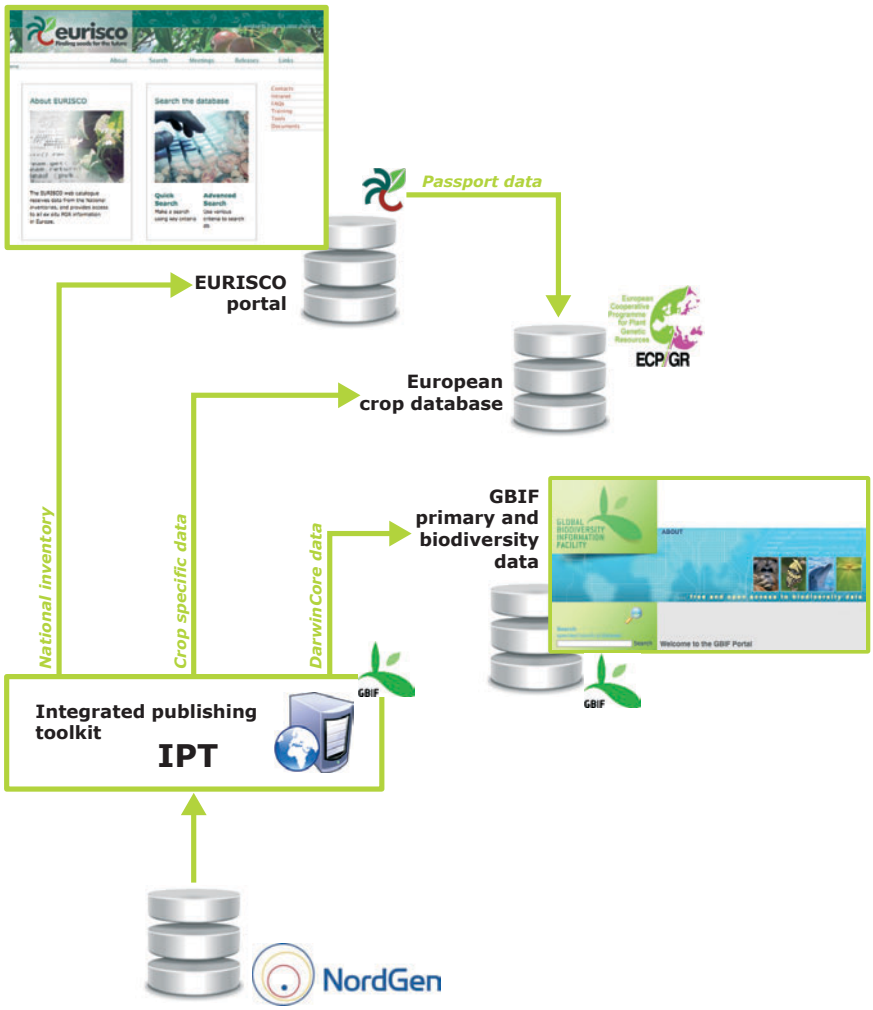


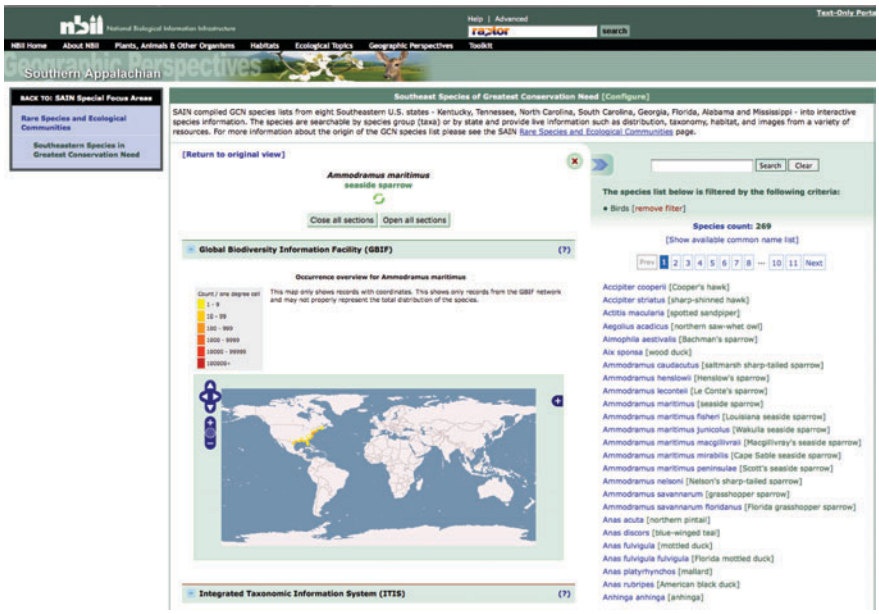
Fig. 26 Envisaged use of the IPT by the genebank community for the publishing of germplasm data

