# Collections-based data for conservation actions: engaging decision-making actors to save globally threatened epiphytes in Colombia

**Programme:**BID
**Project ID:** BID-CA2020-047-USE
**Project lead organization:**Fundación Jardín Botánico Joaquín Antonio Uribe de Medellín
**Project implementation period:**1/9/2021 - 28/4/2023
**Report approved:** 11/5/2023

## Final Narrative Report

### Executive Summary

We have successfully carried out the systematization and cleaning of data in the herbaria (JAUM, HUA, COL, FMB, and CUVC) for 27.597 records (3.350 species). For JAUM a total of 6.585 epiphyte records of 1.599 species (74 % of the records have coordinates, of which 2.124 coordinate records were reconstructed). In CUVC, 3.860 records of 1.021 species (50 % of the records have coordinates, 1.032 records have been reconstructed). As for HUA, 10.912 epiphyte records of 1.868 species (35 % of the records have validated coordinates). National herbaria, COL, 4.239 epiphyte records of 1.230 species (27% of the records have validated or reconstructed coordinates). Regarding taxonomic quality, for JAUM, we achieved a resolution up to species of 5.199 records, 1334 up to genus and 16 in family. In CUVC, 3.418 up to species, 397 in genus and 33 in family, COL with 4.108 records in species and 131 in genus and HUA records up to species 8.678, genus 2.063 and family 22 records. For FMB, the dataset contains 1580 records of epiphytes and hemiepiphytes representing 38 botanical families (the most frequent Orchidaceae, Polypodiaceae, Bromeliaceae, Araceae y Piperaceae), 176 genus, 1068 species and 1 subspecies, and records coming from 25 political units in Colombia.

In relation to mounting and digitization of floral visitors (e.g., bees, beetles) deposited in IAvH-E, 1723 records of the beetle's superfamily Pleurosticti (Coleoptera: Scarabaeidae) were mobilized. This group has been reported as floral visitors of angiosperm plants. The process included specimen preparation, mounting, taxonomic identification and digitization following the respective protocols of the IAVH Entomological Insect Collection. In addition, a list of Scarabaeidae from the IAVH Entomological Insect Collection identified as floral visitors was produced, including a total of 132 records corresponding to four sub-families: Dynastinae with 11 genera, Cetoniinae with 7 genera, Rutelinae with 6 genera and Melolonthinae with 5 genera. In total, 127 species and 5 sub-species corresponding to a total of 29 genera were recorded. The sub-family with the highest number of species was Dynastinae with 83, followed by Rutelinae with 22, Cetoniinae with 14 and Melolonthinae with 13 species. The genus with the largest number of species corresponds to Cyclocephala with 57, followed by Pelidnotha with 11 and Phyllophaga with 9 species.

In the information development phase, we assessed 290 species' conservation status according to the International Union for the Conservation of Nature (IUCN) Red List guideline version 3.1 (IUCN, 2022), using geographic occurrences obtained from GBIF, herbarium specimens, and expert observations. We analyzed habitat quantity and quality (using forest cover and human footprint maps) and documented anthropogenic threats. The experts of each clade of interest validated the records. Our validation process of the assessments included a round with Colombian taxonomists, botanists, and biologists from the Botanical Garden of Medellin and a subsequent review by the Colombian Plant Specialist Group. Once we consolidate

the assessments following the standard templates, we prepared them to be submitted to the Species Information Service (SIS) platform, containing all the mandatory fields for an assessment to the IUCN and other fields IUCN Colombian Plant Specialist Group. The IUCN Orchid Specialized Group will review Orchid species assessments. We have published the information on the species in platforms and tools for official consultation in Colombia. In SIB Colombia, we have created a record of 290 epiphyte species evaluated, and 150 epiphyte species have been published in Biomodels of Colombia.

This study reveals that more than 40% of the evaluated epiphyte species are likely to be at some risk of extinction. While our results need to be interpreted cautiously since it is based on a sample of the epiphytic species in the country, the absolute numbers from our study are alarming, with 126 epiphyte species at elevated risk of extinction. This information will be helpful for users worldwide and country officials who require details of these species.

