

# Unlocking the flow of data on plant biodiversity for decision-making in S. Tomé e Príncipe

**Programme:**BID

**Project ID:** BID-AF2020-127-INS

**Project lead organization:**Centro Investigação Agronómica e Tecnológica de STP

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

**Report approved:** 2/6/2023

## Final Narrative Report

### Executive Summary

The project team has successfully managed to complete most of the planned activities. We have increased the STPH institutional capacity, with one member of the team participating in the BID Capacity Workshop (Dilson Madre Deus). We also successfully trained 4 herbarium staff on the main Herbarium Techniques (mounting; digitization; informatization of herbarium data - Specify, and how to publish on GBIF data portal). An Internship for 3 santomean technicians, at our Partner COI - University of Coimbra, Portugal, was held from 15 January - 15 April 2022. Additionally, several on-line training sessions were organized with COI - University of Coimbra for the remaining team members, who were in S. Tomé, with the aim of clarifying doubts regarding data publication tools. After the trainees' return from Portugal, the knowledge acquired has been passed on to the other members of the team.

So far, we have managed to digitize more than 6000 herbarium specimens and to published 2 occurrences datasets held by National Herbarium of S. Tomé e Príncipe: 2.008 occurrences (STPH herbarium species dataset) + 1162 occurrences (48 events dataset) and participated in the digitized and publishing of 3.088 preserved specimens (COI) into GBIF data portal.

The project Inception meeting was held in June 2021 where partners met and discuss the chronogram and modalities for achieving the set goals. A member of the project team (Dilson M.Deus) was selected to participate in the BID Capacity Workshop. In October 2021 a meeting was held in University of Coimbra with our partner COI, to plan the internship and select the specimens to be worked on. The Internship for 3 santomean technicians was delayed due to the pandemic, and started in 15 January - 15 April 2022.

At National Herbarium of S. Tomé e Príncipe (STPH) work began with herbarium specimens mounted, computerized and introduced in the Specify program of STPH, which allow us to published the first data set of 404 occurrences through GBIF on 29/01/2022, with the help of one of the mentors of our partner COI, through the GBIF Portuguese node.

All data relating to the specimens of Flora de STP, which were worked on (mounted, digitized) at the COI University Coimbra, Portugal by our 3 São Tomé interns were also published. This is a set of 3.088 herbarium Specimens (2,547 herbarium specimens from STP flora general collectors + 541 herbarium specimens from STP Historical Collection), published by COI on April 2022 on the GBIF platform, within the scope of the project (DOI:10.15468/bktv9j).

From June 2022 - April 2023 we mounted, labeled, digitized and publish 2.008 occurrences from the STPH collections (General collectors; STPH curator old collection; COI duplicates collection) - DOI: 10.15468/bktv9j, and also mounted, labeled, digitized and publish more 1.162 occurrences from 48 events - Dataset "Transects performed at S. Tome Island - Project Flora Ameaçada" (DOI: 10.15468/4uz49f). At present, we have a set of more 400 occurrences ready to be published, from the STPH old collections that we have been working on. From the 7500 specimens

In May 2022 we organized a Workshop to launch the Project in S. Tomé and Principe, which was attended by around 40 participants / stakeholders, representing the main national institutions working with data related to the biodiversity of STP. During this workshop we presented the project objectives and the results of the activities carried out so far.

We organize in Feb-April 2023, another Workshop in STPH on data publishing, with 2 specialists from COI, in order to strengthen the capacities of all the team members in this thematic (Specify database and GBIF publication platform). Six online training sessions were held, with the participation of all members of the project team.

Weekly reports & regular meetings have been held to monitor the progress of the project. A final meeting with all the team members was held at the end of the project (29 April) in order to do the final evaluation of the project. The main conclusions are:

- The team recognized that the time available to carry out the activities was not enough, with the need to raise awareness of the CIAT Directorate and the Minister himself to resolve this situation. The STPH cannot continue to be maintained with a part-time team, since there is still a lot of work that needs to be completed in order to organize the Herbarium collections.

- the state of the old collections, existing in the STPH, needs urgent organization, and did not allow the team to advance more quickly and achieve all the project's objectives. All specimens had to be checked one by one, and their data entered manually, since the old listings provided to us did not fully correspond to the content of the herbarium specimen labels.

- many of the specimens from the old collections had to be restored, which further delayed the process, since this activity had not been initially foreseen.

- the team is aware that, after the end of the project, it will continue to work to achieve the objective of being able to organize the entire STPH collection, and for that, it will use the methodologies learned and perfected throughout this Project, and which are a precious tool to ensure careful and quality work.

- it is essential to pass on this information and training to the Forest team on the island of Príncipe, which is responsible for maintaining a small herbarium on Príncipe; therefore, the team will organize as soon as possible (June 2023) a trip to Príncipe with the aim of training Forestry/Park technicians and helping to organize the herbarium on the island of Príncipe. To this end, we have already established contact with Fundação Príncipe, so that we can carry out this activity together.

- a very important aspect, which was not concluded, is to hold a new meeting / workshop, with the main partners, with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. With the change of Government, at the end of last year, all the Directors of these institutions changed, since they are positions of political appointment. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at national level.

