

# Mobilization and use of botanical data as decision-making tools in Gabon

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**Programme:**BID

**Project ID:** BID-AF2020-194-USE

**Project lead organization:**Institut de Pharmacopée et de Médecine Traditionnelle

**Project implementation period:**1/4/2021 - 30/4/2023

**Report approved:** 9/6/2023

## Final Narrative Report

### Executive Summary

The project was implemented according to the initial objectives such as : digitalization of herbarium specimens ; categorization of medicinal, cosmetic, endemic and threatened plants ; habitats modeling of commercial timber and communication tools development. For this purpose the following activities were implemented.

#### i) Meeting launch of project activities

This first physical meeting with the partners of the local institutions was essential to remind researchers and technicians the different tasks and strategies to be implemented for the best running of the project activities.

#### ii) Data mobilization

For herbarium specimen, more than 10 000 herbarium sheets were mounted in total for this specific purpose and stored in the Herbarium National du Gabon collection room. Since many samples were not identified at species level, 7983 were selected for publication (<https://www.gbif.org/dataset/44d6b38d-af49-470a-b03c-438b636d947b#description>). Forest inventory data were mobilized according 2 main datasets. The first dataset is based on 182 temporary plots from 0.1 to 0.25 for biodiversity description of the Crystal Mountains National Park buffer zone publié en mars 2022 (<https://www.gbif.org/dataset/8be5d1f5-802e-4401-9c1c-2e01b67e252c>). Second forestry dataset consists of data extracted from the project entitled “Régénération post exploitation des essences commerciales dans les concessions forestières sous aménagement durable au Gabon” carried in the certified forest concessions of Rougier-Gabon by the Institut de Recherche en Ecologie Tropicale (IRET). The data used come from 652 plots of 30 m<sup>2</sup> established on the skid trails and the 141 others from felling gaps whose sizes vary between 3,8 to 20 m<sup>2</sup> was exploited. This dataset was also published on the GBIF portal.

#### iii) Data categorization

This activity allowed to select approximately 249 herbarium samples of endemic species and 285 type specimens; 85 logged species and 100 cosmetic species specimens for scanning. With regard to medicinal plants, information extracted from bibliographical references led to the publication of the checklist of medicinal plants in Gabon comprising 907 species belonging to 114 families. This checklist gives the vernacular names and the different virtues of plants. The digitization of this category of biodiversity involved 200 herbarium specimens, also including cosmetic plants. For threatened plants, the categorization made it possible to select 411 species of threatened plants from Gabon but the scanning was done 134 herbarium specimens. This component was supported thanks to the interaction with the partners of the project, in particular the MBG which developed a whole project on Threatened Plants of Gabon of which the Herbarium is also a partner. Gabon's 411 threatened plant species are available online at the following addresses :

- <http://legacy.tropicos.org/NameSearch.aspx?IsExact=False&ListID=29306&IncludeActive=True&IncludeInactive=False&OrderBy=1&SortOrder=1&projectid=75>
- <http://legacy.tropicos.org/projectwebportal.aspx?pagename=IntroHVC&projectid=75>

#### iv) Digitalization of herbarium specimens

Data categorization activity allowed to scan more than 2000 specimens by AGS company. Excepted this categorization, digitalization was also done on the fertile specimens representing different families to reach 2000 images according the initial objectives. The entire digitization thus resulted about 2100 images.

#### v) Workshop attendance

Two projects representative, Mboma Raymonde and Engone Obiang Nestor, attended workshops organized by BID-AF2020 between May and November 2021.

Our approach to evaluate the project first consisted to properly monitor the implementation of project activities and then to check the achievement of all objectives. Activities listed above were done by the herbarium team and the partner institutions except the digitalization process implemented by AGS, an international company specializing in the archiving management. After digitalization, monitoring was mainly based on the checking correspondence between images encoding and the label contains of herbarium specimen by the Herbarium researchers.

Generally, the project planned to digitalize 2000 specimens, including cosmetic, endemic, logged, threatened and type specimens; to mobilize 10 000 occurrences data and forestry data; to produce the distribution maps of logged species. For this purpose, all these objectives were significantly achieved and data publications are available on the GBIF portal.

#### vi) Overall impact of the project

The results of this project have an impact on the activities of researchers, students, other data users and on the preservation of specimens.

##### • Specimens digitalization

Digitizing herbarium specimens makes it easier to identify plants in the field. Without access to the specimens in the field, users can directly consult the available images and confirm their identification. This activity can be considered as a beginning of a digital herbarium implementation. In addition, the mapping of species can also facilitate their localisation and accessibility in the field during the botanical harvests by researchers. To implement the national projects or other forestry activities, Gabonese government imposes for Example:

- Carrying environmental and social impact studies before the project's activities implementation
- Carrying Forest management inventories for logging companies

When studying the vegetation of the initial state of the kinguele-aval project on the hydroelectric dam construction (<https://www.gbif.org/dataset/8be5d1f5-802e-4401-9c1c-2e01b67e252c>), the images from scanned herbarium specimens were used to help the plants identification in the field.