In support of the decentralisation of the GBIF Informatics architecture, NORDGEN has been tasked to lead a feasibility study with the 2009 objective to test the deployment of the IPT instances in European genebanks. The outcomes of this feasibility study will guide the further improvement of the IPT in order to ensure that it meets the needs of the scientific communities.

'This demonstrated the potential of adapting the GBIF architecture to the needs of its Participants such as here in the context the EURISCO thematic network.'
Dag Terje, Filip Endresen, NORDGEN, Elizabeth Arnaud and Sonia Dias, Bioversity International

The United States GBIF Node

'The U.S. GBIF Node has begun developing an application within the National Biological Information Infrastructure (NBII) supported Mercury framework. The application, hosted by Oak Ridge National Laboratory (ORNL), is in support of U.S. State Wildlife Action Plans. State wildlife action plans outline the steps that are needed to conserve wildlife and habitats before they become rarer and more costly to protect. Taken as a whole, they present a national action agenda for preventing wildlife from becoming endangered. The U.S. NBII Program has been working to develop various databases, species Mashups (which also include global GBIF data, statistics, visualisations and other supporting infrastructure) to assist U.S. States in the implementation and monitoring of wildlife and conservation lands/waters.'[10]
Mike Frame, US Node Manager, NBII.



US Node website linking to GBIF

IABIN website

National Biodiversity Institute of Costa Rica (INBio)

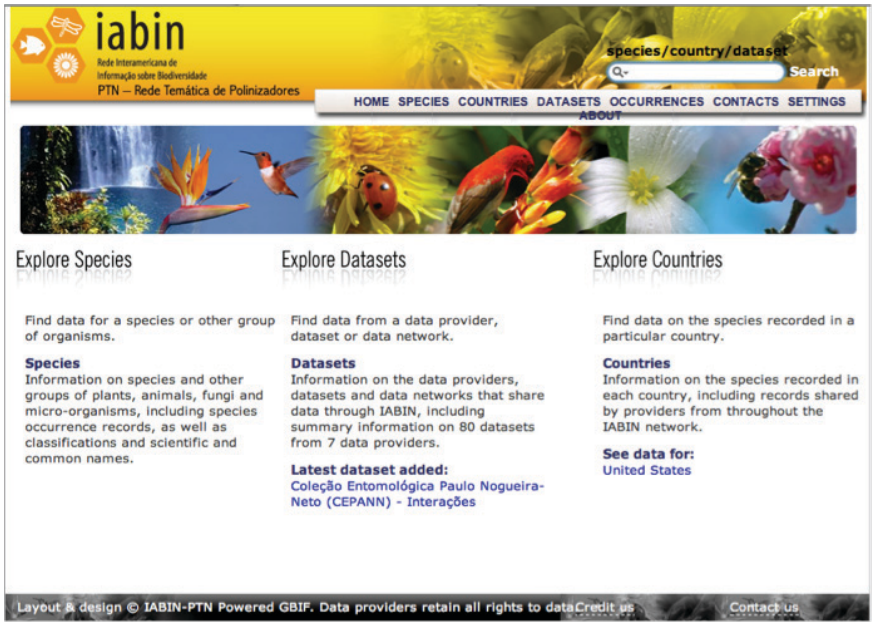
The IABIN Specimen and Species Thematic Network (SSTN), is an electronic, institutional network established to facilitate the digitisation, integration and delivery of digital data of specimens and species from the Americas. To this end, the SSTN developed software tools in coordination with other national, regional and worldwide initiatives. SSTN also facilitates training activities that enable users to adopt these tools and promotes their use by scientists, institutions, other networks and the general public.