The extinction risk assessment of 117 species of "Pleurosticti" beetles (Coleoptera: Scarabaeidae) and 48 species of Euglossini bees reported as floral visitors of angiosperm plants, were prioritized for extinction risk assessments. The 50 species of Euglossini bees, known as orchid bees, were prioritized for extinction risk assessment based on the following criteria: (1) presence in Colombia, (2) confirmation of epiphytic plants visited, and (3) species of interest due to their ecological aspects. It should be noted that the three criteria were not met for all species, for this reason, it was established as a requirement that at least two were met. Information from literature on geographic distribution, altitudinal, habitat, and floral association was synthesized, and parameters used in national extinction risk assessments were calculated using the "ConR" script based on the "RStudio", which automatically generates the values of Extent of Occupancy (EOO), Area of Occupancy (AOO), and the geographic file (shapefile), as well as distribution maps in JPG format and complementary information such as number of subpopulations and localities mainly based on IUCN Red List criteria B. The information was standardized and documented in a specific template for the IUCN Species Information Service (SIS) web platform.

As a result, species of bees were assessed as follows: 15 species are Critically Endangered (CR), 19 Endangered (EN), 10 Vulnerable (VU), and 14 Near Threatened (NT). In terms of beetles, the following results were obtained: 92 species (78.63%) Least Concern (LC), 10 species (8.55%) Data Deficient (DD), 10 species (8.55%) Vulnerable (VU), and five species (5) (4.27%) Endangered (EN).

In addition, the validated records of epiphytes, beetles and bees species were shared with the platform BioModelos, http://biomodelos.humboldt.org.co/, and experts' groups were created for each taxa (epiphytes [http://biomodelos.humboldt.org.co/es/groups/61] and beetles [http://biomodelos.humboldt.org.co/es/groups/32]). Distribution models were produced for 111 epiphytes and 103 beetles and the validation process was initiated by experts on each taxonomic group. Bees records for 45 species were validated and one group of experts was created to implement ecological niche models.

Finally, a capacity-building session for environmental authorities using mobilized data is planned for the 24th of May 2023, aimed at the use of mobilized data using the different platforms where there are available, specifically GBIF, SiB Colombia, and Biomodelos. This activity has been delayed due to the additional time that the assessment and publication of species extinction risk has taken.

We highlight the importance of not only making the analysis of extinction risks based on distribution criteria and habitat status to be presented to an academic public, but we highlight the effort needed to make and implement the route to publish the data in national and global platforms such as the Catalogue of Biodiversity hosted by the SiB Colombia and the IUCN global Red List, that can be used by the authorities of the countries that will take concrete actions for the conservation of this group of plants.

We want to point out to be considered in the planning of similar projects.

A large amount of data currently available in GBIF needs to make a very rigorous curation process prior to analysis to ensure that spatial, temporal, and taxonomic information are correct. (2) Many records available through GBIF and other databases have not been studied by a taxonomic expert, and the identifications of many records are incorrect or dubious.

This problem is especially relevant for taxa in countries like Colombia, which both harbor immense

biodiversity and have relatively few taxonomists working in natural history collections. It is critical that taxonomic specialists participate in the curation of specimen records used in conservation status assessments to improve the reliability of the data and the conclusions drawn from them.

## 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

Regarding activity 1. (Analysis of the information resources required to address the policy framework and decision needed to protect epiphyte) and activity 2. (To assess which biodiversity data could become accessible through this project) the gap analysis and workflow were determined to accomplish high-quality data sets, as we presented in the mid-report. The gap analysis has allowed us to understand where the data mobilization gaps were and guides us in directing the mobilization efforts. According to the plan, mobilization has been prioritized for those families with little or no systematization at each herbarium and the cleaning of the databases following the directives to publish the data effectively. In addition, we established a workflow with a team of collaborators (specialist taxonomists) that allowed us to monitor progress in assessing the risk of extinction of prioritized species.

Regarding activity 3: 25,596 records of 3,350 epiphyte species deposited in selected herbaria (JAUM, HUA, COL; FMB, and CUVC) in Colombia have been systematized. Six datasets, accounting for 22,916 records, have been published (6585 of JAUM, 10,910 records of HUA, 3,841 of CUCV, COL, and 1580 FMB).