##### • Preservation of specimens and limitation of the maintenance costs

The National Herbarium of Gabon is a place open to the public. Technicians, students, researchers and other users regularly consult the specimens which weakens the old specimens collected more than a hundred years ago, for example, or fertile specimens with the risk of losing certain organs such as flowers and fruits. Viewing the images will limit this risk and the costs associated with maintaining these specimens.

##### • Species distribution maps

Species distribution maps are regularly consulted to facilitate botanical data collection in the field. The project results have so a socio-economic impact. In fact, they can be used for example by the consultants or experts of environmental and social impact studies offices to help them to identify plant species in the field, far from national herbarium. They also contribute to solving Gabon's problems on the knowledge of biodiversity such as the endemic and threatened species localisation.

##### • Medicinal plants checklist

The key policy questions and different challenges that the project addressed to increase the uptake of biodiversity data into decision making processes is focused on the following question: What species are used as medicinal plants in Gabon? This project has implemented first time in Gabon the medicinal plants checklist (<https://www.gbif.org/dataset/31dc1507-a6e1-4233-a8df-c7a78596a7e4#description>) recording 922 species. This an important tool to best support policy-makers and data users especially the researcher institutes as IPHAMETRA, CIRMF, CERMEL and Gabonese universities who work on the medicinal plants.

##### • Citation in other works

Data published in the GBIF portal, for example, are also used and cited in other works:

- Biodiversity description of the Crystal Mountains National Park buffer zone

(<https://www.gbif.org/dataset/8be5d1f5-802e-4401-9c1c-2e01b67e252c>), 7 citations since March, 8, 2022

- Gabon Vascular Plant Occurrences (<https://www.gbif.org/dataset/44d6b38d-af49-470a-b03c-438b636d947b>), 1 citation since February, 1, 2023

#### vii) Additional objectives

No major additional objectives were defined during the implementation of the project. But we organized in collaboration with the GBIF regional a restitution workshop that was important to present our results and once again to show the using of the GBIF portal and data publications process.

#### viii) Post project activities

The generation of species mapping on the website is facilitated when:

- Samples contain barcodes
- Samples are georeferenced

However, many specimens in the herbarium do not contain a bar code and others are not georeferenced. These activities also constitute new avenues for setting up new projects. IPHAMETRA is already involved in the project entitled “Digitization and Enrichment of U.S. Herbarium Data from Tropical Africa to Enable Urgent Quantitative Conservation Assessments”. We will lead a georeferencing team at the Herbar National de Gabon to manually georeference those African seed plant records that are not able to be automatically georeferenced from 21 herbaria in the United States whose plant holdings are being imaged and digitized for this project.

#### ix) Recommendations to policy makers

The results of the project about Mobilization and use of botanical data as decision-making tools in Gabon has made significant contributions to improving knowledge of Gabon’s flora, conservation and medicinal plants research. For increasing the uptake of biodiversity data, specifically the results of this project into decision making processes, the following recommendations can be formulated to the policy makers:

- The results of the biodiversity inventories by the environmental and social impact studies offices and the logging companies must provide the evidences of their botanical identification from the specimens of the national herbarium of Gabon for a best documentation on the High Conservation value forests
- Provide the evidences that websites of the national herbarium of Gabon or its partners were consulted to check the presence or absence of the threatened species in the project areas
- Propose a guideline to the offices of the environmental impact studies to uptake the importance of biodiversity in the project areas
- Encourage Gabonese researcher institutes and universities working on the medicinal plants to use Gabonese medicinal plant checklist as one of the basic tools of their research.
- Any medicinal plant used in the local production of medicine or Improved Traditional Medicine (ITM) must have at least one referenced specimen in the National herbarium of Gabon in addition to the other conditions and authorizations relating to its marketing.

## Progress against milestones

**Has your project completed all planned activities?: Yes**

**Has your project produced all deliverables: Yes**

## Report on Activities

Summary of the implementation of the project activities

Activities planned in the project as mobilization, categorization and digitization have significantly evolved.

- Occurrences data

The two first reports contained the data mobilized and categorized up to January 2022, i.e. 7046 occurrences. Between January 2022 and February 2023, more than 4000 new data have been mobilized. Mobilization of occurrences data begins with the mounting of samples before encoding them. About 11000 samples were mounted until February 2023. As some specimens were identified at the genus rang, that led to the publication of around 8000 occurrences after data cleaning.

- Sampling event

This activity allowed to mobilize data from 58 non-permanent plots between May and July 2021. Other data from 123 plots of 0.25 ha mobilized between July 2022 and January 2023 were published. The last forestry data mobilized between January 2022 and April 2023 are the extracted data of the post-logging regeneration of commercial species in forest concessions under sustainable management (FSCM) in Gabon project and provided by IRET. These data coming from 652 plots of 30 m<sup>2</sup> established on the skid trails and the 141 others from felling gaps whose sizes vary between 3,8 to 20 m<sup>2</sup> have also been published.