## Progress against milestones

**Has your project completed all planned activities?: No**

**Has your project produced all deliverables: No**

**Rationale:**In addition to the Covid-19 pandemic, which severely affected the key activities of the project, on 26 September 2022, there were elections in STP, and a strike during 3 weeks was declared by workers of CIAT Laboratory, preventing us from carrying out any activities at STPH. With the change of Government, all the Directors of these institutions changed (including CIAT Director), at the beginning of 2023, since these are positions of political appointment. We have initiated the contacts with the new Director of CIAT to organize a new meeting, with the main partners, with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at the national level.

We intend to organize also an Workshop in June-July 2023, in order to present all the project results and also with the objective of disseminating information on this thematics with policymakers.

## Report on Activities

### Summary of the implementation of the project activities

1- Organization of Project: The organization of project activities & launch workshop were Delayed, but 100% completed (2022-05-11). We Organized the launching Workshop on May 2022 and developed action plans and informed key actors.

2-BID Workshop: Participation in the BID Capacity Enhancement workshop was performed, and completed (submitted) on 15 September 2022: This will increase institutional capacity. The need to invest in the English language learning of the team members was highlighted.

3- Development of a Biodiversity Information Facility: Formalizing agreements for collaboration and research developed between the project partners and other identified stakeholders from key institutions holding or using plant data, in order to prepare STP to become a GBIF node(60%): 2022-05-11 - main national and international stakeholders were identified and participate in the launching workshop. Two members of the team participated in 2 meetings organized by UNDP(Proj. Liqueza Tela Non) on this theme (5 September; 17 Nov 2022) to prepare a Clearing HouseMechanism and create a National Biodiversity Database. Other stakeholders institutions that also participated: OIKOS; BirdLife; Environment General Directorate; D. Fisheries; D. Forests; D. Industry and Commerce; D. PNST; ALISEI; CIAT.

However, it will be essential to organize a new meeting, with the main partners, with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. With the change of Government at the beginning of 2023, all the Directors of these institutions changed, since these are positions of political appointment. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at the national level.

We intend to organize a final Workshop in June-July 2023, in order to present all the project results and also with the objective of disseminating information on this thematics with policymakers.

4 - Training in the mobilization of specimens: digitization and publications; Training on data analysis techniques (100%). We have increased institutional capacity with an internship held at the University of Coimbra (COI), for 3 months, for 3 technicians from STPH. Specific training with the practical application was carried out on these topics using the specimens that were being worked on by our 3 interns during their internship at the COI.

An initial online training session was also prepared for the remaining team members, who were in S. Tomé, with the aim of clarifying doubts regarding data publication tools (4 February 2022). After the trainees return from Portugal, in April 2022, the knowledge acquired has been passed on to the other members of the team.

Final training with two COI specialists was held in February-March-April 2023. This training was held online, during 6 sessions, with all STPH team, and allowed the entire team to solidify their knowledge in data publication and also in techniques for organization and management of the Herbarium collection.

5- Mobilization of data: Mobilization of data from partners and other local institutions (inventories, analysis). During the 3 months internship held at the University of Coimbra (COI), our team worked and learned all herbarium techniques, and contributed to filling taxonomic /temporal/geographic gaps in data availability. We have selected and worked with more than 2500 specimens from different collections/collectors of STP COI herbarium specimens, in order to make them available. During the stay of our team in Coimbra, Portugal, a data set of 3088 occurrences (herbarium specimens) was digitized and published in GBIF.org - 100% completed.

6 - Digitalization: Digitalization of general collection data and forest inventory data has progressed considerably in STPH, with the Digitalization and informatization and publication of 2 data sets (2008 occurrences - Herbarium Dataset + 1162 occurrences - 48 Forest Transects Event Dataset), increasing the availability of local biodiversity data. However, the digitalization was suspended in January 2022, due to a malfunction in the photographic equipment, which had to be sent to the manufacturer (NIKON, Spain) for repair. It is already repaired but we received the equipment in STPH on August 2022, and only since then could continue this activity - 83% completed. We are continuing this work, until its conclusion.

7 - Database (SPECIFY; GBIF IPT) training and management tool to publish data. For increasing institutional capacity, we hired an extra technician to work at the National Herbarium; this technician has been receiving training from colleagues who returned from the internship in Portugal, and training sessions have also been organized via the digital platform (ZOOM), with the COI mentors in these thematics. Final training with two COI specialists was held in February - March - April 2023. Six online training sessions were held, with the participation of all members of the project team (Certificates in Annex), and allowed the entire team to solidify their knowledge in data publication and also in techniques for organization and management of the Herbarium collection. An Excel sheet was developed in order to facilitate the transfer of data to Specify and from this to the Darwin core models.

