

Catalog of the Fishes of Colombia

Programme:BID

Project ID: BID-CA2020-030-USE

Project lead organization:Universidad Nacional de Colombia

Project implementation period:1/7/2021 - 30/6/2023

Report approved: 30/8/2023

Final Narrative Report

Executive Summary

We present the first complete Catalog of the Fishes of Colombia, an authoritative online resource on the Colombian ichthyofauna (www.catalogopecesdecolombia.unal.edu.co). The Catalog brings together information on all 3797 freshwater and marine species in the country. This effort was led by the Biodiversity Informatics Program of the Instituto de Ciencias Naturales at the Universidad Nacional de Colombia working in concert with the Catalog of the Fishes of Colombia Editorial Committee to coordinate over 100 taxonomic specialists contributing their expertise. The development of the resource was carried out in consultation with our project partners in the Colombian Ministry of the Environment, National Fisheries Agency, National Natural Parks agency, World Wildlife Fund, Invemar and our national GBIF node, SiB Colombia.

The Catalog was constructed in stages, beginning with an update of the national checklist of freshwater fishes, in 2021. This list includes 1616 species and the last metadata update was done in January 2023. This year we also produced, for the first time, a complete list of marine species for Colombia, achieved via the publication of two new datasets from the Caribbean and Pacific basins, respectively, documenting a total of 2181 marine fish species. The three datasets are now shared via GBIF and SiB Colombia.

These lists together comprise the taxonomic backbone of the Catalog, which can also be accessed via an API that was developed to facilitate data access for our partners in government agencies. In the online version of the Catalog, species pages are dynamically generated to display taxonomic information together with maps that show basin-level distributions for each species. About a third of the species pages also include descriptive information such as diagnostic characters, common names, ecological data or up to date conservation status. It was not possible to complete the descriptive information for all species during the project timeline, but the team (editors and authors) will continue working to identify and complete information gaps going forward. At the project outset we had commitments from about 75 ichthyologists to contribute their expertise. That number is now 104 and the seven members of the Editorial Committee are committed to keeping the resource up to date and as complete as possible.

A preliminary launch of the platform was carried out at a workshop with project partners on June 28, including a comprehensive overview of its design and functionality. Previous to the launch, conversations and meetings were held with each one of the partners to coordinate development of the API so that it could be maximally beneficial to our end users.

Synergies were also created between the Catalog of Fishes of Colombia and the “Catalogo Visual de Peces de Colombia” (<https://cavfish.unibague.edu.co/>) to allow the sharing of information and images between the two platforms. The latter is a repository of high quality images of freshwater fish, photographed using innovative techniques. Additional images from Invemar will also be linked to the Catalog of Fishes platform to illustrate as many of the marine species as possible. This work will be carried out in the coming weeks.

With support from the Ministry of the Environment we will also organize a formal launch event to which members of the scientific community, local and national environmental agencies and members of the

media will be invited. We project that the hard launch of the Catalog will take place in August.

In addition to the freshwater and marine checklists and the online Catalog, the project also produced 1,004 high quality images of freshwater fish species from the ichthyology collection of the Instituto de Ciencias Naturales, and supported the publication of two new specimen datasets: Universidad del Valle (500 marine fish specimens), Universidad de la Salle (1940 freshwater fish specimens). A third specimen dataset from Universidad del Atlántico (1398 marine fish specimens) was submitted to SiB Colombia for publication and should be available later this year.