 HUA

https://doi.org/10.15472/esjdio

Metadata

https://doi.org/10.15472/hzgflx

CUVC

https://doi.org/10.15472/lapeh5

Metadata

https://doi.org/10.15472/tvqwlu

 JAUM

https://doi.org/10.15472/b7ifs4

Metadata

https://doi.org/10.15472/8vopwt

FMB

https://doi.org/10.15472/ighftu

Metadata

https://ipt.biodiversidad.co/iavh/resource?r=epifitas_fmb_2022

Regarding Activity 4. In the information development phase, we assessed the extinction risk of 290 species following the Categories and Criteria of the International Union for the Conservation of Nature (IUCN) Red List guideline version 3.1 (IUCN, 2022), using geographic occurrences obtained from GBIF, herbarium specimens, and expert observations. We analyzed habitat quantity and quality (using forest cover and human footprint maps) and documented anthropogenic threats. The experts of each clade of interest validated the records. The validation process included locality verification, species determination, and specimen data such as collector, herbarium, and collection data. We checked the location and coordinates, species name, collector, herbarium, and collection dates, among other relevant information for each specimen per species. Efforts between 0.1 to 1 hour per species are required to validate or discard a species for the assessment. With all the required parameters estimated, we assign the category of the risk of extinction for each species. Additionally, we prepared all the assessment information, including species' ecological attributes (range of distribution, dispersion, growth form, among others), use, threats, and conservation actions.

Our validation process of the assessments included a round with Colombian taxonomists, botanists, and biologists from the Botanical Garden of Medellin and a subsequent review by the Colombian Plant Specialist Group. Once we consolidate the assessments following the standard templates, we prepare them to be submitted to the Species Information Service (SIS) platform, containing all the mandatory fields for an assessment to the IUCN and other fields IUCN Colombian Plant Specialist Group. The IUCN Orchid Specialized Group will review Orchid species assessments.

We have published the information on the species in platforms and tools for official consultation in Colombia. In SIB Colombia, we have created a record of 290 species evaluated and continue the evaluation, and 150 species have been published in biomodels. This information will be helpful for users worldwide and country officials who require details of these species.

Regarding Activity 5. Webinar with global specialists on epiphytes addressing extinction risk for the selected families during a Second Epiphytes Symposium: extinction risk and conservation actions, were organized and transmitted). A webinar with global specialists on epiphytes addressing extinction risk for the selected families was held on October 2022 (https://www.youtube.com/live/sHFv2iuCH44?feature=share (25th October 2022, 805 views).

Activity seven is the only delayed one—a capacity-building session for environmental authorities using mobilized data. An online workshop has been organized to train environmental authorities in the use of mobilized data using the different platforms where there are available, specifically GBIF, SiB Colombia, and Biomodelos. However, we have had delays proving it since the cards still need to be visible, i.e., the project products could not be displayed (but they were already created offline).

Regarding Activity 6. Integrating data solutions into policy-making process. We have created the recommendations integrated into the manuscript "On the brink of extinction: red list of epiphytes of Colombia" (Annex 2). We summarize the policy options, main conclusions, and recommendations that facilitate decision-making processes on conservation and management once accepted for publication as supplementary data the Spanish- language to broaden the scope of the publication to a national audience.

Regarding activity 8. Conducting an outreach campaign in social networks. The campaign was created as a social media, reaching a broad audience during the second semester of 2022

Completed activities

## Activity: Analysis of the information resources required to address the policy framework and decision need to protect epiphytes

**Description:** We describe a species occurrence dataset of vascular epiphytes from Colombia based on the country's most up-to-date Epiphyte Species List. The dataset contains more than 700,000 records of epiphytes available and published by several institutions through the global repository Global Biodiversity Information Facility. It is currently the largest compiled dataset of epiphyte species in Colombia. With this compiled information, occurrences were downloaded from GBIF, and the database was post-processed to verify spatial and taxonomic information. The resulting dataset includes 5,191 epiphytic species (69 families), including 1,902 endemics to Colombia. The processed data is accessible through Zenodo and the data paper have been submitted (Annex 2).
**Start Date - End Date:** 2/4/2023 - 7/4/2023
**Verification Sources:** https://zenodo.org/record/7846601#

## Activity: A data mobilization phase

**Description:** 25.596 records of 3.350 epiphyte species deposited in selected herbaria in Colombia have been systematized. 22.916 records of six data sets have been published (6585 of JAUM, 10910 records of HUA, 3841 of CUCV and 1580 FMB).

