

DIGITIZATION OF GABON BIODIVERSITY COLLECTIONS AND DIGITAL OCCURRENCE RECORDS TO CREATE A NATIONAL BIODIVERSITY DATABASE

Programme: BID

Project ID: BID-AF2020-122-NAC

Project lead organization: National School of Water and Forests

Project implementation period: 1/4/2021 - 31/3/2023

Report approved: 24/2/2022

Narrative Midterm report

Executive Summary

1- Gabon Portal Launch: On October 21st, 2021, we publicly launched the Gabon Biodiversity Portal (gabonbiota.org). Using Symbiota software the portal serves both as a data management tool and data exploration platform. The portal is available in both French and English.

2- Digitization and Mobilization: Since the beginning of the project, we have digitized and mobilized 5,107 specimen-based occurrence records. We are working to georeference and link photographs to many specimens in the Gabon Portal before publishing them to GBIF.

3- Publishing to GBIF: On December 7th, we published our first dataset from the Gabon Portal on GBIF. This dataset of amphibians includes 520 occurrence records, which increased the total number of amphibians on GBIF by 15%. Many specimens have could be considered “extended” specimens with photos and disease infections loads linked in the portal and GBIF.

4- Workshop: Training of national experts on the digitization of biodiversity data in Gabon. This activity took place during the national workshop that was organized from 22 to 26 November 2021. The workshop focused on training participants about digitization mobilization using Symbiota. Dr. Ganglo provided detailed overviews about GBIF.

5- Participation at TDWG (October 2021): Three members of the project participated in a workshop to Translate TDWG Controlled Vocabularies in October 2021. We also presented a poster about the Gabon Portal.

6- Software development. Our Mbaza Artificial Intelligence software for identifying terrestrial mammals from camera traps was updated in October 2021. The main updates were (1) improved stability and error handling, (2) improved user interface, (3) output Darwin Core format for direct integration with the Gabon Portal and GBIF.

Progress against milestones

Has your project published at least one dataset through GBIF.org?: Yes

Dataset published:

Has at least one member of your project team received certification following the BID capacity enhancement workshop?: No

Rationale: We are sorry that we did not submit our exercises at the set time. the first reason is that the second workshop convened by the GBIF executive secretariat on 22 november 2021 was in the middle of a workshop on the digitisation of biodiversity data. it was difficult for me to attend both workshops at the same time. I first focused on the two mid-term reports (technical and financial) to be submitted before January 31, 2022. However, I undertake to submit my exercises before February 05, 2022. I assure you that such inconvenience will not happen again thereafter. thank you for understanding and granting me this indulgence.

Report on Activities

Activity progress summary

1- List all biodiversity collections and camera trap databases to have an overview of all vertebrate specimens and occurrence records. One collection, managed by IRET, still needs an inventory. Because the collection is located at a remote site (Ipasa Field Station) and restrictions for in-country travel due to COVID-19, this inventory has been delayed. The collection was visited in January 2022 and a report is currently being compiled.

2- Formalise the partnership agreements Formalise the working partnership between the participating institutions. the new dates are Jan-22 June-22. To date, no formalities have been carried out, there are existing collaboration agreements that are not very recent. With the COVID-19 crisis, it is difficult to meet in person. The formal agreement will be signed before 31 June 2022.

5- Transcribe paper records to Excel. We have met our targets, by digitizing and mobilizing ~625 specimen records/month. The planned dates are from 01-Apr-21 to 01-Jan-2023. IRAF digitized 2983 fish specimens (from field notes to excel files). These have been mobilized to the Gabon Portal. All of the Gabon Biodiversity collections (Amphibians, Birds, Fish, Mammal; 1790 specimens) have been digitized and mobilized to the Gabon Portal. Every specimen has also been photographed. These photos are hosted on the Arizona State University servers, and we are currently linking them to specimens in the database.

4- Complete the development of a software tool (Mbaza AI) for camera trap data. The prototype will be developed into a functional product. 01-Apr-21 31-Aug-21. This activity is completed, the Mbaza software is working. We are currently processing the first batch of 45,000 photographs.