The National Biodiversity Institute of Costa Rica (INBio) as the coordinating institution of the SSTN has led the software development process. INBio has made successful use of GBIF's data portal codebase by expanding its functionality, so that the SSTN portal integrates and gives access to species records, provides a user-friendly mechanism to browse species records and gives users different ways of searching, for instance, by common names. In addition, and in order to better serve the needs of users of the SSTN portal, a Spanish interface was also developed.[11]

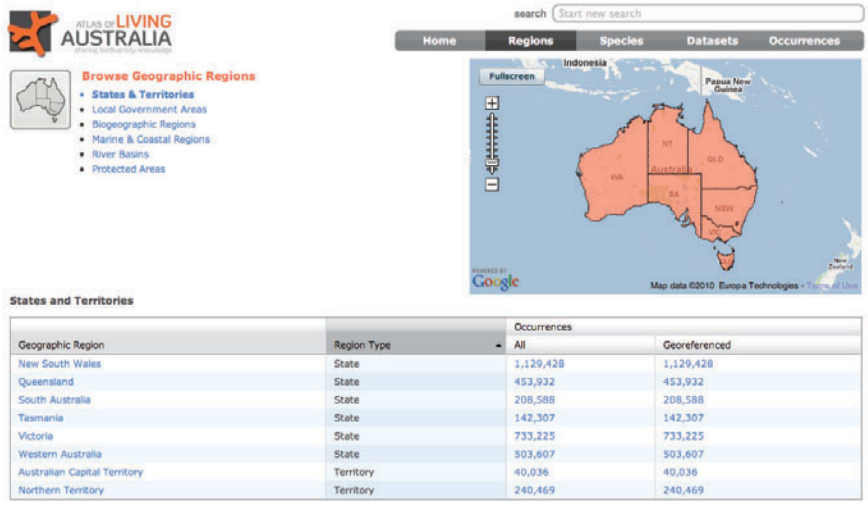
INBio continues to improve the species database portal functionality by taking the needs of other users and communities into consideration and successfully making the following four datasets available through GBIF:

- The Costa Rican Biodiversity Information System - CRBio, partially funded by the Spanish and Norwegian governments;[12]

- The Bhutanese biodiversity website, funded by the Government of the Netherlands, through Fundecooperación and the Programme for South-South Cooperation;[13]
- The 'Baseline Tools for Management of the La Amistad National Park' Project, Costa Rica, funded by the Darwin Initiative;[14] and
- The GBIF Spain Species Data Portal, funded by the Spanish GBIF Node.[15]



IABIN website

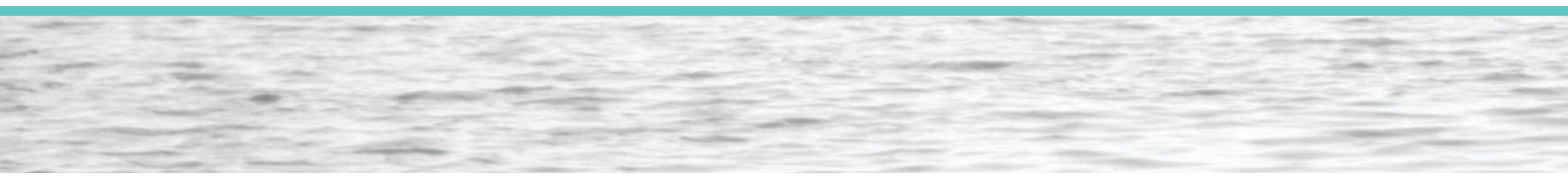


Atlas of Living Australia website

The Atlas of Living Australia

'The Atlas of Living Australia (ALA) is working to integrate all available data on Australian biodiversity. The GBIF portal codebase has been an essential component in starting this work. The software has been customised to recognise state and territory boundaries and other divisions within the continent. The ALA will use it to harvest occurrence data and serve map layers. Using the GBIF portal code will also make it easy for the ALA to act as the national GBIF Node and provide a complete snapshot of Australian data in a compatible form and with quality control based on national gazetteers and species lists.'