An dataset of 1723 records of insects representing 161 species and 6 subspecies from IAVH- Entomological collection were mobilized. The process included specimen preparation, mounting, taxonomic identification and digitization

**Start Date - End Date:** 1/10/2021 - 30/11/2022
**Verification Sources:** The existing resource was updated for the following herbaria

HUA

https://doi.org/10.15472/esjdio

Metadatos

https://doi.org/10.15472/hzgflx

CUVC

https://doi.org/10.15472/lapeh5

Metadatos

https://doi.org/10.15472/tvqwlu

JAUM

https://doi.org/10.15472/b7ifs4

Metadatos

https://doi.org/10.15472/8vopwt

FMB

https://doi.org/10.15472/ighftu

IAVH-E – Floral visitors

Biological collection updated resource:

https://www.gbif.org/dataset/cf8f886b-7289-4d59-9cb1-f2d293147d98

Metadata: https://www.gbif.org/dataset/a9932d64-c20f-414d-a659-582c269240df

Metadato: https://ipt.biodiversidad.co/iavh/resource?r=epifitas_fmb_2022

## Activity: A capacity building session on biological collection data management for participating collections and other key collections in the country

**Description:** Online workshop to strengthen the capacities of biological collections in data management and publication were hold

**Start Date - End Date:** 30/6/2022 - 30/6/2022
**Verification Sources:** https://www.youtube.com/watch?v=BG5zEKUNcz4&t=2012s

## Activity: Extinction risk assessments and producing distribution models for prioritizied group of species

**Description:** The Extinction Risk Assessment have been developed in collaboration with IUCN Colombian Plant Specialist Group. Of the 290 epiphytes assessed, 126 (43%) were assigned to a Red List threat category. Among the threatened species, 24 were categorized in the Critically Endangered category (CR), 66 in the Endangered (EN), and 36 in the Vulnerable category (VU). Of the remaining species, 94 were categorized as Near Threatened (NT, 32% of species assessed), and 71 as Least Concern (LC, Dataset 1). For the 82 endemic species, the assessment identified 51 species (nearly 61% of the evaluated endemic species) as threatened, 14% were CR, 34 % EN, and 12 % VU. Thirty-two species were in non-threatened LC and NT.

**Start Date - End Date:** 1/10/2021 - 31/3/2023
**Verification Sources:** Brink of extinction: red list of epiphytes of Colombia
Maria Judith Carmona Higuita; Daihana Arango; Jennifer Calderón-Caro; Cristina Lopez-Gallego; Carolina Castellanos-Castro; Sebastián Vieira-Uribe; Laura Vibiana Clavijo Romero; Alejandra Vasco; Susana Vega Betancur; Weston Testo; Michael Sundue; Dino Tuberquia; Ricardo Callejas; Álvaro Idárraga; Alejandro Zuluaga; Nhora Elena Ospina-Calderon; Ana María Benavides
https://zenodo.org/record/7834256#.ZEs7vXaZPmF

Checklist of prioritized beetles species

https://www.gbif.org/dataset/495efac0-ecc2-4f1f-8af4-400a603b0974

Checklist of prioritized bee species

https://www.gbif.org/dataset/2140abec-03c7-4e99-8e70-9988d6383c57

## Activity: Conducting an outreach campaign in social networks

**Description:** Conducting an outreach campaign in social networks of the consortium partners, to intensively promote epiphytes conservation for a wide audience. These contents were co-created by the project team. We developed a series of short videos presenting the data collection and mobilization process and each of the partner herbariums were presented on social networks.

**Start Date - End Date:** 29/4/2021 - 28/2/2023
**Verification Sources:**

https://www.facebook.com/hashtag/epifitasgbif Herbarios

https://www.instagram.com/p/CiU1ZB1MALc/

https://www.facebook.com/hashtag/epifitasgbif

https://www.instagram.com/p/CiWHWgCMVeR/

https://www.facebook.com/hashtag/epifitasgbif

https://www.instagram.com/p/CiXtqBAg32a/

https://www.instagram.com/p/CiYRDf0g02o/

https://www.facebook.com/hashtag/epifitasgbif

https://www.instagram.com/p/Cia-6-RgFBa/

https://www.facebook.com/hashtag/epifitasgbif

https://www.instagram.com/p/Cj3s-maMvkM/

https://www.facebook.com/hashtag/epifitasgbif

https://www.instagram.com/p/CkGcoXhLrh3/

## Activity: Integrating data solutions into policymaking process - Producing a policy brief witting process

**Description:** We have created the recommendations integrated into the submitted manuscript "On the brink of extinction: red list of epiphytes of Colombia" (Annex 2). We summarize the policy options, main conclusions, and recommendations that facilitate decision-making processes on conservation and management once accepted for publication as supplementary data the Spanish- language to broaden the scope of the publication to a national audience.
**Start Date - End Date:** 1/2/2023 - 27/4/2023
**Verification Sources:** Annex 2

## Activity: Establishing workflows to promote further data mobilization to update information resources developed in the project