8 - Publication: Preparation of an Online Catalogue of the herbarium specimens; Updating the checklists of key flora species, and developing distribution maps of threatened, endemic, and rare species from STP. The STPH sample collectors lists have been organized as the first step to filling taxonomic /temporal/ geographic gaps in Herbarium data availability. Until now, we have mounted, labeled, computerized, and digitalized 3.570 occurrences, and published 3.170 occurrences from the STPH general collections. We have also contributed to the digitalization and publication of 3.088 occurrences from the STP collection of COI. We have 400 more occurrences ready to be published (May 2023), and we are continuing this work until its conclusion.

The project team (as part of the Project Flora Ameaçada de STP) actively participated in updating the Checklist of around 200 priority species, with the respective distribution maps having been drawn up; these data are published in two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", recently published and available online: <https://link.springer.com/book/10.1007/978-3-031-06153-0>; the team also contributed to the assessments or updated of the threat status, according to IUCN criteria, of about 110 species, that will be published at the Book "Red DataBook of the Plant Species Endemic to São Tomé and Príncipe" (expected to be available very soon).

9- Round table with policymakers: Round table discussion with policymakers to identify information priorities and to promote the use of openly accessible data. Decision makers can access and use best-available evidence to address national biodiversity priorities. In meetings with Directors of public institutions, these issues have been widely debated by our team. However, the recent change in the Government, after the elections of September 2022, makes it necessary to have a new round of discussions, since the Ministers and Directors have changed, and it is necessary to pass the information on to the current political decision-makers. The project team also suffers from this situation, as the project leader and Director of CIAT, ceased functions in February 2023. We have already meet with the new Director and together we intend to organize a final Workshop (June-July 2023).

10 - Other Publishing data: Publishing data papers (peer-reviewed), available nationally and internationally (GBIF). The publications described above(see activity 8), contribute to global knowledge about STP biodiversity and are / will be accessible online, free of charge, in English and Portuguese.

The publication of data on the flora of STP on the GBIF platform is another way of contributing to increasing knowledge about the biodiversity of the islands of S. Tomé e Príncipe.

### Completed activities

#### **Activity: Organization of Project: Organization of project activities & launch workshop**

**Description:** The organization of the project started in August 2021, but the launching workshop was delayed until the return of the team from the Internship at COI, Coimbra University, and it took place in 11/05/2022, with more than 40 participants from the main national and international organisations.

**Start Date - End Date:** 1/8/2021 - 11/5/2022

**Verification Sources:** Lauching Workshop- 11May2022.JPG  
GBIF-Apresentação-11-05-2022.pdf

#### **Activity: BID Workshop**

**Description:** Participation in BID Capacity Enhancement workshop - Dilson Madre Deus

**Start Date - End Date:** 1/6/2021 - 15/9/2022

**Verification Sources:** Submission of Work cases in 15/09/2022:  
Workshop GBIF-Dilson files  
Dilson-submitted\_success.docx

#### **Activity: Training**

**Description:** Training in the mobilisation of specimens: digitization and publications ; Training on data analysis techniques. We have Increasing institutional capacity with an internship held in University of Coimbra (COI), during 3 months, for 3 technicians from STPH. (Final Report attached).

We organize in Feb-April 2023, another Workshop in STPH on data publishing, with 2 specialists from COI, in order to strengthen the capacities of all the team members in this thematic (Specify database and GBIF publication platform). Six online training sessions were held, with the participation of all members of the project team (Certificates in Annex).

**Start Date - End Date:** 15/1/2022 - 28/4/2023

**Verification Sources:** FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 1.pdf FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 2.pdf

#### **Activity: Mobilization of data**

**Description:** Mobilization of data from partners and others local institutions (inventories, analysis). During the 3 months internship held in University of Coimbra (COI), our team worked and learned all herbarium techniques, and contributed to filling taxonomic /temporal/ geographic gaps in data availability. We have selected and worked in more than 2500 specimens from different collections/collectors of STP COI herbarium specimens, in order to make them available. During the stay of our team in Coimbra, Portugal, a data set of 3088 occurrences (herbarium specimens) were prepared and published in GBIF.org - 100% completed for COI specimens.

**Start Date - End Date:** 15/1/2022 - 15/4/2022

**Verification Sources:** <https://doi.org/10.15468/dl.txtzax>

FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 1.pdf FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 2.pdf

#### **Activity: Database (SPECIFY; GBIF IPT) training and management tool to publish data.**

**Description:** For increasing institutional capacity, we hired an extra technician to work at the National Herbarium; this technician has been

receiving training from colleagues who returned from the internship in Portugal, and training sessions have also been organized via the digital platform (ZOOM), with the COI mentors in these thematic. Final training with two COI specialists was held in February - March - April 2023. Six online training sessions were held, with the participation of all members of the project team (Certificates in Annex), and allowed the entire team to solidify their knowledge in data publication and also in techniques for organization and management of the Herbarium collection. An Excel sheet was developed in order to facilitate the transfer of data to Specify and from this to the Darwin core models.