5- Prepare online training materials for digitization with Mbaza AI software and Symbiota. A detailed, 50-page guide to Symbiota was translated into French in July 2021. We have been made freely available online (https://github.com/GJongsma/Symbiota-light/blob/master/docs/SymbiotaGuide_French_v1.1.pdf). We have also produced (and continue to produce) video tutorials with French subtitles about data management and digitization with Symbiota (<https://www.youtube.com/channel/UC7glMVLrNtA6ES3VTsci7iQ>).

6- Organize the 1st training workshop on digitization and Symbiota. The workshop was delayed due to the availability of funds and COVID-19. The new dates are Aug-2021 Nov-2021.

7- First training workshop on digitization and mobilization. This workshop was delayed due to COVID-19. Original date: 05-Jul-21 09-Jul-2; Actual Dates: 22-Nov-21 26-Nov-21 This activity was a success. There was participation was of 10 partner institutions and 17 technicians. A workshop report is available.

8- Specimen/camera trap occurrence data entry and upload to Symbiota and GBIF. This has been delayed. The Mbaza software is working and now produces Darwin Core files as output. We continued to classify existing image databases, including 45,000 images with 40 mammal species collected between 2018 – 2021

by the National Parks Agency of Gabon from 200 cameras deployed in 7000 km² of forest. These are nearly ready to export as Darwin Core and submit to GBIF and the Gabon Portal. External partner also completed species ID for a database with ~1 million images. We will work to add the first database of camera trap-based occurrences to the Gabon Portal and GBIF by March 2022.

9- Testing of Mbaza AI software within partner organizations. The software has been successfully tested on a dataset of 45,000 images. We detected ~35,000 animals. These occurrences will be smaller after we filter the data to minimize the same individuals being photographed on the same day.

10- Workshop 2: Advanced methods in digitization. Original dates: 2022-06-05 - 2022-06-09. Revised dates: 2022-11-01 - 2022-11-05.

11- Workshop 3: Machine learning and digitization. This workshop is going forward as planned but will be hosted at ENEF instead of Lope National Park.

12- Workshop 4: Machine learning and digitization. This workshop is going forward as planned but will be hosted at ENEF instead of Lope National Park.

13- Specimen data entry and upload to Symbiota and GBIF. This work is moving forward as planned. We have mobilized >5000 specimen-based occurrence records to the Gabon Portal. Within the portal we are georeferencing, updating identifications, and linking photographs to specimens. We have mobilized the Gabon Biodiversity Collection's Amphibian database to GBIF. The GBC is now the second-largest contributor of amphibian specimen records on GBIF. The GBC is a top 5 contributor of media files (including live and specimen photos) for all of Africa.

Completed activities

Activity: list all biodiversity collections and camera trap databases in order to have an overview of all vertebrate specimens and occurrence records. "Contact each institution and ask for the complete list of vertebrate specimens. As well as 2 contact points ENEF,

Description: Contact each institution and seek complete list of vertebrate specimen of ENEF, IRET, IRAF, Smithsonian in Gamba.

Start Date - End Date: 1/5/2021 - 28/2/2021

Verification Sources: mid-term progress monitoring table

Activity: 2/ Formalize partnership agreements

Description: Formalize the working partnership between the participating institutions to date no formalities have been made, there are collaboration agreements that exist and are not very recent? With the covid crisis it is almost difficult to meet face-to-face there is only the video option left which is not very suitable for signing conventions.

Start Date - End Date: 2/1/2022 - 30/6/2022

Verification Sources: mid-term progress monitoring table

Activity: 4/ Convert all Excel field notes to comma separated values (.csv)

Description: Each institution is responsible for converting all specimen data to a digital version (.csv). Some collections are already in .csv format. All data will be normalized using DwC terms before the end of the project. new dates will make it possible to make up for this delay.

Start Date - End Date: 1/4/2021 - 31/1/2023

Verification Sources: mid-term progress monitoring table

Activity: 5/ Complete the development of a software tool (Mbaza AI) for camera trap data.

Description: The prototype will be developed into a functional product. it is currently paid, delivered and available. it only remains to test it in national parks.

Start Date - End Date: 1/4/2021 - 31/8/2021

Verification Sources: mid-term progress monitoring table

Activity: 6/ Purchase of computer equipment for ENEF

Description: It is necessary to specify which are the key purchases. Due to the delay in the availability of funds, we have brought forward the date of the purchases. The purchases were made from a new dates. The key IT equipment are computers, switches, routers, software and the installation of the wifi network in the digitisation workshop room.