**Description:** We summarize the workflow and have share in the Colombian Botanical Congress in 2022 and National Epiphyte Symposium
**Start Date - End Date:** 25/10/2022 - 25/10/2022
**Verification Sources:** https://www.youtube.com/live/sHFv2iuCH44?feature=share&t=5441

## Activity: To assess which biodiversity data could become accessible through this project

**Description:** We submitted a data paper where we described a species occurrence dataset of vascular epiphytes from Colombia based on the most up-to-date Epiphyte Species List. The dataset contains more than 700,000 records of epiphytes available and published by several institutions through the global repository Global Biodiversity Information Facility. Its currently the largest compiled dataset of epiphyte species in Colombia. Occurrences were downloaded from GBIF, and the database was post-processed to verify spatial and taxonomic information. The resulting dataset includes 5,191 epiphytic species (69 families), including 1,902 endemics to Colombia. The processed data is accessible through Zenodo and the Global Biodiversity Information Facility (GBIF).

We seek to quantify the existing knowledge gaps regarding the records' quality, temporality, representativeness, and distribution. Second, we introduced a map of epiphyte species richness, highlighting the relative contribution of different families. Lastly, we described the sampling effort over the years and finally focus on the current quality of the records (levels of uncertainty in the geolocation data).

**Start Date - End Date:** 1/10/2022 - 27/4/2023
**Verification Sources:** Annex 1

## Report on Deliverables

### Deliverables - Summary

For the Planning phase, the information sources analyze to protect epiphytes in Colombia. Based on information sources analyses required to address policy framework and decisions needed to protect epiphytes based on data availability, taxonomic scope, access, data gaps, data quality, and relationships to other environmental data, the gap analysis was completed. It was discussed in the first months of 2022 with the project team and partners, and during a workshop to validate it was presented during the Colombian botanical congress in November 2022.

For the Data mobilization phase, the activity "A data mobilization phase," we have accomplished the systematization of more than 25 thousand records of epiphyte species deposited in selected herbaria in Colombia, and one data set of 22,916 records has been published. HUA, CUCV, and FMB datasets were published between July 2022 and February 2023. Dataset of Floral Visitors of Colombia: Collection-based data for science and conservation have been completed 100%.

### Deliverables produced by the project

## Dataset deliverables

## Other deliverables

## Deliverables - Project planning phase

**Information sources analyses to protect epiphytes in Colombia**

**Description:** Information sources analyses required to address policy framework and decisions needed to protect epiphytes based on data availability, taxonomic scope, access, data gaps, data quality, and relationships to other environmental data.
**% complete:** 100%
**Status update:** Manuscript submitted to Biodiversity and Conservation journal
**Sources of verification:** Annex 1

## Deliverables - Project data mobilization phase

**Epiphytes of Colombia: Collection-based data for science and conservation**

**Dataset type:** Occurrences
**Dataset scope:** Description: approx. 22,916 records in a dataset of undigitized collections (or digitalized by not following Darwin Core (DW) requirements deposited in key herbaria and published in the Colombia Biodiversity Information National Facility (SiB)
**Number of records:** 22,916

**Data holder:** herbaria: CUCV, HUA; JAUM, FBM
**Data host institution:** herbaria: CUCV, HUA; JAUM, FBM
**% complete:** 100%
**Status update:** 6585 of JAUM, 10910 records of HUA, 3841 of CUCV, and 1580 FMB
**DOI:** HUA https://doi.org/10.15472/esjdio Metadatos https://doi.org/10.15472/hzgflx CUVC
https://doi.org/10.15472/lapeh5 Metadatos https://doi.org/10.15472/tvqwlu JAUM
https://doi.org/10.15472/b7ifs4 Metadatos https://doi.org/10.15472/8vopwt FMB https://doi.org
**Expected date of publication:**


## Epiphytes and Floral visitors of Colombia: Collection-based data for science and conservation

**Dataset type:** Occurrences
**Dataset scope:** approx. 1,723 records in a dataset of undigitized collections was (or digitalized following DW requirements
**Number of records:** 1,723
**Data holder:** Colección de Entomología del Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH-E)
**Data host institution:** Instituto de Investigación de Recursos Biológicos Alexander von Humboldt
**% complete:** 100%
**Status update:** The process included specimen preparation, mounting, taxonomic identification, georeferencing and digitization following the respective protocols of the IAVH Entomological Insect Collection. Links to updated dataset of the Humboldt's Institute Entomology Collection: https://ipt.biodiversidad.co/iavh/resource?r=coleccion_entomologica Metadata of floral visitors' records mobilized: https://www.gbif.org/dataset/a9932d64-c20f-414d-a659-582c269240df#description
**DOI:** Links to updated dataset of the Humboldt's Institute Entomology Collection: https://ipt.biodiversidad.co/iavh/resource?r=coleccion_entomologica Metadata of floral visitors' records mobilized: https://www.gbif.org/dataset/a9932d64-c20f-414d-a659-5
**Expected date of publication:**