**Start Date - End Date:** 31/5/2022 - 28/4/2023

**Verification Sources:** Certificado Treino GBIF2

## Activity: Publication

**Description:** 8 - Publication: Preparation of an Online Catalogue of the herbarium specimens; Updating the checklists of key flora species, and developing distribution maps of threatened, endemic, and rare species from STP. The STPH sample collectors lists have been organized as the first step to filling taxonomic/temporal/geographic gaps in Herbarium data availability. Until now, we have mounted, labeled, computerized, and digitalized 3.570 occurrences, and published 3.170 occurrences from the STPH general collections. We have also contributed to the digitalization and publication of 3.088 occurrences from the STP collection of COI. We have 400 more occurrences ready to be published (May 2023), and we are continuing this work until its conclusion.

The project team (as part of the Project Flora Ameaçada de STP) actively participated in updating the Checklist of around 200 priority species, with the respective distribution maps having been drawn up; these data are published in two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", recently published and available online: <https://link.springer.com/book/10.1007/978-3-031-06153-0>; the team also contributed to the assessments or updated of the threat status, according to IUCN criteria, of about 110 species, that will be published at the Book "Red DataBook of the Plant Species Endemic to São Tomé and Príncipe" (expected to be available very soon).

**Start Date - End Date:** 15/1/2022 - 28/4/2023

**Verification Sources:** <https://www.gbif.org/pt/dataset/99350bf7-b320-4ff5-8303-dc690da304c2>

<https://doi.org/10.15468/dl.txtzax>

<https://www.gbif.org/pt/dataset/db9a9794-181f-4ca7-9d41-482a74f3383e#dataDescription>

<https://www.gbif.org/pt/dataset/7e7d19d2-09dc-47f5-a9d5-4c2003df6e07>

<https://link.springer.com/book/10.1007/978-3-031-06153-0>

## Activity: Other Publishing data

**Description:** Publishing data papers (peer-reviewed), available nationally and internationally (GBIF). The publications described above (see activity 8), contribute to global knowledge about STP biodiversity and are / will be accessible online, free of charge, in English and Portuguese. The publication of data on the flora of STP on the GBIF platform is another way of contributing to increasing knowledge about the biodiversity of the islands of S. Tomé and Príncipe.

**Start Date - End Date:** 17/10/2022 - 30/4/2023

**Verification Sources:** <https://link.springer.com/book/10.1007/978-3-031-06153-0>

## Report on Deliverables

### Deliverables - Summary

Resources metadata COI

Dataset Type: Occurrences, from COI University of Coimbra natural history collections, we predicted an approximate number of Records 50

Data Holders: COI - Herbarium University of Coimbra

Sampling Methodology: Endemics

Current Format: 100% Digitized

During the internship at COI, our team has been able to mount, restore and digitalised cc. 3088 specimens from the historical collections and from the main STP collectors, and this data has been published in 25/05/2022 in GBIF.org.

This sub-dataset contributes with 3088 occurrence records of plant specimens sampled in São Tomé and Príncipe. The data have been digitized as part of the Herbarium of the University of Coimbra contribution to the GBIF BID (Biodiversity Information for Development) project "Unlocking data on plant biodiversity for decision-making in São Tomé and Príncipe" BID- AF2020-127-INS. DOI: 10.15468/mumwq6.

Dataset Catálogo On Line - Herbário STP, Occurrences, for Taxonomic catalog and check-list; Geographic: STP; Data Holders: STPH; COI, with an approximate # of Records: 7500.

Informatization on Specify and Publication of 6.258 occurrences: (2 datasets of records from STPH on GBIF (2008 occurrences - Herbarium specimens; 1162 occurrences - transects samples). DOI : 10.15468/bktv9j / DOI: 10.15468/4uz49f. The data have been digitized as part of the São Tomé e Príncipe National Herbarium collection (to be included in the Catálogo on-line);

Since October 2022, the old collection of STPH has been computerized, with 2 elements of the team transcribing to an Excel table all the existing information of each specimen contained in the labels, as well as in the records of the field notebooks that are available.

This activity is taking an extremely long time, and was not foreseen, since we thought to use the lists initially provided by the main collectors (eg Faustino Oliveira); however, we found that the collection numbers and the information on the existing specimens in the Herbarium could not be crossed with the data in the excel lists provided. As the collections are older (1990 - 2000) only a few are georeferenced, so we are also calculating the coordinates for the respective collection locations. Thus, we had to start reviewing, one by one, all the herbarium specimens of this important collection, and completely redo the lists, in order to obtain reliable information, which would allow its computerization, inclusion in the Specify and subsequent publication in GBIF, as well as its inclusion in the On-line Herbarium.

At present, more 400 specimens are ready to be included in the STPH database. It remains to verify and computerize cc. 1600 herbarium specimens.

We will continue this work until its completion, as we have now 4 elements of the team involved in this activity (May-July 2023).

Dataset: Forest transects data

Dataset Type: Sampling Event

Dataset Description and Scope: Geographic: ST and P Taxonomic

Approximate # of Records: 1500

Data Holders: STPH

Expected Host Institution: STPH

## Sampling Methodology:

Current Format: Undigitized

We have cc. 1100 records computerized (excel files), but not digitized and they will be published accordingly. Until now we have published 48 Sampling Events in one STPH Dataset, with a total of 1162 occurrences, collected during the 48 transects performed at S. Tomé island (DOI: 10.15468/4uz49f). We will publish another Sampling Event with the data from the transects performed at Príncipe island (July - August 2023).