- Categorization and digitalization

The first task of this activity was to filter the target data in the databases and check if the samples are physically present at the herbarium. Until July 2021, 577 samples had been selected for digitalization. Between July 2021 and January 2022, another 391 specimens were selected and a total of 668 samples have been scanned by the AGS Archive company. Other specimens selected between January and December 2022 allowed to scan about 2100 specimens including endemic, threatened, medicinal, cosmetic, commercial and fertile species specimens.

Excepted the selected specimens to be digitalized, other activities were to extract bibliographic information and of websites as Tropicos to improve the categorization list. This allowed to have the following categorization final list including the images

- 249 endemic species specimens

- 285 types specimens

- 100 cosmetic species specimens

- 411 threatened species

- 904 medicinal species

- 84 commercial species

- Niche modelling of *Aucoumea klaineana*

This activity started with checking the geographic coordinates supposed to be outliers of the *A. klaineana* spatial distribution, the selected species for modelling. No field mission took place because of the bad condition of the Makokou road. This geographic coordinate come from one of the 181 the ANPN forest plots installed for biomass calculation. For this purpose, we selected coordinates from the Herbar National du Gabon database and GBIF portal. In all 757 data was downloaded and submitted to cleaning. Firstly, external occurrences of *A. klaineana* natural range as Ghana, Ivory Coast, Benin, Congo Democratic and Nigeria, were deleted and then the Gabon ones located in the same plots, that permit to retain 595 occurrences. Occurrence data were associated with bioclimatic variables selected after analysis to simulate current and future favorable habitats to *A. klaineana* according to the Maxent utilization process. Bioclimatic variables were downloaded from the Africlim 3.0 (<https://webfiles.york.ac.uk/KITE/AfriClim/>) in the form of 21 bioclimatic variables at a resolution of 30 arc-seconds based especially on precipitation and temperature.

Future climate data were ones detailed in the IPCC 5th assessment report and representative concentration pathways (RCP 4.5 and RCP 8.5). Data were projected on 2085. This activity contributes to the sustainable management of this species or to the implementation of different reforestation strategies in the climatic change context. However, these maps are not published for the moment because of the discussions about the eventual model improvement with the partners and co-authors.

To better fuel discussions with policy makers and have more arguments, it is imperative that these maps are first published in a good scientific journal. We hope that this activity on niche models continues immediately after the project and also extend it to Gabon threatened species.

- Medicinal plants workshop

The BID-AF2020-194-USE project co-organized with IPHAMETRA in September 2022 a workshop dedicated to medicinal plants. This workshop aimed to promote biodiversity through medicinal plants and the local production of Improved Traditional Medicine (MTA) against malaria.

- Restitution workshop of GBIF projects

Workshop organized in collaboration between IPHAMETRA and GBIF projects (BID-AF2020-184-USE and BID-AF2020-040-REG) focused on

- The restitution of the results already obtained from these two GBIF projects currently hosted at IPHAMETRA
- Use of GBIF portal tools - Presentation of the steps for publishing data on the GBIF portal

## Completed activities

### Activity: Data mobilization

**Description:** About 9000 new occurrences have been mobilized after the early progress report

**Start Date - End Date:** 1/8/2021 - 1/2/2023

**Verification Sources:** Publication of occurrences

-[https://ipt-gabon.gbif.fr/resource?r=ga\\_occurrence](https://ipt-gabon.gbif.fr/resource?r=ga_occurrence)

-<https://www.gbif.org/dataset/44d6b38d-af49-470a-b03c-438b636d947b>

### Activity: Data mobilization

**Description:** Forestry data from 775 non-permanents plots have been mobilized after the early progress report

**Start Date - End Date:** 1/8/2021 - 6/4/2022

**Verification Sources:** Publication of 2 sampling event dataset

-[https://ipt-gabon.gbif.fr/resource?r=biodiversity\\_kinguele\\_aval](https://ipt-gabon.gbif.fr/resource?r=biodiversity_kinguele_aval)

-<https://ipt-gabon.gbif.fr/resource?r=regefor>

### Activity: Data categorization and digitalization

**Description:** Categorization and digitalization of:

- o 249 endemic species specimens;
  - o 285 types specimens;
  - o 100 cosmetic species specimens;
  - o 411 threatened species;
  - o 904 medicinal species;
  - o 84 commercial species
- in total 2100 herbarium specimens have been digitalized (scan image)

**Start Date - End Date:** 1/8/2021 - 6/4/2023

**Verification Sources:** The categorization of endemic, threatened and types specimens is available as:

- [https://gab.e-archivsystem.com/log\\_client.aspx](https://gab.e-archivsystem.com/log_client.aspx)