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

1. Assignment of species: for the creation of the checklists, complete. All species were assigned to specialists, and where no specialist could be found, the editorial committee reviewed the taxonomy and distribution information. The contributing specialists are also participating in the curation of the descriptive content for the species pages. At present, about a third of the pages have either conservation status, diagnostic characters, common names, or some combination of these. Currently 53 % of species have an author assigned for the completion of the descriptive data and 47% remain "orphaned". The editorial team is currently recruiting students to help with the completion of species pages and the validation of the information will be the responsibility of the editors. We expect the participation of specialists to expand in the future as well.
2. Data completion of freshwater fishes: complete. An updated checklist of the freshwater species was published with 1616 species. See corresponding deliverable for this activity. Regarding descriptive content, 40% of the freshwater species have data completed, the other 60% has information relevant to taxonomical status, distribution, conservation status and origin. However, more data will be added to this species post-project.
3. Digital Platform Design. The platform design is complete. This activity refers to development (and subsequent implementation) of a backend interface for the editors and authors. It was completed in early 2022 and included in the midterm report.
4. Caribbean fishes checklist publication - the publication the Caribbean list was projected at an earlier stage of the project but was actually the last to be completed. Of the two marine lists (Pacific and Caribbean), it has the greatest number of species, but fewer specialists. The total number of marine species included is 2181. (See deliverables below)
5. Data completion of marine species - all species are currently in the platform and contain information regarding taxonomic status and distribution, other descriptive content will be added post-project for those species that do not yet have complete entries.
6. Data integration for endemic freshwater species - all the descriptive content data for endemic species were reused from information available in SiB Colombia and are now included in the Catalog of Fishes of Colombia. There are 384 endemic species in Colombia. The content was created before the project was initiated but the original authors are currently reviewing the information and future updates will be made directly in the Catalog.
7. Planning workshop with partner institutions: completed at project outset and included in the first early progress report. We have met periodically with the partners throughout the course of the project.
8. Closing workshop: conducted on June 28th with representatives from the Ministry of the Environment, National Parks, WWF, SiB Colombia and members of ACICTIOS (Colombian Association of Ichthyologists). (Also see Events.)

9. Specialist visits to ichthyology collections in Colombia. During 2022, specialists from Colombia and Brazil visited collections at the University del Tolima, Instituto de Ciencias Naturales of the Universidad Nacional de Colombia, Universidad de la Salle, Universidad del Valle. As a direct output of these visits, new species records for Colombia were discovered and a new species was described (I am attaching the submitted manuscript here).

Completed activities

Activity: Assignment of species

Description: Assignment by editorial committee of specialists to taxonomic groups. This was done as far as possible (104 specialists) over the course of the project but is really ongoing as new specialists and students will be recruited into the future.

Start Date - End Date: 1/1/2020 - 30/6/2023

Verification Sources: Contact list of 104 participating specialists extracted from Catalog backend database attached

Activity: Data completion of freshwater fishes

Description: The freshwater fishes checklist was updated and published. In the Catalog, each species page has at least some descriptive content including conservation status and origin, in addition to the taxonomic and distribution information. Additional descriptive information will be included in the future.

Start Date - End Date: 1/7/2021 - 30/6/2023

Verification Sources: <http://catalogopecesdecolombia.unal.edu.co/es/>

<https://www.gbif.org/dataset/7e3a2242-46d6-4b90-b80c-42c5d27ed93b>

Activity: Digital Platform Design

Description: This activity refers to the development and implementation of the backend interface for editors and authors.

Start Date - End Date: 1/7/2021 - 15/11/2022

Verification Sources: screen shots of backend included in attachments

Activity: Caribbean fishes checklist publication

Description: Publication of the 1329 marine fish species in the Caribbean basin.

Start Date - End Date: 1/7/2023 - 31/3/2022

Verification Sources: https://ipt.biodiversidad.co/sibm/resource?r=checklist_caribe

Activity: Pacific fishes checklist publication

Description: Publication of checklist of 852 marine species from the Pacific Basin.

Start Date - End Date: 1/7/2021 - 30/6/2023

Verification Sources: https://ipt.biodiversidad.co/sibm/resource?r=checklist_pacifico

Activity: Data completion of marine species

Description: All 2181 species are currently included in the online platform created for this project Catalogo de los Peces de Colombia. All have basic taxonomic and distribution information. Additional descriptive content will be added in the future

Start Date - End Date: 1/7/2021 - 30/6/2023

Verification Sources: <http://catalogopecesdecolombia.unal.edu.co/es/>

Activity: Data integration for endemic freshwater species

Description: Descriptive data for the endemic species were migrated from SiB Colombia to the Catalogo database and successfully integrated into the new online platform.