Donald Hobern, Director, Atlas of Living Australia



END NOTES

1. http://www.wdpa.org
2. http://www.wdpa-marine.org
3. http://www.iabinpatn.org
4. http://www.groms.de
5. http://www.aquamaps.org
6. http://www.ciat.cgiar.org
7. http://nbii-gbif.ornl.gov/PACountry/PACountry.html#/area/1
8. http://www.vtinverts.org/dataportal.html
9. http://rs.nordgen.org/dwc/
10. http://www.nbii.gov/portal/server.pt?open=512&objID=1055&&PageID=5806&mode=2&in_hi_userid=2&cached=true
11. http://ara.inbio.ac.cr/SSTN-IABIN
12. http://crbio.cr/portalCRBio/
13. http://216.75.53.104/portalBhutan
14. http://www.inbio.ac.cr/pila-darwin/
15. http://www.gbif.es

Financial Information 2009

Financial Statement 2009

GBIF Core Funds	Euros €
Income	3,041,308
Expenditures	
Work Programme 2008/2009 - Informatics	(1,688,582)
Work Programme 2008/2009 - Participation	(752,444)
Governance Committee Costs	(156,188)
Management - Staff Expenditure	(658,745)
Management - Running Expenditure	(300,467)
Management - Secretariat Facilities	(149,965)
Total Expenditures	(3,706,391)
Changes in foreign exchange rates	1,999
Interest	34,155
Result	(628,929)
Assets	
Other Receivables and VAT refund	44,880
Cash and cash at Bank	2,566,500
Total Assets	2,611,380
Retained funds and liabilities	120,101
Provisions	610,014
Supplementary funds	510,131
Auditor	5,913
Prepayments	1,266,308
Other payables	98,913
Total equity and liabilities	2,611,380
GBIF Supplementary funds	
Balance at January 1	551,714
Income	363,986
Expenditure	(405,569)
Balance December 31	510,131

Basic Financial Contributions 2009

Voting Participants	Financial Contributors
Argentina	CONICET - Museo Argentino de Ciencias Naturales
Australia	CSIRO Entomology
Belgium	Belgian Federal Science Policy Office
Canada	Agriculture and Agri-Food of Canada
Costa Rica	Asociación Instituto Nacional de Biodeversidad (InBio)
Denmark	Danish Natural Research Council
Equatorial Guinea	CICTE - Council of Scientific and Technological Investigations
Estonia	Ministry of Environment
Finland	Academy of Finland
France	Ministère de Lénseignement Supérieur et de la Recherche
Germany	German Aerospace Centre / DFG
Iceland	Ministry for the Environment
Ireland	National Parks & Wildlife Service
Japan	Japan Science and Technology Agency
Mauretania	Ecole Normale de Supérieure de Nouakchott
Mexico	CONACYT
Netherlands	Ministry of Education, culture and Science
New Zealand	Ministry of Research, Science and Technology
Norway	The Research Council of Norway
Peru	Instituto to Investigation de la Amazonian Peruana (IIAP)
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	National Research Foundation
Spain	Ministry of Education and Science
Sweden	Swedish Research Council
Tanzania	Tanzanian Commission for Science and Technology (COSTECH)
United Kingdom	BBSRC, Polaris House Swindon
	NERC, Polaris House Swindon
	Royal Botanic Gardens, Kew
	Natural History Museum
	Joint Nature Conservation Committee
	DEFRA
USA	National Science Foundation
Uruguay	Jefa Departemanto Biodiversidad

Grants Received 2009

Harvard (GSAP-NHC)	USD 5.000
Copenhagen University (IT)	EUR 22.845
Copenhagen University (Salaries)	EUR 8.063
Inst. De Recherche pour le Developpement	EUR 140.000
Ishøj Kommune	EUR 14.854
Sloan Foundation	USD 45.000
World Meteorological Organization	CHF 50.000
Flandern Marine Institute	EUR 10.000
euroGEOSS	EUR 46.252

Secretariat Staff 2009

Management and General Service Staff

Executive Secretary / Director:
Nicholas King

Deputy Director for Management & International Relations:
Hugo von Linstow

Office Manager & PA to the Director:
Susanne Lønstrup Sheldon

ICT Support Officer:
Anne Mette Nielsen

Financial Officer:
Bo Thorsteinsson

Work Programme Assistant Officer:
Louise Scharff

Informatics

Head of Informatics:
Samy Gaiji

Systems Architect:
Tim Robertson

Webmaster and Network Administrator:
Ciprian Vizitiu

System Administrator:
Andrei Cenja

Data Portal Manager:
Andrea Hahn

Programmer:
Jose Miguel Cuadra Morales

Programmer Assistant:
Kyle Braak

Senior Developer:
Markus Döring (Consultant)