- Login: iphametra

- Pass word: IPHA2023metra

The medicinal plants ckecklist was published on the GBIF portal

<https://ipt-gabon.gbif.fr/resource?r=medecinal-plants>

### Activity: Niche modeling

**Description:** Implementation of distribution of logged species and the currennt and futur suitable habitats of *Aucoumea klaineana* maps

**Start Date - End Date:** 1/8/2021 - 20/4/2023

**Verification Sources:** Spatial distribution maps are available :  
-<http://herbiergabon.fr/gabon/collection/especes/view/6303>; -  
<http://herbiergabon.fr/gabon/collection/especes/view/3384>

The suitable habitats of *Aucoumea klaineana* have been uploaded

## **Activity: Medicinal plants workshop organisation with IPHAMETRA**

**Description:** - Promote biodiversity through medicinal plants

- Identify medicinal plants in the treatment of malaria

**Start Date - End Date:** 12/9/2022 - 16/9/2022

**Verification Sources:** - Final report

- Summaries of presentations book

## **Activity: Restitution workshop of GBIF**

**Description:** Workshop organized in collaboration between IPHAMETRA and GBIF projects (BID-AF2020-184-USE and BID-AF2020-040-REG) focused on

- The restitution of the results already obtained from these two GBIF projects currently hosted at IPHAMETRA

- Use of GBIF portal tools

- Presentation of the steps for publishing data on the GBIF portal

**Start Date - End Date:** 31/1/2023 - 1/2/2023

**Verification Sources:** - Final report

- Workshop program

## **Report on Deliverables**

### **Deliverables - Summary**

The following described deliverables and come from project activities implemented since May 2021 are divided into two main components: the meetings or workshops and mobilization, digitalization, categorization and modelling activities.

#### 1) Meetings to launch and monitor project activities

The first meeting had been organized on May 2021 with the staff of local institutions, especially IRET and ANPN (cf. BID Narrative Early Progress Report). The objective of this meeting was to launch the activities of the project focused on the following points: Data mobilization; Data digitalization; Data categorization; Niche modelling. Large gatherings being limited on the basis of compliance with barrier measures related to COVID 19, eight people were present. List of participants and the meeting report are the verification source of this event (cf. BID Narrative Early Progress Report).

#### 2) GBIF project presentation to CENAREST administration in the meetings with the research institute managers

The directors of CENAREST institutes meet regularly to take stock of the research activities carried out and identify the various international projects housed in each institute. This is how the BID-AF2020-194-USE project has often been presented. The meetings held between February and June 2022 were based on the preparation of the sixth board of directors of CENAREST. Thus, the contribution of GBIF projects in the mobilization and use of biodiversity data in Gabon was included in the final report of this Board of Directors, deliverable of this activity.

#### 3) Medicinal plants workshop

The project co-organized with IPHAMETRA in September 2022 a workshop on medicinal plants. This workshop aimed to promote local production of Improved Traditional Medicine (ITM) against malaria. The final report of this workshop and the book of presentation summaries are the deliverables of this activity.

#### 4) Restitution workshop of GBIF Gabon projects

Workshop organized in collaboration between IPHAMETRA and GBIF projects (BID-AF2020-184-USE and BID-AF2020-040-REG) focused on:

- The restitution of the results already obtained from these two GBIF projects currently hosted at IPHAMETRA

- Use of GBIF portal tools
  - Presentation of the steps for publishing data on the GBIF portal
- Final report of this workshop is the deliverable of this meeting.

## 5) Data Mobilization

### a. Data occurrences

It was planned to mobilize 10,000 occurrence data and publish them on the GBIF portal at the end of the project. Occurrences have been mobilized. This mobilization was based on the mounting of the specimens and their insertion in the Herbarium cabinets. The deliverable of this activity is the publication of Gabon Vascular Plant Occurrences available online:

- <https://www.gbif.org/dataset/44d6b38d-af49-470a-b03c-438b636d947b>
- [https://ipt-gabon.gbif.fr/resource?r=ga\\_occurrence](https://ipt-gabon.gbif.fr/resource?r=ga_occurrence)

### b. Inventory data

All the forestry data mobilized come from 904 non-permanent plots whereas project have planned to mobilize forestry data from 77 plots. The two published datasets constitute the main deliverables of this activity and available on the GBIF portal or the Gabon IPT:

- Biodiversity description of the Crystal Mountains National Park
  - <https://www.gbif.org/dataset/8be5d1f5-802e-4401-9c1c-2e01b67e252c>
  - [https://ipt-gabon.gbif.fr/resource?r=biodiversity\\_kinguele\\_aval](https://ipt-gabon.gbif.fr/resource?r=biodiversity_kinguele_aval)
- Forest dynamic and trees regeneration in the logging gaps in Gabon
  - <https://www.gbif.org/dataset/3eaece88-38a5-4252-9f34-e90b05fdbfba>
  - <https://ipt-gabon.gbif.fr/resource?r=regefor>