## Assessing extinction risk for key epiphytic lineages in Colombia

**Dataset type:** Checklist
**Dataset scope:** The IUCN Red List assessments of Colombian flora significantly impact national public policy by informing conservation strategies and prioritizing areas for conservation. However, little is known about the distribution, conservation status, or evolutionary history of most Colombian epiphytes, which prevents the development of strategies aimed at their protection. In this article, we present the results of national assessments of extinction risk for 290 species of vascular epiphyte species from Colombia, including 81 country endemics, using geographic occurrences obtained from GBIF, herbarium specimens, and expert observations and implementing the analysis of habitat quantity and quality. We identify the most common threats facing these taxa and highlight the most at-risk taxa, to identify conservation priorities for epiphytic plants in this megadiverse country. We show that focusing on specific taxonomic groups at the national level is a practical approach for accelerating the assessment process. We suggest continuing working collectively, implementing workshops to share the complete route for an individual or multispecies assessment, and sharing experiences of efforts in several countries since, with a standardized methodology and published evaluations in national and global repositories, we can continue working for the conservation of biodiversity of mega-diverse countries, which its protection is critical to maintaining global biodiversity.
**Number of records:** 290
**Data holder:** Botanical Garden of Medellin
**Data host institution:** Botanical Garden of Medellin
**% complete:** 100%
**Status update:** Extinction Risk Assessments (ERA) for 290 species predominantly epiphytic plant families. ERA is published in Colombia Biodiversity Information National Facility (SiB).
**DOI:** 10.5281/zenodo.7834256
**Expected date of publication:**


## Extinction Risk Assessing for floral visitors of epiphytes in Colombia

**Dataset type:** Checklist
**Dataset scope:** Extinction Risk Assessments (ERA) for 165 species of floral visitors of epiphytes in Colombia. ERA were published in Checklist in GBIF
**Number of records:** 165
**Data holder:** Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH)
**Data host institution:** Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH)
**% complete:** 100%
**Status update:** A list of species was prioritized based on association with epiphytes, information on ecology, geographic distribution (biological records), and use was consolidated and extinction risk was assessed using the criteria and categories of the IUCN Red List. Links to the checklists in GBIF:
https://www.gbif.org/dataset/0c8181c3-1d11-42f6-8b67-1a0c17aa1b55
https://www.gbif.org/dataset/2140abec-03c7-4e99-8e70-9988d6383c57 Links to biological records datasets for assessed species: https://www.gbif.org/dataset/a9932d64-c20f-414d-a659-582c269240df
https://www.gbif.org/dataset/9bc3c08c-b7e5-4eaa-9535-c75e5005a314 Annex 4. Beetles' assessments
**DOI:** Links to the checklists in GBIF: https://www.gbif.org/dataset/0c8181c3-1d11-42f6-8b67-1a0c17aa1b55
https://www.gbif.org/dataset/2140abec-03c7-4e99-8e70-9988d6383c57 Links to biological records datasets for assessed species: https://www.gbif.
**Expected date of publication:**


## Deliverables - Project evaluation phase


### Plants on plants and people: an outreach campaign in social networks to draw attention on epiphytes conservation

**Description:** Interactive communication posts and videos were published in social media of the Medellin Botanical garden.
**% complete:** 100%
**Status update:** metrics of impacting over 10,000 followers.
**Sources of verification:** https://www.instagram.com/p/CiU1ZB1MALc/
https://www.facebook.com/hashtag/epifitasgbif https://www.instagram.com/p/CiWHWgCMVeR/
https://www.facebook.com/hashtag/epifitasgbif https://www.instagram.com/p/CiXtqBAg32a/
https://www.instagram.com/p/CiYRDf0g02o/ https://www.facebook.com/hashtag/epifitasgbif
https://www.instagram.com/p/Cia-6-RgFBa/ https://www.facebook.com/hashtag/epifitasgbif
https://www.instagram.com/p/Cj3s-maMvkM/ https://www.facebook.com/hashtag/epifitasgbif
https://www.instagram.com/p/CkGcoXhLrh3/