Start Date - End Date: 1/7/2021 - 31/5/2022

Verification Sources: <http://catalogopecesdecolombia.unal.edu.co/es/>

Activity: Closing working

Description: Final workshop to present the Catalog to representatives from the Ministry of the Environment, National Parks, WWF, SiB Colombia and members of ACICTIOS (Colombian Association of Ichthyologists). (Also see Events.)

Start Date - End Date: 28/6/2023 - 28/6/2023

Verification Sources: recording of online meeting here:

https://drexel.zoom.us/rec/share/GD-vYpMtWFz8xiavqd8FuKOKQPUOEGGXqEXavI5htqoXRgPlkmfViNCQnEE9jdsh.wGfxt_KwEI5NfvKq?startTime=1687979132000

Passcode: o.?XF!B1

Activity: Release of the Catalogo de los Peces de Colombia

Description: Release of the online Platform Catalogo de los Peces de Colombia hosted on the servers of the Universidad Nacional de Colombia

Start Date - End Date: 1/7/2021 - 28/6/2023

Verification Sources: <http://catalogopecesdecolombia.unal.edu.co/es/>

Activity: Specialist visits to Colombian Ichthyology Collections

Description: The project supported visits by taxonomic specialists to national fish collections at the University of Tolima, Universidad Nacional de Colombia, Universidad de la Salle and Universidad del Valle. These visits were timed with national ichthyological and zoological congresses so that only national travel expenses required funding. International visitors covered their own tickets for travel in and out of Colombia.

Start Date - End Date: 1/7/2022 - 31/3/2023

Verification Sources: Manuscript of new species attached; see also financial report for per diem allowances issued to pay for the visits

Report on Deliverables

Deliverables - Summary

1. Checklist of freshwater species containing 1494 species of fishes distributed in Colombia. Published in 2022. Final count 1616 freshwater fish species.
2. Planning Workshop. Completed at the start of the project. See earlier reports.
3. Digital platform to host the Catalog of the Fishes of Colombia. This refers to the construction of the database and backend user interface for authors and editors. Completed Nov 2022. The front end user interface is the online Catalog, listed here as a separate deliverable.
4. Checklist of Colombian Pacific marine fish containing 800-900 species. The checklist was published in the nick of time at the end of the project but was incorporated into the backbone of the Catalog at an earlier stage. Final count 852 marine fish species.
5. Checklist of Colombian Caribbean marine fish containing 1400-1500 species. The checklist was also published at the end of the project but was incorporated into the backbone of the Catalog at an earlier stage. Final count 1329 marine fish species.
6. Integration of data on endemic freshwater fishes. Migration of descriptive content from SiB Colombia. Completed successfully March 2022.
7. Dataset Title: Ichthyology collection University of Quindio. We had promising initial conversations with the curator of the fish collection at University of Quindio who was very interested in publishing a specimen dataset, but we were not able to work out the logistics. Nevertheless, we can deliver two other datasets (see next deliverables).
8. Dataset Title: Colección Ictiológica del Museo de La Salle Bogotá (MLS). We helped Universidad de la Salle publish 1940 specimen records of freshwater fish.
9. Dataset Title: Colección Ictiológica de la Universidad del Atlántico. We are helping Universidad del Atlántico publish 1308 specimen records of marine fish from the Caribbean basin.
10. Dataset Title: Colección ictiológica de referencia de la Universidad del Valle- We helped Universidad de Valle publish 500 specimen records of marine fish from the Pacific basin.
11. Dataset Title: Checklist of Fishes from Colombia. This deliverable was erroneously entered as a "checklist" but was meant to be a specimen record dataset. It is replaced by the three published datasets indicated above. Project funds were used to support data entry for 500 specimen records at Universidad del Valle, which has important collections from the Pacific region of Colombia. This dataset has been published and credited to the project. Publication of a second dataset representing Caribbean fish specimens stored at Universidad del Atlántico is also pending. The dataset was submitted to SiB Colombia and after an initial round of validation, was returned to the curator for corrections, which are now being applied (supporting document: email from SiB Colombia). This dataset will also be credited to the project, as has been the Universidad de la Salle collection for freshwater fish.
12. Dataset Title: Checklist of Fishes from Colombia. This is the list of all marine and freshwater species, the unified taxonomic backbone of the Catalog, now integrated into the portal with its associated API. This is not actually a separate published dataset in GBIF. For historical and practical reasons the three lists have been published separately, but maintenance of the lists will be henceforth managed through the single interface of the Catalog.
13. Photographs of living and preserved specimens. We produced 1004 high quality images of fish specimens from the Instituto de Ciencias Naturales. Integration of live fish images with the Catalog is underway but there have been some technical challenges. We are still working with our partner, the PI of CavFish, Professor Jorge García-Melo, to make the URL friendly. However, here is an example of the future links between both platforms:
https://experience.arcgis.com/experience/c2709552ee6244a69d96b7fa0d1fdc51/page/P%C3%A1gina-de-datos/?data_id=dataSource_15-17dbfb96758-layer-2%3A1. Additionally, we will be incorporating