## 6) Data categorization

Except the provided tables in the midterm report, others deliverables concern the excel table on commercial and the complete list about threatened species (uploaded). Another deliverable on the medicinal plant species publication is available on the GBIF portal or the Gabon IPT according to the following links :

- Gabon medicinal plants
  - <https://www.gbif.org/dataset/31dc1507-a6e1-4233-a8df-c7a78596a7e4>
  - <https://ipt-gabon.gbif.fr/resource?r=medecinal-plants>
- Threatened plants of Gabon

Missouri Botanical Garden developed a large project on the threatened plants in collaboration with the Herbar National du Gabon. This project listed 411 threatened species and described different HCV in Gabon. These data are available on the following links:

- <http://legacy.tropicos.org/NameSearch.aspx?IsExact=False&ListID=29306&IncludeActive=True&IncludeInactive=False&OrderBy=1&SortOrder=1&projectid=75>
- <http://legacy.tropicos.org/projectwebportal.aspx?pagename=IntroHVC&projectid=75>

Data was extracted from this website to learn more on the thratened species of Gabon.

## 7) Digitalization

All the 2000 specimens planned including endemic, threatened, medicinal, cosmetic and commercial species were digitalized. Fertile specimens were added in this activity to reach 2100 in total. The deliverable of this activity are the images available in our database. Their consultation is accessible to IPHAMETRA account to AGS website as the following link:

- [https://gab.e-archivsystem.com/log\\_client.aspx](https://gab.e-archivsystem.com/log_client.aspx)
- Login: iphametra
- Pass word: IPHA2023metra

Images are also available in the regional data platform of West and Central African herbaria via RHIA (<http://riha.african-herbaria.org/>). As a partner, we provided these images to supply the Gabon collection account. To

image access require a minimum filtering in the Gabon collection as the specimen number. For example, *Berlinia rabiensis* can be sought in RHIA according to the following step:

Collector: Schoenmaker J  
Number :330  
<http://riha.african-herbaria.org/details-echantillon/162714/LBV>

Images are also directly available through onedrive

[https://1drv.ms/f/s!ApF5Q8MuSDTLkQ1yb6qqE\\_VEIBmb?e=Fo6XkA](https://1drv.ms/f/s!ApF5Q8MuSDTLkQ1yb6qqE_VEIBmb?e=Fo6XkA)

## 8) Niche modeling

The first step for this activity was to map the spatial distribution of two species, *Lophira alata* and *Aucoumea klaineana*. These maps are visible on website of the Herbar National du Gabon (<http://herbierygabon.fr/gabon/collection/especes/view/6303>) for *A. klaineana* and (<http://herbierygabon.fr/gabon/collection/species/view/3384>) for *L. alata*. We have then modelled ecological niche for *A. klaineana* for the evocated reasons above. Deliverable are the maps uploaded which characterize potential current and future habitats according to the different climate change scenarios.

Deliverables produced by the project

## Dataset deliverables

## Other deliverables

## Deliverables - Project planning phase

### Digital herbarium

**Description:** The planned list of 2000 classified and digitalized specimens, including threatened, endemic, cosmetic, medicinal and logged species is available.

**% complete:** 105%

**Status update:** All specimens were digitalized. Fertile specimens were added in this activity to reach 2100 in total.

**Sources of verification:** - [https://gab.e-archivsystem.com/log\\_client.aspx](https://gab.e-archivsystem.com/log_client.aspx) - Login: iphametra - Pass word: IPHA2023metra - [https://1drv.ms/f/s!ApF5Q8MuSDTLkQ1yb6qqE\\_VEIBmb?e=neBBmv](https://1drv.ms/f/s!ApF5Q8MuSDTLkQ1yb6qqE_VEIBmb?e=neBBmv)

### Ecological niche modeling of logged species

**Description:** The modeling of *Aucoumea klaineana* ecological niches carried to map the current and future suitable habitats of this species according to different climate change scenarios

**% complete:** 75%

**Status update:** - Establishment of the logged species distribution maps - Mapping of *A. klaineana* suitable habitats - Publication of *A. klaineana* suitable habitats maps in a scientific journal not yet done

**Sources of verification:** -<http://herbierygabon.fr/gabon/collection/especes/view/6303> - <http://herbierygabon.fr/gabon/collection/species/view/3384> - <https://1drv.ms/f/s!ApF5Q8MuSDTLgopJmmYHuhmYM0EfhA?e=fBfS3e>

## Deliverables - Project data mobilization phase

### Herbarium specimen data

**Dataset type:** Occurrences

**Dataset scope:** All occurrences data have been mobilized. Mobilization concerns the mounting of the specimens and their insertion in the collection cabinets.