Access, Standards and Content

Senior Programme Officer for Inventory, Discovery and Access: (IDA)
Éamonn Ó'Tuama

Senior Programme Officer for Digitisation and Mobilisation of Primary Biodiversity Data: (DIGIT)
Vishwas Chavan

Senior Programme Officer for the Electronic Catalogue of Names of Known Organisms: (ECAT)
David Remsen

Technical Assistant (ECAT):
Nikolas Ioannou

Participation

Head of Participation:
Eric Gilman (from April to October)

Senior Programme Officer for Nodes:
Juan Bello

Programme Assistant for Nodes:
Mélianie Raymond (from May)

CEPDEC Intern:
Simone Niedermüller (until May)

Senior Programme Officer for Outreach:
Beatriz Torres (until February)

Programme Officer for Training:
Alberto González-Talaván

Communication and Outreach

Senior Programme Officer for Communication and Outreach:
Francois Rogers (from November)

Communications Programme Assistant:
Caterina Schwedt (from September)

Committees 2009

GBIF Governing Board, Standing Committees and Task Groups

Elections for some of the committee positions were held at the 16th Governing Board meeting in October 2009 where new officers were elected. These new officers will be presented in the 2010 Annual Report.

Executive Committee

Chair	David Penman
1st Vice Chair	Keiichi Matsuura
2nd Vice Chair	Christoph Häuser
3rd Vice Chair	Gladys Cotter
Committee Chairs	
Science	Erick Mata
Budget	Lars Nilsson
Nodes	Francisco Pando
Rules	Joanne Daly
Ex-officio	
Exec. Secretary	Nick King

Science Committee

Chair	Erick Mata
Vice Chairs	Daphne Fautin
	Mark Graham
Work Area Chairs	
DIGIT	Walter Berendsohn
ECAT	Yde de Jong
IDA	William Ulate
Outreach	Carmen Quesada
Ex-officio	
Chair GB	David Penman
1st Vice Chair GB	Keiichi Matsuura
2nd Vice Chair GB	Christoph Häuser
3rd Vice Chair GB	Gladys Cotter
Chair Node Managers Committee	Francisco Pando
Exec. Secretary	Nick King

Budget Committee

Chair	Lars Nilsson
Vice Chairs	Helmut Kühr
	Peter Schalk
Members	Bonnie C. Carroll
	Shunichi Kikuchi
Ex-officio	
Chair GB	David Penman
Exec. Secretary	Nick King

Node Managers Committee

Chair	Francisco Pando
Vice Chairs	Jim Croft
	Dag Terje Endresen
Members	All Node Managers

Rules Committee

Chair	Joanne Daly
Vice Chair	Mark Fornwall
Members	E. Manrique Reoal
	William Alex Gray
	Fabian Haas

Task Groups

Metadata Implementation Framework Task Group

Co-chairs	Matt Jones
	Nic Bertrand
Members	Á. Suárez-Mayorga
	Burke Chih-Jen Ko
	Dave Watts
	Jörg Holetschek
	Melanie Meaux
	Vivian Huchison
Secretariat	Éamonn O'Tuama

LSID-GUID Task Group

Co-chairs	Greg Riccardi
	Richard White
Members	Phil Cryer
	Roger Hyam
	Chuck Miller
	Nicola Nicolson
	Rod Page
	Jonathan Rees
	Kevin Richards
Secretariat	Éamonn O'Tuama

Multimedia Resources Task Group

Chair	Robert Morris
Members:	Greg Riccardi
	Greg Whitbread
	Vijay Barve
	Gregor Hagedorn
	Annette Olson
	Patrick Leary
	Ivan Teage
	Dimitry Mozzherin
	Chris Freeland
	Mihail Carausu
Secretariat	Vishwas Chavan