### Manuscript on epiphytic species richness and conservation status in Colombia

**Description:** A manuscript submitted to a worldwide impact journal including analyses of the selected groups (vascular epiphytes). Including map products such as species distributions and geographical data gap analyses.
**% complete:** 90%
**Status update:** The manuscript was submitted and rejected. We have worked in the last two months on correcting errors in the database and preparing to resubmit
**Sources of verification:** Annex 2


### Second National Epiphytes Symposium: extinction risk and conservation actions

**Description:** Webinar with global specialists on epiphytes addressing extinction risk for epiphytes in Colombia, Mexico y Brazil, organized by the project consortium of this proposal
**% complete:** 100%
**Status update:** During the symposium it was exposed and discussed crucial aspects of the experiences in America with the conservation of epiphytes, addressing aspects such as: the current state of conservation, extinction risk assessments. The mechanisms or tools that allow us to conserve epiphytes at a national level and relevant experiences. Speakers: - Thorsten Kroemer, Center for Tropical Research Universidad Veracruzana. - Flávio Nunes Ramos, Institute of Nature Sciences, Federal University of Alfenas. - Cristina

López, Institute of Biology, University of Antioquia. - Carolina Castellanos, Basic Biodiversity Sciences, Alexander Von Humboldt Biological Resources Research Institute. - Eduardo Fernández, National Center for the Conservation of Flora. - Maria Judith Carmona. Botanical Garden of Medellin. - Ana Maria Benavides. Botanical Garden of Medellin.
**Sources of verification:** https://www.youtube.com/watch?v=sHFv2iuCH44&t=5515s


### Police maker's brief on epiphytes facing extinction risk in Colombia

**Description:** We have created the recommendations of the policy brief integrated into the manuscript "On the brink of extinction: red list of epiphytes of Colombia" (Annex 2). We summarize the policy options, main conclusions, and recommendations that facilitate decision-making processes on conservation and management once accepted for publication as supplementary data the Spanish- language to broaden the scope of the publication to a national audience.
**% complete:** 90%
**Status update:** A publication submitted to a journal
**Sources of verification:** Annex 2


### Species distribution models of epiphytes and their floral visitors in Colombia

**Description:** Distribution maps in BioModelos plataform
**% complete:** 100%
**Status update:** Ecological niche models were calculated for 111 species of epiphytes and 103 for Coleoptera. Maps of epiphytes species distribution models are under validation by specialists and available on the platform: http://biomodelos.humboldt.org.co/. Maps of Coleoptera species distribution models are ready to upload in BioModelos. http://biomodelos.humboldt.org.co/es/groups/61
http://biomodelos.humboldt.org.co/es/groups/32
**Sources of verification:** http://biomodelos.humboldt.org.co/es/groups/61
http://biomodelos.humboldt.org.co/es/groups/32


## Events


## Online workshop to strengthen the capacities of biological collections in data management and publication were hold

**Dates:** 2022-06-30 -
**Organizing institution:** Jardín Botanico de Medelin and Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH)
**Country:** Colombia
**Number of participants:** 128
**Comments:**
**Website or sources of verification:** https://www.youtube.com/watch?v=BG5zEKUNcz4&t=2012s

## Events


## Segundo Simposio de Epífitas: Experiencias de Conservación en América

**Dates:** 2022-10-25 -
**Organizing institution:** Jardín Botanico de Medelin
**Country:** Colombia
**Number of participants:** 820
**Comments:**

# Events

## A capacity-building session for environmental authorities using mobilized data.

**Dates:** 2023-05-24 - 2023-05-24
**Organizing institution:** Jardín Botanico de Medelin and Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH)
**Country:** Colombia
**Number of participants:** 35
**Comments:** Webinar with environmental authorities of Colombia to disseminate species descriptions and extinction risk assessments as tools to make species management decisions
**Website or sources of verification:** An online workshop

# Communications and visibility

The communication strategy was activated in July 2022, reaching 94564 accounts (52856 impressions and 17159 visualizations; Annex 3). The "Second Epiphyte Symposium: Conservation Experiences in America," a webinar with global specialists on epiphytes addressing extinction risk for epiphytes in Colombia, Mexico, y Brazil, organized by the project consortium of this proposal was attended by eight hundred people (Segundo Simposio de Epífitas: Experiencias de Conservación en América).

We held two results progress meetings with the experts associated with the project; with them, the mobilization prioritization in each herbarium was defined. Moreover, results of the project have been presented in three academic events: (1) the Colombian Ecology Congress in August 2022), (2) the Botanical Colombian Congress in November 2022, and during (3) the second symposium of epiphytes in October 2022.