**Number of records:** 10,000

**Data holder:** IPHAMETRA

**Data host institution:** IPHAMETRA

**% complete:** 100%

**Status update:** Mobilization concerns the mounting of the specimens and their insertion in the collection cabinets.



**DOI:** - <https://www.gbif.org/dataset/44d6b38d-af49-470a-b03c-438b636d947b> - [https://ipt-gabon.gbif.fr/resource?r=ga\\_occurrence](https://ipt-gabon.gbif.fr/resource?r=ga_occurrence)

**Expected date of publication:**

## Forest inventory

**Dataset type:** Sampling Event

**Dataset scope:** - Crystal Mountains national park buffer zone, Estauaire, Gabon - Forest dynamic and trees regeneration in the logging gaps in Gabon

**Number of records:** 904

**Data holder:** IPHAMETRA

**Data host institution:** IPHAMETRA

**% complete:** 1174%

**Status update:** Published datasets

**DOI:** - <https://www.gbif.org/dataset/8be5d1f5-802e-4401-9c1c-2e01b67e252c> - [https://ipt-gabon.gbif.fr/resource?r=biodiversity\\_kinguele\\_aval](https://ipt-gabon.gbif.fr/resource?r=biodiversity_kinguele_aval) - <https://www.gbif.org/dataset/3eaece88-38a5-4252-9f34-e90b05fdbfba> - <https://ipt-gabon.gbif.fr/resource?r=regefor>

**Expected date of publication:**

## Gabon medicinal plants

**Dataset type:** Checklist

**Dataset scope:** Extraction of information on medicinal plants of Gabon from bibliographical sources

**Number of records:** 922

**Data holder:** IPHAMETRA

**Data host institution:** IPHAMETRA

**% complete:** 100%

**Status update:** Published dataset

**DOI:** - <https://www.gbif.org/dataset/31dc1507-a6e1-4233-a8df-c7a78596a7e4> - <https://ipt-gabon.gbif.fr/resource?r=medecinal-plants>

**Expected date of publication:**

## Deliverables - Project evaluation phase

### Events

## Medicinal plants workshop

**Dates:** 2022-09-12 - 2022-09-16

**Organizing institution:** IPHAMETRA

**Country:** Gabon

**Number of participants:** 90

**Comments:** This workshop were a organizing between GBIF project and IPHAMETRA to promote biodiversity through medicinal plants. medecinal plants was selected among biodiversity categorization activity. About 100 participants were presents but the uploaded list is researchers and technicians who took part at the conference one.

**Website or sources of verification:** Final report and other documents relating to this event

### Events

## Restitution workshop of GBIF Gabon projects

**Dates:** 2023-01-31 - 2023-02-01

**Organizing institution:** IPHAMETRA

**Country:** Gabon

**Number of participants:** 45

**Comments:** This workshop were a organizing between the GBIF projects (BID-AF2020-194-USE, BID-AF2020-REG-040) and IPHAMETRA to restitue the obtained results by these projects and also to show to participants the main steps of data publishing on the GBIF portal.

**Website or sources of verification:** Final report and other documents relating to this event

## Communications and visibility

For the visibility of the project, the communication focused on the awareness plan that the project has planned to best interact with the decision-makers and the data users i.e the development of communication tools, the organization of scientific workshops and the meeting with the policy makers or with the hierarchy.

### 1) Development of communication tools

The creation of a web page dedicated to the project by the GBIF communication team and by the manager of the IPHAMETRA site are part of the communication tools developed to publicize the GBIF project and present its objectives. The main activities have been published on the IPHAMETRA website, in particular the objectives of the projects (<https://iphametra.org/departements/projets.php>) and the activities relating to the workshops that the project has co-organized with the IPHAMETRA. The other communication tools used for project visibility are local newspapers such as the local newspaper called "Union".

### 2) Co-organization of workshops

The project co-organized two workshops, one with IPHAMETRA and the other with IPHAMETRA and another GBIF project (BID-AF2020-040-REG). The first workshop organized in September 2022, which was part of the International Day of Traditional Medicine, has a link with one of the objectives of the project on the enhancement of biodiversity through medicinal plants. The main theme of workshop was "Efficacy of plants used in traditional medicine in the management of certain pathologies such as malaria", aimed to promote local production of Improved Traditional Medicine (ITM) against malaria. Two ministers, the minister in charge of forests and the environment and that of higher education, took part in this workshop. A communication on the contribution of GBIF projects in Gabon and a poster on the activities of the National Herbarium of Gabon mentioning the project were presented. The verification elements of this event are :