Start Date - End Date: 1/8/2021 - 30/9/2021

Verification Sources: mid-term progress monitoring table

Activity: 7/ Prepare the e-learning material for digitisation with Mbaza AI and Symbiota software.

Description: Organise the elements of the online training into a coherent programme and organise the translation into French. due to the late availability of the GBIF grant we have shifted the dates of preparation. however, we have maintained the preparatory meetings on the organisation of the digitisation workshop. the preparation of the room and the purchases started in August 2021.

Start Date - End Date: 1/8/2021 - 26/11/2021

Verification Sources: mid-term progress monitoring table

Activity: 8/ Organise the 1st training workshop on digitisation and Symbiota and Mbaza AI

Description: Plan travel, accommodation, reception logistics and the availability of participants. a delay due to the late availability of the grant was noted. we have brought forward the dates. the new dates 01-May-21 30-June-21 Aug-21 Nov-21 this activity went well the workshop was held and the participants were mobilised some participants were unable to attend because of the corona virus,

Start Date - End Date: 1/8/2021 - 30/11/2021

Verification Sources: mid-term progress monitoring table

Activity: 9/ 1st training workshop on digitisation and Symbiota and Mbaza AI

Description: 5-day training on digitisation and data management in Symbiota and Mbaza AI 05-Jul-21 09-Jul-21 22-Nov-21 26-Nov-21 this activity was carried out, the participation was of 10 partner institutions and 17 technicians? 4 trainers were mobilised. a workshop report is available

Start Date - End Date: 22/11/2021 - 26/11/2021

Verification Sources: workshop report

Report on Deliverables

Deliverables progress summary

1/ Dataset Title: Gabon Biodiversity Collection (GBC)

Dataset Type: Occurrences

Dataset Description and Scope: Gabonese collections represent high taxonomic diversity. They span the entire country. Specimens have associated data that includes, at a minimum: locality, collection data, and collector(s). More recent collections also have ecological, genetic, and photographic information associated with them.

Approximate # of Records: 13500

Data Holders: Gabon Biodiversity Network (ENEF, IRAF, IRET, SI-GBP)

Expected Host Institution: ENEF

Sampling Methodology: : Various collecting trips across Gabon since the 1970s.

Current Format: Partially Digitized

the amphibian collection are published by the Smithsonian Biodiversity Program. The next collections who's published are collections of fish by ENEF and IRAF, herpetofauna collection by ENEF and IRAF, the plants by USTM, IRET and national herbarium.

2/Dataset Title: Gabon Terrestrial Vertebrates occurrence data

Dataset Type: Occurrences

Dataset Description and Scope: Terrestrial mammals records from camera trap images and videos. We estimate approximately 50 species are included in these data. Geographic coverage at a 6 x 6km grid square resolution is estimated to be >20000 km² across all of Gabon's regions. Data were collected from approximately 2000 to 2020.

Approximate # of Records: 1000000

Data Holders: Multiple

Expected Host Institution: ANPN

Sampling Methodology: Camera traps

Current Format: Partially Digitized

this deliverable has not yet been achieved. we focused on the development of the prototype of the Mbaza software. once the Mbaza software is available, several data will be produced, then processed and published.

3/Documentation and Tutorials

We will provide documentation and recorded tutorials about digitization and importing records to the Symbiota database and from there to GBIF. For camera trap records, this will include full documentation for Mbaza AI. We will also provide tutorials on how to utilize databases like GBIF in research. Providing these resources in French will be extremely valuable to many countries in Sub-Saharan Africa and beyond. this deliverable has been achieved to date. the documents that translate the use of Symbiota are available and were used during the workshop from November 22 to 26, 2021. concerning Mbaza the prototype is available and paid for so the user documents are also available to date.

4/Software Fully deployment of the Mbaza AI application, a custom, offline, database-driven software tool that allows users to easily analyse and submit new camera trap records to a centralised database, from where records will be submitted to GBIF using the REST API. The Mbaza app's special features will include automated analyses of species distributions in Gabon using occupancy modeling and fully automated labeling of camera trap data using machine learning algorithms. A working prototype is available here

<https://github.com/Appsilon/wildlife->

this deliverable has been achieved to date. it remains to test the software.