## DELIVERABLES:

1- Producing user-ready analyses of GBIF-mediated data that respond to policy questions: Using the data collected during the previous project Flora Ameaçada, the team participated in the writing of two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands" <https://link.springer.com/book/10.1007/978-3-031-06153-0>;

The team participated in September 2021 in a Workshop for KBAs evaluation (Annex KBAs- Red List);

The team is working on the Red List of Endemic Species of the Flora of STP (Annex KBAs- Red List).

2 - Mobilized data for STP flora species:

Published datasets (COI) - We have selected and worked with more than 2500 specimens from different collections/collectors of STP COI herbarium specimens, in order to make them available. During the stay of our team in Coimbra, Portugal, a data set of 3007 occurrences (herbarium specimens) were prepared and published in GBIF.org (DOI: DOI10.15468/mumwq6) - 100% completed for COI specimens.

3- Training Workshop - GBIF

Dilson Madre Deus completed and submitted the final work on 15 September 2022, and is waiting for the certificate.

We also trained 5 people in biodiversity data mobilization and publishing.: Dilson Madre Deus - GBIF; internship at COI (15 Jan-15 April 2022)

Angela Lima - internship at COI (15 Jan-15 April 2022); Lewis Eduardo - COI online (Feb 2022); Francisca - COI online (Feb 2022); Davide

Dias - internship COI (15 Mar-15 April 2022). Reports of COI internships in annex.

An initial online training session was prepared for the remaining team members, who were in S. Tomé, with the aim of clarifying doubts regarding data publication tools.

After the trainees' return from Portugal, the knowledge acquired has been passed on to the other members of the team.

Final training with two COI specialists was held in February - March - April 2023. Six online training sessions were held, with the participation of all members of the project team (Certificates in Annex), and allowed the entire team to solidify their knowledge in data publication and also in techniques for organization and management of the Herbarium collection.

4- Checklist of STP Flora:

The project team (as part of the Project Flora Ameaçada de STP) actively participated in updating the Checklist of around 200 priority species, with the respective distribution maps having been drawn up; these data are published in two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", recently published and available online: <https://link.springer.com/book/10.1007/978-3-031-06153-0>; the team also contributed to the assessments or updated of the threat status, according to IUCN criteria, of about 110 species, that will be published at the Book "Red DataBook of the Plant Species Endemic to São Tomé and Príncipe" (expected to be available very soon). Annex - Contribution of the team to KBA & Red List.

5- Biodiversity database (Flora) set up at the STPH, with IT equipment and relevant software installed to catalog, store, and manage biodiversity data in STPH. At present we have Specify database installed at STPH, and all the other types of equipment to prepare and manage the herbarium specimens and their data (PC; photographic equipment for digitalization; etc.). We expected an update of the actual version of Specify to be installed by our partners from COI. We are also working on a program that facilitates the use of GBIF publishing tools for all the team members.

6- Stakeholders capacity needs assessment: Biodiversity data communicated to data users and collectors during our launch workshop on 11 May 2022 (Presentations in Annex). A final Workshop will be organized with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. With the change of Government at the beginning of 2023, all the Directors of these institutions changed, since these are positions of political appointment. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at the national level.

We intend to organize a Final Workshop in June-July 2023, in order to present all the project results and also with the objective of disseminating information on this thematic with policymakers.

7- Online STPH catalog: the preparation of the online catalog is on-going (August 2023), and we start to focus on endemic and priority species. The project team (as part of the Project Flora Ameaçada de STP) actively participated in updating the Checklist of around 200 priority species, with the respective distribution maps having been drawn up; these data are published in two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", recently published and available online: <https://link.springer.com/book/10.1007/978-3-031-06153-0>; the team also contributed to the assessments or updated of the threat status, according to IUCN criteria, of about 110 species, that will be published at the Book "Red DataBook of the Plant Species Endemic to São Tomé and Príncipe" (expected to be available very soon). Annex - Contribution of the team to KBA & Red List.

Deliverables produced by the project

## Dataset deliverables

### Resources metadata COI

**Dataset type:** Occurrences

**Dataset scope:** Dataset Description and Scope: University of Coimbra natural history collections Approximate # of Records: 2500 Data Holders: COI - Herbarium University of Coimbra Expected Host Institution: STPH - Herbário Nacional de STP Sampling Methodology: Current Format: Partially Digitized

**Number of records:** 3,088

**Data holder:** COI

**Data host institution:** Herbarium of University of Coimbra

**% complete:** 100%

**Status update:** Publication of the dataset on GBIF on 25/05/2022 <https://doi.org/10.15468/mumwq6> This sub-dataset contributes with 3088 occurrence records of plant specimens sampled in São Tomé and Príncipe. The data have been digitized as part of the Herbarium of the University of Coimbra contribution to the GBIF BID (Biodiversity Information for Development) project "Unlocking data on plant biodiversity for decision-making in São Tomé and Príncipe" BID-AF2020-127-INS.