Content Needs Assessment Task Group

Co-chairs	Daniel P. Faith
	Ben Collen
Members	Leslie Underhill
	Jeremy Kerr
	Patricia Koleff Osorio
	Arturo H. Ariño
	Henrik Enghoff
	John Guinotte
Secretariat	Vishwas Chavan

Data Publishing Framework Task Group

Co-chairs	Tom Moritz
	S. Krishnan
Members	David Roberts
	Donat Agosti
	Peter Ingwarsen
	Philippa Benson
	Matthew Cockerill
	Lyubomir Penev
Secretariat	Vishwas Chavan

Resources 2009

GBIF Training CDs

All GBIF training CDs are available at: http://www.gbif.org/participation/training/resources/gbif-training-cds/

GBIF Participant Node Management - Course CDs

The GBIF training courses on 'GBIF Participant Node Management' have been compiled into interactive CDs: information about GBIF, how to build a GBIF Participant Node, how to engage data providers, etc. together with the latest information about the GBIF resources: the GBIF Data Portal, the GBIF Integrated Publishing Toolkit, GBIF Training Materials, etc.

GBIF Promotional Country - CDs / DVDs

- Brunei Darussalam
- Cambodia
- Chile
- Czech Republic
- Indonesia
- Kazakhstan
- Laos PDR
- Macedonia
- Malaysia
- Morocco
- Myanmar
- Nepal
- Panama
- Philippines
- Russian Federation
- Singapore
- Thailand
- Vietnam

GBIF Standards - Course CD

The GBIF Standards Course CD includes information about the biodiversity informatics standards used by GBIF, together with information about the GBIF Integrated Publishing Toolkit, as an example of an informatics application that makes use of those standards. This information derives from a course on biodiversity informatics standards held in June 2009 in Cape Town (South Africa).

'Numérisation et Publication des Données sur la Biodiversité' - Course CD

The GBIF SEP-CEPDEC Regional Meetings include a relevant training component on biodiversity data digitisation and publication (from the project planning phase to the GBIF Integrated Publishing Toolkit use). Other topics such as GBIF Participant BIF creation and management or IPR issues are also tackled. All the information distributed in those courses has been compiled and is now available on this CD.

Helpdesk Experts on the GBIF IPT - Course CD

The IPT course CD contains plenty of materials on the GBIF Integrated Publishing Toolkit, especially addressed to those interested in getting involved in the development and the deployment of the tool, including those, who are interested in participating in the Distributed Helpdesk Network for the benefit of their communities and regions.

GBIF Posters 2009

All GBIF posters are available at: http://www.gbif.org/communications/resources/posters/

1. GBIF: mobilising information for adapting agriculture to climate change, Adapting Future Agricultural Production to Climate.
2. GBIF: Providing means for evaluating the impact of climate change on crop wild relatives, Biodiversity: Enhancement of Resilience or Facilitating Transformation?
3. Using GBIF to forecast climate change impacts on marine resources, Adapting Coastal Zone and Marine Resources.
4. Enabling Long-Term Climate Policy, Lessons from GBIF – global infrastructure, data and tools to inform climate and biodiversity policy.
5. GBIF Data Portal.
6. The GBIF Harvesting and Indexing Toolkit (HIT).
7. Integrated Publishing Toolkit (IPT).
8. Metadata - a Core Component of the GBIF Network.
9. Mobilising Primary Biodiversity Data associated with EIAs.
10. Data Publishing Framework: Unlocking access to the untapped world of primary biodiversity data.
11. SEP-CEPDEC, Facilitating access and use of biodiversity data to underpin sustainable development in African and Asian francophone countries.
12. Regional approach in training: the successfull example of South Africa.
13. Global Biodiversity Information Facility Strategic Applications.
14. Integrating GBIF-enabled Data with the Global Registry of Migratory Species (GROMS).
15. Integrating GBIF-enabled Data with the World Database on Protected Areas (WDPA).