- The article published in the newspaper "union"

o <https://1drv.ms/b/s!ApF5Q8MuSDDLgfQ2DoNyh2p8A7uUlw?e=bupCPr>

- The other verification elements are contained in the folder relating to this event

o <https://1drv.ms/f/s!ApF5Q8MuSDDLgolvytCB5vILlm9qxw?e=pwpTmS>

The second workshop was organized in January and February 2023 in collaboration with the regional GBIF project. Overall objective of this workshop was to present the results already obtained from these two GBIF projects currently hosted at IPHAMETRA. More specifically, the workshop focused on the general presentation of the platform and the RHIA taxonomic repository with some practical examples of collection management and the taxonomic repository. The impact of GBIF projects in the mobilization and use of biodiversity data in Gabon was also presented as well as the process of publishing data on the GBIF portal. During this workshop, a dataset from the BID-AF2020-194-USE project was published, which served as an example to show participants the main steps to publish the data on the GBIF portal. An article relating to the GBIF project was also published in the Gabonese newspaper "union" on page 6. The final report of this workshop is also visible on the IPHAMETRA website.

o <https://1drv.ms/b/s!ApF5Q8MuSDDLgacW8ZG-RgtWINUnzQ?e=Yjl7sV>

o [https://iphametra.org/app/document/PV%20atelier%20de%20restitution\\_GBIF%20\(1\).pdf](https://iphametra.org/app/document/PV%20atelier%20de%20restitution_GBIF%20(1).pdf)

### 3) GBIF activities insertion in the final report of the CENAREST board of director

The GBIF Gabon project was often presented at meetings organized by CENAREST and which involved the directors of research institutes. In addition, this project was presented to the meetings relating to the sixth session of the CENAREST board of directors organized in July 2002 and whose activities appear in the final report of this meeting on page 16. The project was well appreciated and the integration of the results in the decision-making process is done gradually. The project deadlines allow the implementation of the project activities but the consideration of the results is often late in most of the projects carried out in our institutions.

o <https://1drv.ms/b/s!ApF5Q8MuSDDLgooMqZINGHP9lJ3yiw?e=wzYkNL>

## Monitoring and evaluation

## Final Evaluation

Project is monitored and evaluated by checking the implementation of the specific activities and the associated final deliverable. Occurrence data mobilization starts by the selection of the non-mounted-specimens. The monitoring of this activity concerns the checking of contents of the specimens' labels before to encoding data. The result is a excel table giving the number of the mounted-specimens. The last step is the checking of the table fields without the geographical coordinates. So, the specimen number is checking in Tropicos or BRAHMS database to extract the specimen geographical coordinates. This activity has been evaluated by checking the publishing of occurrences dataset. Sampling event data is monitored since the uploading files in the GBIF portal to correct spelling scientific names errors until the dataset publishing.

The categorized data are extracted from Tropicos, Brahms databases and other sources. The monitoring of this activity focused on checking of each specimen numbers to ensure their physical presence in the Herbarium. The species categorization column added to the existing database allow their filtration according uses and sort them for digitalization. The evaluation concerns the information checking associated to specimens et the number of sorted specimens by technical staff under the supervision of researchers and the project leader. Thanks to this checking, a discrepancy has been noted between the number of type specimens found in the database et the current number physically present at the herbarium. The ultimate evaluation was to look at dataset publishing. Medicinal plant checklist of Gabon was published on the GBIF portal from this categorization.

For the scanned specimens, the monitoring is done by checking the image quality and their encoding. Matching between each encoding and information contained in the specimens' labels must be established.

The quality checking of all published data on the GBIF portal data as part of this evaluation had the support of the expert that GBIF was kind enough to entrust to us, Mr. Tsiky Rabetrano. His expertise was a great asset to the project. From the Darwin Core files design to the data publishing and the correction of the Meta data already published, he has always been available. During the GBIF projects restitution workshop held on February in Gabon, Mr. Tsiky also made a zoom presentation on the data publication on the GBIF portal, which was a novelty for many participants.

## Best Practices and Lessons learned

The activities of the project on the mobilization and use of biodiversity data began in May 2021 and ended in April 2023. During the project activities implementation, several lessons could be learned.

### 1) Calendar and project duration

During the project drafting, all the planned activities may sometimes not be entirely carried. In this project, for example, we thought it would be useful to publish the suitable habitats maps for logged species come from the niche model in a good scientific journal to better discuss with decision-makers. The maps are produced but this publication could not be done within the project deadlines because we found new ways to improve our model. We first focused on occurrences downloaded from the GBIF site. Then we thought of establishing another model based on forest inventory data by integrating "true absences" and not pseudo-absences automatically generated by maxent. The learned lesson here is that projects must be prepared with all possible stimulation well before responding to calls. Adjustments can simply be made based on the terms of reference of the call.

### 2) Data mobilization and categorization

Data mobilization and categorization were among the main objectives of this project. Before specimens sorting, the first activity was to extract data from the databases we mentioned above. We noted a discrepancy between the existing data in the databases and the physical presence of specimens in the Herbarium. Several specimens from the National Herbarium of Gabon are stored for example in the Paris Natural History Museum. Strategies must be found for their repatriation. Furthermore, when collecting data in the field, the partners who leave with the duplicates digitize them in their institution of origin, in Europe. The data is then directly integrated into their databases while the Gabon herbarium specimens are a long time stored in the mounting room. We learn here that other grants need to be find to continue the work one on the specimens mounting.