**DOI:** 10.15468/mumwq6  
**Expected date of publication:**

## Catálogo On Line - Herbário STP

**Dataset type:** Occurrences

**Dataset scope:** Taxonomic catalogue and check-list; Geographic: STP Approximate # of Records: 7500 (5000 STPH + 2500 COI)

**Number of records:** 7,500

**Data holder:** STPH; COI

**Data host institution:** S. Tomé e Príncipe National Herbarium

**% complete:** 83%

**Status update:** Informatization on Specify and Publication of 3570 occurrences (2 datasets of records) from STPH on GBIF (2008 occurrences in 27/04/2023- Herbarium specimens; 1162 occurrences in 25/04/2023 - Event samples). The data have been digitized as part of the São Tomé e Príncipe National Herbarium collection (to be included in the Catálogo on-line) in the framework of the GBIF BID (Biodiversity Information for Development) project "Unlocking data on plant biodiversity for decision-making in São Tomé and Príncipe"; DOI : 10.15468/bktv9j / 10.15468/bktv9f. The team has mounted, computerized, digitalized and imported to Specify 3570 occurrences specimens; In addition to these specimens, the team assembled and computerized data from about 400 more occurrences (expected date of publication: 20/05/2023). One of our team members, Angela Lima, was on maternity leave after the birth of her child (June-September 2022), so this fact also delayed this activity, as we have one less person in a team that is already quite small for the work we have to do. Upon her return, and since October 2022, the old collection of STPH has been computerized, with 2 elements of the team transcribing to an Excel table all the existing information of each specimen contained in the labels, as well as in the records of the field notebooks that are available. This activity is taking an extremely long time, and was not foreseen, since we thought to use the lists initially provided by the main collectors (eg Faustino Oliveira); however, we found that the collection numbers and the information on the existing specimens in the Herbarium could not be crossed with the data in the excel lists provided. As the collections are older (1990 - 2000) very few are georeferenced, so we are also calculating the coordinates for the respective collection locations. Thus, we had to start reviewing, one by one, all the herbarium specimens of this important collection, and completely redo the lists, in order to obtain reliable information, which would allow its computerization, inclusion in the Specify and subsequent publication in GBIF, as well as its inclusion in the On-line Herbarium. At present, 400 more specimens are ready to be included in the STPH database. It remains to verify and computerize cc. 1000 herbarium specimens. We expect to have this work completed by the end of August 2023, as we have 4 elements of the team involved in this activity.

**DOI:** 10.15468/bktv9j; 10.15468/bktv9f

**Expected date of publication:** 2023-08-31

## Forest transects data

**Dataset type:** Sampling Event

**Dataset scope:** Specimens collected during transects performed at S. Tome Island - Project Flora Ameaçada, and held by the National Herbarium of São Tomé and Príncipe (STPH). The digitization and publication of 1162 records has been carried out at 27/04/2023 during the BID project "Unlocking data on plant biodiversity for decision-making in São Tomé and Príncipe" - BID-AF2020-127-INS.

**Number of records:** 1,500

**Data holder:** STPH

**Data host institution:** S. Tomé e Príncipe National Herbarium

**% complete:** 85%

**Status update:** All the specimens collected at the 48 transects performed at S. Tomé islands are published. The samples collected in the transects performed at Príncipe island will be also digitalized and published.

**DOI:** 10.15468/4uz49f

**Expected date of publication:** 2023-08-31

## Mobilized data for STP flora species

**Dataset type:** Occurrences

**Dataset scope:** Mobilization of data from partners and others local institutions (inventories, analysis). During the 3 months internship held in University of Coimbra (COI), our team worked and learned all herbarium techniques, and contributed to filling taxonomic /temporal/ geographic gaps in data availability.

**Number of records:** 3,088

**Data holder:** COI

**Data host institution:** COI - Herbarium University of Coimbra

**% complete:** 100%

**Status update:** We have selected and worked with more than 2500 specimens from different collections/collectors of STP COI herbarium specimens, in order to make them available. During the stay of our team in Coimbra, Portugal, a data set of 3088 occurrences (herbarium specimens) were prepared and published in GBIF.org - 100% completed for COI specimens.

**DOI:** 10.15468/mumwq6

**Expected date of publication:**

## Other deliverables

### Producing user-ready analyses of GBIF-mediated data that respond to policy questions:

**Description:** Using the data collected during the previous project Flora Ameaçada, the team participated in the writing of two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands"; The team participated in September 2021 in a Workshop for KBAs evaluation; The team contributed for the Red List of Endemic Species of the Flora of STP (in press).

**% complete:** 100%

**Status update:** Two chapters in the book "Biodiversity of the Gulf of Guinea Oceanic Islands", published in 17 October 2022. In the Workshop for KBA evaluation we give our contribute regarding to the flora (September 2022). We made the assessments of 20 species for the Red List of Endemic Species of the Flora of STP (in press - 2023).