5/ Workshops Workshop I: Introduction to Digitization: During our first workshop (July 05-09, 2021), we will train 15 personnel from partner organisations on technical aspects of digitization and mobilizing natural history collection and camera trap data. Workshops will cover DarwinCore terms for standardizing data across several institutions, databasing with Symbiota, and finally making these records publically available on GBIF. This workshop will be a virtual workshop led by international experts of UF, CU, and ASU. Hosted by ENEF.

this deliverable is achieved. the workshop took place from November 22 to 26, 2021. 4 trainers were mobilized, two were able to go face-to-face and the other two intervened by video. instead of 15, 17 local experts were trained for 5 days.

Progress towards deliverables

Dataset deliverables

Gabon Biodiversity Collection - Amphibia

Dataset type: Occurrences

Dataset scope: The GBC amphibian collection is the second largest contributor of Gabon amphibian specimens globally. Its publication increased the total number of Amphibian specimens from Gabon on GBIF by 15%. This database represents many "extended" specimens. Nearly half of the specimens have associated media (both photos of the specimens alive and after preservation) and disease data. The GBC is among the top 5 contributors of media-associated specimens for all of Africa. Number of records: 520

Number of records: 520

Data holder: Smithsonian Gabon Biodiversity Program

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 99%

Status update: Initial GBIF publication: November 2021. Updated 24 January 2022. We are still linking photos to specimens. There are 900 photos (live and preserved specimens) to link to specimens.

DOI: <https://doi.org/10.15468/fze7sg>

Expected date of publication:

Gabon Biodiversity Collection - Aves

Dataset type: Occurrences

Dataset scope: Dataset scope: The GBC bird collection has been mobilized to the Gabon Portal (<https://gabonbiota.org/portal/collections/misc/collprofiles.php?collid=21>). 78 specimens representing: 24 families 38 genera 51 species All bird specimens have been photographed and these media are in the Gabon portal. We are in the process of linking them to the specimens.

Number of records: 78

Data holder: Smithsonian Gabon Biodiversity Program

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 75%

Status update: Work required before publishing to GBIF: -5 specimens need to be digitized. -73specimens need to be georeferenced. -Link photos to specimens (All specimens have photographs and we are in the process of linking them in the Symbiota Portal).

DOI:

Expected date of publication: 2022-03-15

Gabon Biodiversity Collection - Fish

Dataset type: Occurrences

Dataset scope: The GBC fish collection has been mobilized to the Gabon Portal

<https://gabonbiota.org/portal/collections/misc/collprofiles.php?collid=22> 786 specimen records representing: 30 families 44 genera 52 species

Number of records: 786

Data holder: Smithsonian Gabon Biodiversity Program

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 70%

Status update: -206 (26%) identified to species -20 (3%) georeferenced We are working to link photo and georeference specimens before publishing to GBIF. We will work with Ichthyologists at IRAF (partner institution on project) to identify specimens to species.

DOI:

Expected date of publication: 2022-10-15

Institut de Recherches Agronomiques et Forestières (IRAF-Poisson)

Dataset type: Occurrences

Dataset scope: We have digitized and mobilized ~30% of the IRAF fish collection online, to the Gabon Biodiversity Portal (<https://gabonbiota.org/portal/collections/misc/collprofiles.php?collid=16>). There are 2,983 specimen records representing: 35 families 38 genera 50 species

Number of records: 2,983

Data holder: Institut de Recherches Agronomiques et Forestières

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 30%

Status update: The IRAF fish collection is the largest vertebrate collection in Gabon. We have digitized and mobilized nearly 3000 specimens out of an estimated 10,000. We continue to digitize our holdings and are working to georeference existing specimens.

DOI:

Expected date of publication: 2023-01-01

Gabon Biodiversity Collection - Mammals

Dataset type: Occurrences

Dataset scope: The GBC mammal collection has been mobilized to the Gabon Portal

(<https://gabonbiota.org/portal/collections/misc/collprofiles.php?collid=18>) 99 specimen records representing: 16 families 24 genera 25 species

Number of records: 99

Data holder: Smithsonian Gabon Biodiversity Program

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 75%

Status update: Status update: 99 specimen records 0 georeferenced 62 (63%) with images (404 total images) 93 (94%) identified to species All records have been mobilized to the Gabon Biodiversity Portal. We are in the process of georeferencing and linking photographs.