### 3) Digitization and insertion of scanned images into databases

Handling the herbarium specimens during the selection and digitization process presented the risk of specimens degrading and losing the fertile organs. The project resulted in the digitization of more than 2000 samples (images). Some of these images are now available online and others have not. Many sorted samples for categorization had barcode deficiencies. Unfortunately barcode activity was not planned as part of this project.

The learned lesson here is the need to scan all herbarium specimens to have a virtual herbarium, which will significantly reduce physical contact with specimens. For the insertion of images in databases, it is also important to provide all specimens with a barcode.

## Post Project activities

The activities carried in this project have resulted in perspectives that need to be developed for a possible new

proposal with the partners of this project and identify the new partnerships. Project continuity could be based on the niche model, collections number increasing, codification and digitization (image) of all herbarium specimens and finally the georeferencing.

### 1- Niches modeling

As part of this proposal, the model of the niches had been identified for the exploited species. The obtained results produced suitable habitats maps for *A. klaineana*, the main logged species in Gabon. This work may extend to threatened species. In Gabon, more than 400 plant species are threatened according to the IUCN assessment criteria. This work carried in collaboration between Missouri Botanical Garden and the National Herbarium of Gabon has enabled the creation of a website dedicated to these species, which is a good basis for work.

### 2 - Increasing of the collections and specimens number in the Herbarium National du Gabon

- Relationship with the MBG partner. Beyond the project that MBG carried in collaboration with the Herbarium on the threatened plants, this partner contributes to supplying the herbarium with specimens from new collections and to feeding the database. Each year the MBG multiplies the field botanical missions in Gabon as part of its program relating to the transects and general harvest to determine the Gabon HCVs. Indeed, the field missions undertaken between MBG and the National Herbarium from 2018 to 2022 provided the herbarium with more than 2000 specimens.

- Relationship with CTFS-ForestGeo (Smithsonian). CTFS has established a network of permanent plots in the world. Rabi's plot in Gabon is part of this network. This partner contributes to supply the herbarium not only by providing specimens but also to make available data from permanent plots for feeding herbarium forest database. The Lausanne university in Switzerland (partner of IPHAMETRA), the CTFS and IPHAMETRA have developed a project called ForHist to install a 25 ha-permanent plot for the forest dynamics long-terms monitoring, in the north-east of Gabon, in the Makokou region. The project will be submitted in November 2022 to the Lausanne University for funding. This project could also feed the herbarium database in terms of specimens and forest inventory data.

- Interaction with local partners (IRET and ANPN). IRET and ANPN are the main local partners of the Herbarium National du Gabon. Indeed, most of the forest inventory data that we digitized were provided by IRET, which allowed us to access its field notebooks and its bibliographic database containing a large amount of forest data. With regard to the ANPN, all the activities of the Herbarium take place on the premises of this institution which hosts it following the disaster that this department has experienced since 2016. Also, for two years, the Herbarium is involved in the ANPN project called CAFI (CADRE D'INVESTISSEMENT DU GABON POUR L'INITIATIVE POUR LA FORET DE L'AFRIQUE CENTRALE) to set up 300 permanent plots which will therefore allow feed the herbarium database. In addition, this project has just provided the herbarium with new field and computer equipment.

### 3- Georeferencing of specimens

Project sustainability requires also we involve in the new projects. IPHAMETRA is partner in the project with University of Kansas Center for Research, Inc. according to the Grant Period: 09/15/2022 - 08/31/2026. The aims of this project entitled Collaborative Research: Digitization and Enrichment of U.S. Herbarium Data from Tropical Africa to Enable Urgent Quantitative Conservation Assessments are:

- specimen image capture;
- digitization of data associated with each specimen;
- extraction and georeferencing each distinct locality;
- quality control and error-checking of the data records;
- serving resulting datasets via iDigBio, GBIF and other biodiversity information portals.

We will lead a georeferencing team at the Herbarium National de Gabon to manually georeference those African seed plant records that are not able to be automatically georeferenced from 21 herbaria in the United States whose plant holdings are being imaged and digitized for this project.

In summary, project continuity in the botanical harvest and the specimens digitization will lead to the strengthening of the existing collections and database. Some activities carried in this project framework and new tasks will be an integral part of the daily activities of the herbarium, including: - Digitization and codification of herbarium specimens - Insertion of new information from partner databases - Insertion of new bibliographic data - New taxonomic update - Insertion of new collections in the database.

## Sustainability

### Sustainability Plans

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## Impact of COVID-19 pandemic on project implementation

Since the covid 19 pandemic emergence, the researcher movements, meetings and workshops organizations have been limited. However, the activities was executed respecting preventives measures for covid 19 in this period. At the restriction rules end, we began the large meetings and workshops, which improved project activities implemetation and communication. In general, project activities did not significantly impacted by the pandemic because the goals was achieved.

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**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.**