**Sources of verification:** <https://link.springer.com/book/10.1007/978-3-031-06153-0> Annex KBAs- Red List

## Training Workshop - GBIF

**Description:** One element of the team (Dilson Madre Deus) completed and submitted the final work on 15 September 2022, and is waiting for the certificate. We also trained 5 people in biodiversity data mobilization and publishing.: Dilson Madre Deus - GBIF; internship at COI (15 Jan-15 April 2022) Angela Lima - internship at COI (15 Jan-15 April 2022); Lewis Eduardo - COI online (Feb 2022); Francisca Trindade - COI online (Feb 2022); Davide Dias - internship COI (15 Mar-15 April 2022). Reports of COI internships in annex.

**% complete:** 100%

**Status update:** An initial online training session was prepared for the remaining team members, who were in S. Tomé, with the aim of clarifying doubts regarding data publication tools (February 2022). After the trainees' return from Portugal, the knowledge acquired has been passed on to the other members of the team. We organize in Feb-April 2023, another Workshop in STPH on data publishing, with 2 specialists from COI, in order to strengthen the capacities of all the team members in this thematic (Specify database and GBIF publication platform). Six online training sessions were held, with the participation of all members of the project team (Certificates in Annex).

**Sources of verification:** FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 1.pdf FINAL REPORT OF THE TRAINING CARRIED OUT IN THE HERBARIUM OF THE UNIVERSITY OF COIMBRA 2.pdf Certificado Treino GBIF2

## Checklist of STP Flora

**Description:** The project team (as part as the Project Flora Ameaçada de STP) actively participated in updating the Checklist of around 200 priority species, with the respective distribution maps having been drawn up; these data are published in two chapters (3,10) of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", recently published and available online: <https://link.springer.com/book/10.1007/978-3-031-06153-0>; the team also contributed to the assessments or updated of the threat status, according to IUCN criteria, of about 110 species, that will be published at the Book "Red List DataBook of the Plant Species Endemic to São Tomé and Príncipe" (expected to be available very soon). Annex - Contribution of the team to KBA & Red List.

**% complete:** 100%

**Status update:** Data published in chapter 3,10 of the book "Biodiversity of the Gulf of Guinea Oceanic Islands", english published on 17/10/2022; portuguese version expected to be published very soon. "Red List DataBook of the Plant Species Endemic to São Tomé and Príncipe", in press (2023).

**Sources of verification:** <https://link.springer.com/book/10.1007/978-3-031-06153-0> Contribution of the team to KBA & Red List.

## Biodiversity database (Flora) set up at the STPH

**Description:** Biodiversity database (Flora) set up at the STPH, with IT equipment and relevant software installed to catalog, store, and manage biodiversity data in STPH.

**% complete:** 90%

**Status update:** At present we have Specify database installed at STPH, and all the other types of equipment to prepare and manage the herbarium specimens and their data (PC; photographic equipment for digitalization; etc.). This equipment was delivered to STPH as part of a joint project with the University of Coimbra, funded by CEPF. We expected an update of the actual version of Specify to be installed by our partners from COI. We are also working on a program that facilitates the use of GBIF publishing tools for all the team members.

**Sources of verification:** ANEXO\_Doação-UC-STPH\_dez21

## Stakeholders capacity needs assessment

**Description:** In May 2022 we organized a Workshop to launch the Project, which was attended by around 40 participants / stakeholders, representing the main national institutions working with data related to the biodiversity of STP. During workshop we present the project objectives and the results of the activities carried out so far. During the Launching workshop we have also presented all the preliminary results to the stakeholders, having a very participative debate session.

**% complete:** 50%

**Status update:** A very important aspect, which was not concluded, is the need to hold a new meeting / workshop, with the main partners, with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. With the change of Government, at the end of last year, all the Directors of these institutions changed, since they are positions of political appointment. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at national level. We expected to organize a new Workshop on June-July 2023.

**Sources of verification:** Launching Workshop- 11May2022.JPG GBIF-Apresentação- 11-05-2022.pdf

## On line STPH Catalogue

**Description:** Preparation of Online Catalogue of the Herbarium Specimens

**% complete:** 75%

**Status update:** The STP Herbarium catalogue is being permanently updated and may be accessed at GBIF or through STPH Website: <https://stpherbarium.org/coleccoes-2/> We are analyzing with our partners the best way to include digitized images of already published herbarium specimens.

**Sources of verification:** <https://stpherbarium.org/coleccoes-2/>

## Events

### Internship in Herbario of University of Coimbra

**Dates:** 2022-01-15 - 2022-04-15

**Organizing institution:** STPH/CIAT; COI-UC

**Country:** Portugal

**Number of participants:** 8

**Comments:** Our Partner COI - Herbarium University of Coimbra hosted and Trained 3 members of the STPH team in the mobilization of specimens: digitization and publications, and training on data analysis techniques. Specific training and training with practical application was carried out on these topics and using the STP specimens that were being worked on by our 3 interns during their internship at the COI (Angela Lima; Dilson Madre Deus; Davide Dias).