Memoranda of Cooperation 2009

MoCs signed in 2009

ASEAN Centre for Biodiversity
http://www.aseanbiodiversity.org/

GBIF France
http://www.gbif.fr/

International Association for Impact Assessment
http://www.iaia.org/

Thomson Reuters
http://thomsonreuters.com/

International Plant Names Index
http://www.ipni.org/

Pensoft Publishers
http://pensoftonline.net/zookeys/index.php/journal/index

Acronyms and Glossary

ABBIF	Amazon Basin Biodiveristy Information Facility
ACB	ASEAN Centre for Biodiversity
ALA	Atlas of Living Australia
ANDINONET	BioNET's Andean Country Network
API	Application Programming Interface
ASEAN	Association of Southeast Asian Nations
ASEANET	BioNET's South East Asian Network
BGCI	Botanic Gardens Conservation International
BHL	Biological Heritage Library
BIF	Biodiveristy Information Facility
BioCASE	Biological Collection Access Services for Europe
BioNET	BioNET-INTERNATIONAL
CBD	Convention on Biological Diversity
CBOL	Consortium for the Barcode of Life
CEPDEC	Capacity Enhancement Programme for Developing Countries
CETAF	Consortium of European Taxonomic Facilities
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CMS	Convention on Migratory Species
CoP	Conference of Parties (of United Nations Conventions)
COSTECH	Commission for Science and Technology (Tanzania)
CYTED	Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo (Spain)
DanBIF	Danish Biodiversity Information Facility
DiGIR	Distributed Generic Information Retrieval
DIGIT	Digitisation of Natural History Collection Data (GBIF)
DwC	Darwin Core
EASIANET	BioNET's East Asian Network
ECAT	Electronic Catalogue of Names of Known Organisms (GBIF)
EIA	Environmental Impact Assessment
ELPT	Early Land Plants Today
EoL	Encyclopaedia of Life
EU	European Union
EWT	Endangered Wildlife Trust
FAO	UN Food and Agriculture Organization
GB16	16th Governing Board meeting (GBIF)
GBIFS	Global Biodiversity Information Facility Secretariat
GBRDS	Global Biodiversity Resources Discovery System
GEO	Group on Earth Observations
GEO BON	Group on Earth Observations Biodiversity Observation Network
GEOSS	Group on Earth Observations System of Systems
GISC	GBRDS Implementation Steering Committee
GNA	Global Names Architecture
GPSC	Global Pollinator Species Campaign
GROMS	Global Registry on Migratory Species
GSAP-NHC	Global Strategy and Action Plan for Mobilisation of Natural History Collections Data
GUID	Globally Unique Identifier
HIT	Harvesting and Indexing Toolkit (GBIF)
IABIN	Inter-American Biodiversity Information Network
IAIA	International Association of Impact Assessments
IARU	International Alliance of Research Universities

ICIMOD	International Centre for Integrated Mountain Development
ICIPE	African Insect Science for Food and Health (form. International Centre for Insect Physiology and Ecology)
ICZN	International Commission on Zoological Nomenclature
IGO	Inter-governmental organisation
ILTER	International Long Term Ecological Research
INBio	Asociacíon Instituto Nacional de Biodiversidad (Costa Rica)
IPCC	Intergovernmental Panel on Climate Change
IPNI	International Plant Names Index
IPT	Integrated Publishing Toolkit
IUCN	International Union for the Conservation of Nature
ISIS	International Species Information System
ITIS	Integrated Taxonomic Information System
IYB	International Year of Biodiversity
LSID	Life Science Identifiers
MoC	Memorandum of Cooperation
MoU	Memorandum of Understanding
MRTG	Multimedia Resources Metadata Schema
MSEF	Major Systematic Entomology Facilities
NLBIF	Dutch Biodiversity Information Facility
NORDGEN	Nordic Genetic Resource Centre
NPT	Nodes Portal Toolkit
NSCA	Natural Science Collections Alliance
OBIS	Ocean Biogeographic Information System
ORNL	Oak Ridge National Laboratory
ODTG	Observational Data Task Group
PBIF	Pacific Biodiversity Information Forum
PRS	Participants Reporting System
RIA	Rich Internet Application
SANBI	South African National Biodiversity Institute
SANBIF	South African Node of GBIF
SAFRINET	BioNET's Southern African Network
SCAR	Scientific Committee on Antarctic Research
SEP	Sud Expert Plantes
SINEPAD	Secrétariat Intérimaire du Volet Environnement du NEPAD
SMEBD	Society for the Management of Biodiversity Data
SPNHC	Society for the Preservation of Natural History Collections
SSTN	Specimen and Species Thematic Network
TanBIF	Tanzanian Biodiversity Information Facility
TAPIR	TDWG Access Protocol for Information Retrieval
TDWG	Taxonomic Databases Working Group
UNEP-WCMC	United Nations Environment Programme - World Conservation Monitoring Centre
UNFCCC	United Nations Framework Convention on Climate Change
USGS-NBII	United States Geological Survey – National Biological Information Infrastructure
VIDA	Vermont Invertebrate Data Alliance
WDCBE	World Data Center for Biodiversity and Ecology
WDPA	World Database of Protected Areas
WFCC	World Federation of Culture Collections
WoRMS	World Register of Marine Species