DOI:

Expected date of publication: 2022-06-15

Gabon Biodiversity Collection - Reptiles

Dataset type: Occurrences

Dataset scope: The GBC Reptile collection has been mobilized to the Gabon Portal

(<https://gabonbiota.org/portal/collections/misc/collprofiles.php?collid=17>) 345 specimen records representing: 21 families 48 genera 60 species

Number of records: 345

Data holder: Smithsonian Gabon Biodiversity Program

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 90%

Status update: Status update: 9 georeferenced (<1%) 1,022 total images 292 (85%) identified to species We are in the process of linking photographs and georeferencing species.

DOI:

Expected date of publication: 2022-07-15

Port Elizabeth Museum Reptilia (PEM-R)

Dataset type: Occurrences

Dataset scope: This dataset represents Port Elizabeth Museum's Gabon collection of Reptiles. These collections were made between 2000 and 2003, primarily in Ogooué-Maritime Province. This collection is housed at PEM in Port Elizabeth, South Africa. We are working with the curator of Herpetology (Werner Conradie) to help mobilize their entire collection to GBIF. 344 specimen records representing: 20 families 51 genera 72 species

Number of records: 344

Data holder: Port Elizabeth Museum

Data host institution: Arizona State University Biodiversity Knowledge Integration Center

% complete: 99%

Status update: 344 specimen records 302 (88%) georeferenced 323 (94%) identified to species

DOI:

Expected date of publication:

Gabon Terrestrial Vertebrates occurrence data

Dataset type: Occurrences

Dataset scope: Terrestrials mammals records from camera trap images and videos. We estimate approximately 50 species are included in these data. Geographic coverage at a 6 x 6km grid square resolution is estimated to be >20000 km² across all of Gabon's regions. Sampling Methodology: Camera traps Current Format: Partially Digitized

Number of records:

Data holder: Multiple

Data host institution: Agence Nationale des Parcs Nationaux

% complete: 10%

Status update: Occurrences in this database are derived from camera traps (200 cameras deployed in 7000 km² of forested area). There are many data holders contributing to this database. Raw data, based on artificial intelligence algorithms (See Mbaza Software development section for details) has detected ~35,000 animals in the first round of ~45,000 photographs. Before mobilizing any data, trained participants will review each photo that detected an animal to confirm or reidentify the species. Before mobilizing our data to the Gabon Portal and GBIF, we will filter total occurrences to daily occurrences to limit counting the same individual multiple times. This process will reduce the total number of occurrences. We plan to analyze ~ 1 million photos using our Mbaza software by the end of the project.

DOI:

Expected date of publication: 2022-12-01

Other deliverables

Documentation and Tutorials

Description: We will provide documentation and recorded tutorials about digitization and importing records to the Symbiota database and from there to GBIF. Providing these resources in French will be extremely valuable to many countries in Sub-Saharan Africa and beyond.

% complete: 100%

Status update: complete

Sources of verification: workshop report

Software

Description: Dully deployment of the Mbaza AI application, a custom, offline, database-driven software tool that allows users to easily analyse and submit new camera trap records to a centralised database, from where records will be submitted to GBIF using the REST API. The Mbaza app's special features will include automated analyses of species distributions in Gabon using occupancy modeling and fully automated labeling of camera trap data using machine learning algorithms. A working prototype is available here

<https://github.com/Appsilon/wildlife-explorer> and a preprint paper is available here

<https://www.biorxiv.org/content/10.1101/2020.09.12.294538v2>. The app and the machine learning model were co-created by Appsilon Data Science in Poland as part of their AI for Good initiative and Robin Whytock at ANPN/University of Stirling. It is fully open-source and uses the popular Electron Software Framework, making it easy to update and robust in the long-term to technological change such as new versions of operating systems. Robin Whytock will provide staff at IRET and ANPN with fundamental training on how to contribute to keeping the software up-to-date, such as how to open issues and report bugs on GitHub.