**Website or sources of verification:** Internship Final Report at COI; [https://www.uc.pt/herbario\\_digital/news/Santomenses\\_estagio\\_news](https://www.uc.pt/herbario_digital/news/Santomenses_estagio_news)  
<https://www.facebook.com/coiherbarium/posts/pfbid02PKB4ZdY4m5heKLFTMGv8uqYvCAZt7NEdDcb5AjNEBSeW5T7uVsihokn3UMSkaoKp>  
<https://twitter.com/CoiHerbarium/status/1>

## Events

### Launching Workshop

**Dates:** 2022-05-11 - 2022-05-11

**Organizing institution:** STPH /CIAT

**Country:** S. Tomé e Príncipe

**Number of participants:** 40

**Comments:**

**Website or sources of verification:** GBIF-Apresentação-11-05-2022; Lauching Workshop- 11May2022.JPG

## Communications and visibility

The project Results are being communicated through the University of Coimbra website

([https://www.uc.pt/herbario\\_digital/news/Santomenses\\_estagio\\_news](https://www.uc.pt/herbario_digital/news/Santomenses_estagio_news)

<https://www.facebook.com/coiherbarium/posts/pfbid02PKB4ZdY4m5heKLFTMGv8uqYvCAZt7NEdDcb5AjNEBSeW5T7uVsihokn3>

<https://twitter.com/CoiHerbarium/status/1>) and other news publishing outlets. Other means of

communication will be via conferences, scientific publications, policy briefs and press releases. During the Launching workshop we have also presented all the preliminary results to the stakeholders, having a very participative debate session. Interviews were also carried out with the national media (radio and TV).

The project results / Catálogo online (data sets published) are in the website of the STPH: <https://stpherbarium.org/colecoes-2/>.

The project is also mentioned in the Face Book page of Fundação Príncipe: <https://hi-in.facebook.com/FundacaoPrincipe/posts/1860490720808776>

## Monitoring and evaluation

### Final Evaluation

A final meeting with all the team members was held at the end of the project (29 April) in order to do the final evaluation of the project and these are the main conclusions:

- the team recognized that the time available to carry out the activities was not enough, with the need to raise awareness of the CIAT Directorate and the Minister himself to resolve this situation. The STPH cannot continue to be maintained with a part-time team, since there is still a lot of work that needs to be completed in order to organize the Herbarium collections.
- the state of the old collections, existing in the STPH, needs urgent organization, and did not allow the team to advance more quickly and achieve all the project's objectives. All specimens had to be checked one by one, and their data entered manually, since the old listings provided to us did not fully correspond to the content of the herbarium specimen labels.
- many of the specimens from the old collections had to be restored, which further delayed the process, since this activity had not been initially foreseen.
- the team is aware that, after the end of the project, it will continue to work to achieve the objective of being able to organize the entire STPH collection, and for that, it will use the methodologies learned and perfected throughout this Project, and which are a precious tool to ensure careful and quality work.
- it is essential to pass on this information and training to the Forest team on the island of Príncipe, which is responsible for maintaining a small herbarium on Príncipe; therefore, the team will organize as soon as possible (June 2023) a trip to Príncipe with the aim of training Forestry/Park technicians and helping to organize the herbarium on the island of Príncipe. To this end, we have already established contact with Fundação Príncipe, so that we can carry out this activity together.
- a very important aspect, which was not concluded, is to hold a new meeting / workshop, with the main partners, with the aim of passing on all the information to the new heads of institutions that deal with biodiversity data. With the change of Government, at the end of last year, all the Directors of these institutions changed, since they are positions of political appointment. This is a crucial aspect to move forward with the possibility of implementing a GBIF Node at national level.

### Best Practices and Lessons learned

The capacity enhancement organized by BID-GBIF has helped us to see the gaps in our team capacities (english language barriers), and encourages us to find solutions. The training during the internship at COI - Portugal was very helpful for the team. We also organized local training sessions to share all the knowledge to the other team members.

The mentorship established with COI is a huge advantage for the STPH team.

### Post Project activities

1. Continuation of STPH collection organization activities and dataset publication.
2. Workshop at Príncipe island - objectives: to pass on this information and training to the Forest team on the island of Príncipe, which is responsible for maintaining a small herbarium on Príncipe; therefore, the team will organize a trip to Príncipe with the aim of training



Forestry/Park technicians and helping to organize the herbarium on the island of Príncipe. To this end, we have already established contact with Fundação Príncipe, so that we can carry out this activity together.

3. Final Workshop and Round-tables - with the aim of passing on all the information and project results to the main stakeholders and the new heads of institutions that deal with biodiversity data, to move forward with the possibility of implementing a GBIF Node at national level.

## Sustainability

### Sustainability Plans

The partner COI, Herbarium of the University of Coimbra, played a fundamental role in the training and technical support of the STPH team, and the ties that already existed between the two institutions became even stronger, so that in future activities we know that we can always count on this technical mentorship. The activities carried out by our 3 technicians from São Tomé and Príncipe during their stay at the COI were also positive for the host institution, as data on more than 3,000 herbarium specimens were worked on and published.

### Impact of COVID-19 pandemic on project implementation

The Internship at the University of Coimbra (COI) was delayed due to the pandemic, and only started in January 2022.

This delay greatly conditioned the progress of the project and the activities initially planned (workshop to launch the project and contacts with stakeholders), which were only carried out after the team returned to S. Tomé e Príncipe (May 2022).

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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.