GBIF Glossary: http://www.gbif.org/index.php?id=604

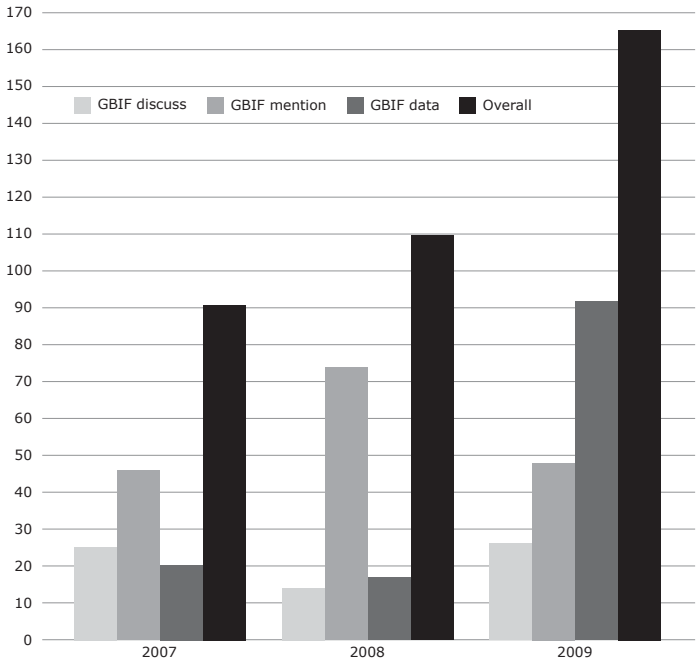
New GBIF Data Publishers 2009

Redpath Museum, McGill University	Canada
Bioresource Collection and Research Center (BCRC)	Chinese Taipei
French Research Institute for Exploitation of the Sea	France
Observatoire Océanologique de Banyuls sur mer	France
Halla Arboretum	Korea, Republic of
Korea Institutie of Water and Enviroment	Korea, Republic of
Kunsan Passage Bird Research Institute	Korea, Republic of
Wooseokheon Natural History Museum	Korea, Republic of
Gyeongsangnam-do forest environment Research Institute	Korea, Republic of
Musée national d'histoire naturelle Luxembourg	Luxembourg
University of Hawaii	PBIF
MACOI - Portuguese Seaweeds	Portugal
ZooKeys	SMEBD
Endangered Wildlife Trust	South Africa
University of Malaga	Spain
National Inventory of Swiss bryophytes	Switzerland
University Museum of Zoology Cambridge	UK
Queen Mary University of London	UK
Royal Botanic Garden Edinburgh	UK
North Carolina State Museum of Natural Sciences	USA
American Museum of Natural History	USA
Ohio State University Acarology Collection	USA
Conservation International	USA
Tulane University Museum of Natural History	USA
Duke University Herbarium	USA
University of Arizona Museum of Natural History	USA
Alabama Museum of Natural History	USA
Auburn University Museum DiGIR Provider	USA
ULM Museum of Natural History	USA
Milwaukee Public Museum	USA
New Mexico Museum of Natural History and Science	USA
Texas Cooperative Wildlife Collection	USA
University of Nevada, Reno	USA
Arizona State University, Global Institute for Sustainability	USA
Consortium of California Herbaria	USA

In 2009, 35 new data publishers registered to the GBIF network with 62 datasets, contributing 3.9 million new records. Of the previously existing publishers, 60 added new datasets during that period, adding 11.7 million records , while others increased the number of records served through existing datasets by another 17.6 million records.

The full list of GBIF data publishers can be found at http://www.gbif.org/participation/data-publishers/who-is-publishing/

Citations 2009



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