% complete: 100%

Status update: complete

Sources of verification: this software is access. prototype is available here

<https://github.com/Appsilon/wildlife>

Workshops

Description: Workshop I: Introduction to Digitization: During our first workshop (november 22-26, 2021), we will train 17 personnel from partner organisations on technical aspects of digitization and mobilizing natural history collection. Workshops will cover DarwinCore terms for standardizing data across several institutions, databasing with Symbiota, and finally making these records publically available on GBIF. This workshop will be a virtual and presentiel workshop led by national expert of IRAF and international experts of UF, ACU, and ASU. Hosted by ENEF.

% complete: 100%

Status update: complete

Sources of verification: workshop report

Events

Atelier National sur la Numérisation et la Mobilisation des Données sur la Biodiversité Au Gabon

Dates: 2021-11-22 - 2021-11-26

Organizing institution: National Water and Forest School (ENEF Gabon)

Country: Gabon

Number of participants: 17

Comments: A technical workshop presented in French with a focus on digitization, data management, and georeferencing data within the Gabon Symbiota Portal. At the end of the workshop, the data will be transferred within the Gabon portal to GBIF. This workshop is limited to Gabonese researchers working on the BID project BID-AF2020-122-NAC.

Website or sources of verification: <https://www.gbif.org/event/f4e9c7-3782-436c-913a-62adea4/atelier-national-sur-la-numerisation-et-la-mobilisation-des-donnees-sur-la-biodiversite-au-gabon>

Communications and visibility

the project stakeholders are informed of all project activities. the communication is horizontal. indeed, we have project point meetings on zoom after a period of two weeks.

Then each output is prepared by the task leader. this output is discussed and validated during the zoom project point meeting. then the documents are immediately exchanged by email after they have been updated. this inla sharing mechanism says that all stakeholders are at the same level of information.

At the level of the wider GBIF community, key documents are posted on the project webpage (<https://www.gbif.org/project/BID-AF2020-122-NAC/the-gabon-biodiversity-portal>) for everyone to see.

We have added the report of the workshop on the digitisation of biodiversity data in Gabon held from 22 to 26 November 2021 and the mid-term progress monitoring table as a source of verification.oint projet

Monitoring and evaluation

Monitoring and evaluation findings

The two main categories of data are preserved specimen records and camera traps. To date, we have digitised 4,870 specimens, which means that we have reached 36% of our final target. There are 14 months left before the end of the project. Monthly targets that each institution must meet in order for us to reach our goals.

1. IRAF

FISH (30% hits online); 10,000 specimens; 2,983 hit records (30% hits online); 2288 geo-referenced (77%); 2432 identified to species (82%); 7017 specimens to be digitised i.e. a TARGET of 501 specimens/month. AMPHIBIA (0 digitised) ~100 specimens; 14 months to go before the end of the project. The digitization TARGET is 7 specimens / month.

2. Smithsonian, Gamba REPTILES (90% of target); 345 occurrence records; 9 georeferenced (<1%); 292 identified to species (85%); TARGET is to digitize 54 specimens/month. FISH (91%); 786 specimen records; 20 (3%) georeferenced; 1 (0.13%) with images (1 total images); 206 (26%) identified to species; TARGET digitization is 74 specimens (5 specimens/month); georeference 54 specimens/month. AMPHIBIANS (100% hits online); 520 hit records; 318 georeferenced (62%); 236 with images (45%); 509 identified to species (97%); TARGET: 202 specimens to be georeferenced. Must georeference 14 specimens/month to reach our goal.

3. ENEF is making an inventory of the specimens that physically exist in its laboratory. FISH (0 online occurrences); The digitization TARGET is 2000 fish specimens or 142 specimens/month to reach our goal.

Impact of COVID-19 pandemic on project implementation

The covid 19 pandemic had a real impact on the implementation of the project. Some activities could not be carried out within the set timeframe because of the covid control measures, which require special authorisation and a negative PCR test for travel, for example. That said, we were unable to hold the meeting to formalise the collaborations. The digitisation workshop that was planned for July 2021 was postponed to November 2021. Arrangements had been made for it to be held entirely face-to-face, but in the end it was held partly face-to-face and partly virtually. To be able to host online meetings, we had to install wifi in the workshop room.

GBIF leads the Biodiversity Information for Development (BID), a programme funded by the European Union. The programme provides supplementary support for activities addressing the needs of regional researchers and policymakers through mobilization and use of biodiversity data.