# Monitoring and evaluation

### Final Evaluation

We have successfully carried out the process of systematization and cleaning of data in the herbaria and entomological collections deposited in IAvH-E. In the information development phase, we assessed 290 epiphyte species and 165 insect species conservation status according to the International Union for the Conservation of Nature (IUCN) Red List guideline version 3.1 (IUCN, 2022), using geographic occurrences obtained from GBIF, herbarium specimens, and expert observations.

### Best Practices and Lessons learned

Colombia exhibits a large proportion of the world's epiphyte species richness, which evidences the effort made by researchers, botanists, and national and international institutions to increase its knowledge. However, according to our analysis in our data paper (Annex 1), many of these records need better uniformity of information; 37 % lack coordinates, 15% do not include an exact date of collection and the accuracy of the scientific names cannot be comprehensibly evaluated as there is no consensus on the taxonomy of many species. These are aspects that can be reviewed and corrected in order to improve the quality of the data.

We have faced several challenges in analyzing mobilized data: (1) Large amount of data currently available in GBIF needs to make a rigorous curation process before analysis to ensure that spatial, temporal, and taxonomic information is correct. (2) Many records available through GBIF and other databases have not been studied by a taxonomic expert, and the identifications of many records need to be corrected or dubious. This problem is especially relevant for taxa in countries like Colombia, which harbor immense biodiversity

and have relatively few taxonomists working in natural history collections. Despite improved access to digital specimen records through online databases, many taxonomic groups cannot be confidently identified from images alone. Hence, the physical study of specimens, which involves expensive travel or extensive inter-institutional specimen loans, is necessary. With these realities in mind, taxonomic specialists must participate in curating specimen records used in conservation status assessments to improve the reliability of the data and the conclusions drawn from them.

In conclusion: new projects in botanical explorations and mobilization of herbarium records should consider improving the species' taxonomy identification and ecological knowledge. We found an over-representation of records in Antioquia, possibly due to multiple reasons, such as a greater sampling intensity and an exceptional species richness in this region. We need to digitize more herbaria specimen's information and increase our inventories nationwide to provide further data for conservation actions.

We highlight the importance of not only making the analysis of extinction risks based on distribution criteria and habitat status to be presented to an academic public but we highlight the effort needed to make and implement the route to publish the data in national and global platforms such as the catalog of biodiversity in Colombia and the IUCN red list, that can be used by the authorities of the countries that will take concrete actions for the conservation of this group of plants.

Moreover, specifically, to comply with the planning of this project, the biggest challenge was to be able to complete with a high level of quality the formats associated with the species assessments, both in the SIS connect standard and, in the format, to publish in the SIB Colombia platform. Although the evaluation of criterion B, once the specialists have contributed to the information and the associated scripts to calculate the geographic information, it is easy to run; what proved to be more complex is the level of detail required to fill in the multiple fields associated with each evaluation. Completing the information associated with each species took a great deal of time.

The use of mobilized data for extinction risk assessment of floral visitors took more time than initially planned considering the curatorial process of the records, in terms of geography and taxonomy, involving specialists in this step was crucial to use the most up to date and high-quality information. The project facilitated experts in both the bee and beetle groups to organize themselves to contribute to the assessment, and in the case of bees they continue working to have global assessments and involving other specialists.

## Post Project activities

Activity seven will be held on 24th May—a capacity-building session for environmental authorities using mobilized data. An online workshop has been organized to train environmental authorities in the use of mobilized data using the different platforms where there are available, specifically GBIF, SiB Colombia, and Biomodelos. An online webinar will be conducted in May to socialize the results of the project. This event was initially planned only for environmental authorities but considering the scope of the results the project team agreed to make it available to a broader audience. Invitation to the webinar will be sent to environmental authorities, students and university teachers, and divulgation for the public will be made through the online channels of the Humboldt Institute and the Medellin Botanical Garden.

We will present the results of this project, "On the brink of extinction: Red list of Colombian epiphytes, on a symposium of epiphytes in America on Wednesday, 31st May, from 14 to 17 (Colombian time).

# Sustainability

## Sustainability Plans

We will share our experience of this project and collaborate with Dra Glenda Mendieta-Leiva (Postdoctoral researcher, University of Marburg), principal researcher of a recently granted project that expects to generate novel insights into the mechanisms underlying vascular epiphyte diversity and provide effective conservation priorities for their protection in the Neotropics.

# Impact of COVID-19 pandemic on project implementation

We had no significative impact associated with Covid.

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