photos of live marine fish together with our partners at the INVEMAR Institute via <https://www.flickr.com>. This deliverable will now become a post-project activity to be completed by the end of 2023.

14. Training Workshops with partner and non-partner institutions. A closing workshop was held on June 28th, 2023 to demo the Catalog to our project partners and members of the ichthyological community (see sections on events and partner responses, below). Continuous communication was maintained with partners during the project.

15. Documentation for Catalog of the Fishes of Colombia. Complete. Code and documentation available in GitHub. The documentation is also available here:

<http://catalogopecesdecolombia.unal.edu.co/es/results/api/v1/doc/>

16. Catalog of the Fishes of Colombia. Delivered. The searchable online platform is now available at: <http://catalogopecesdecolombia.unal.edu.co/es/>

17. APIs. The implementation is based on a REST API for the catalog information, in order to provide not only a web interface for queries, but also an access through this API, initially open, for queries by scientific name or through a LSID (Life Science Identifier) and returning all available information. The decision to use these query criteria comes from thematic meetings held by the catalog team and interested entities in the project, presenting the proposal of the API, the uses it could provide and the access options, so at the end the API is designed based on the feedback received. On our end we have made the API available according to the desired specifications and our partners are coordinating with the technical staff within their institutions regarding implementation within their systems. We will be available for consultations whenever necessary.

<http://catalogopecesdecolombia.unal.edu.co/es/results/api/v1/species/{species}>

Deliverables produced by the project

Dataset deliverables

Other deliverables

Deliverables - Project planning phase

Deliverables - Project data mobilization phase

Lista de especies de peces de agua dulce de Colombia / Checklist of the freshwater fishes of Colombia

Dataset type: Checklist

Dataset scope: All freshwater fish from the continental territory of Colombia

Number of records: 1,616

Data holder: Asociación Colombiana de Ictiólogos

Data host institution: Asociación Colombiana de Ictiólogos

% complete: 100%

Status update: Complete

DOI: 10.15472/numrso

Expected date of publication:

Checklist of Pacific marine fishes of Colombia

Dataset type: Checklist

Dataset scope: All marine fish species from the Pacific Basin of Colombia

Number of records: 851

Data holder: Asociación Colombiana de Ictiólogos

Data host institution: Asociación Colombiana de Ictiólogos

% complete: 100%

Status update: Published but not yet assigned a DOI

DOI: https://ipt.biodiversidad.co/sibm/resource?r=checklist_pacifico

Expected date of publication:

Checklist of Caribbean marine fishes of Colombia

Dataset type: Checklist

Dataset scope: All marine fishes from the Caribbean basin of Colombia

Number of records: 1,328

Data holder: Asociación Colombiana de Ictiólogos

Data host institution: Asociación Colombiana de Ictiólogos

% complete: 100%

Status update: Published but not yet assigned a DOI

DOI: https://ipt.biodiversidad.co/sibm/resource?r=checklist_caribe

Expected date of publication:

Colección ictiológica de referencia de la Universidad del Valle

Dataset type: Occurrences

Dataset scope: marine fish from Pacific region of Colombia

Number of records: 500

Data holder: Universidad del Valle

Data host institution: Universidad del Valle

% complete: 100%

Status update: complete

DOI: DOI 10.15472/9qdylr

Expected date of publication:

Colección Ictiológica del Museo de La Salle Bogotá (MLS) - Catálogo de Peces de Colombia

Dataset type: Occurrences

Dataset scope: Freshwater fish from the Andean region of Colombia, mostly representing the orders Characiformes and Siluriformes. The full Universidad de la Salle dataset has 1940 records. Using project funds over 1000 lots were revised by specialists, resulting in new annotations. To date the curator has been able to update 386 of the records.

Number of records: 1,940

Data holder: Universidad de la Salle

Data host institution: Universidad de la Salle

% complete: 100%

Status update: Complete. The collection can be consulted at the DOI below. Credit to the project is given here: https://ipt.biodiversidad.co/sib/resource?r=bid_caribe_la_salle_catfishcol

DOI: 10.15472/umnba4

Expected date of publication:

Colección Ictiológica de la Universidad del Atlántico

Dataset type: Occurrences

Dataset scope: marine fish from the Caribbean basin of Colombia

Number of records: 1,308

Data holder: Universidad del Atlántico

Data host institution: Universidad del Atlántico

% complete: 95%

Status update: The dataset has been submitted to SiB Colombia and is at the verification stage (supporting email attached). The final publication will most likely be towards the end of 2023.

DOI:

Expected date of publication: 2023-12-15

Deliverables - Project evaluation phase

Photographs of living and preserved specimens

Description: 1004 photographs of fish specimens from ICN ichthyology collection. Links to Visual Catalogue of Colombian Fish.

% complete: 90%

Status update: The specimen photos have been taken, but barcodes have not yet been included in post-processing. The images will be uploaded to www.biovirtual.unal.edu.co and shared with the Catalog by the end of this calendar year.

Sources of verification: Sample link to Visual Catalogue here:

https://experience.arcgis.com/experience/c2709552ee6244a69d96b7fa0d1fdc51/page/P%C3%A1gina-de-datos/?data_id=dataSource_15-17dbfb96758-layer-2%3A1.

Documentation for Catalog of the Fishes of Colombia

Description: Documentation of Catalog and associated API

% complete: 100%

Status update: code and documentation for API are now available on the Catalog website and in Github. Documentation for the Catalog is also in Github. See links below.

Sources of verification:

<http://catalogopecesdecolombia.unal.edu.co/es/results/api/v1/species/{species}>

<https://github.com/informatica-icn/catfishes.git>

Catalog of the Fishes of Colombia

Description: Online searchable Catalogue with complete taxonomic backbone (3797 species) and distribution data for all species. Additional descriptive content for ca. 30% of species.

% complete: 100%

Status update: Online and available for use

Sources of verification: <http://catalogopecesdecolombia.unal.edu.co/es/>

Catalog of the Fishes of Colombia API

Description: API to query the taxonomic backbone to meet the needs of project partners and other users.

% complete: 100%

Status update: complete and currently available for use

Sources of verification:

<http://catalogopecesdecolombia.unal.edu.co/es/results/api/v1/species/{species}>

Events

Closing Workshop Catalog of the Fishes of Colombia

Dates: 2023-06-28 - 2023-06-28

Organizing institution: Universidad Nacional de Colombia

Country: Colombia

Number of participants: 12

Comments: This was the final workshop of the project with the main objective of introducing the online platform and receiving final feedback. It was a hybrid meeting and included members of the Min. of the Environment, SiB Colombia, National Parks, WWF Colombia, the editorial committee of the Catalog of the Fish of Colombia and ichthyologists members of ACICTIOS.

Website or sources of verification: https://drexel.zoom.us/rec/share/GD-vYpMtWFz8xiavqd8FuKOKQPUOEGGXqEXavI5htqoXRgPlkmfviNCQnEE9jdsh.wGfxt_KwEI5NfvKq?startTime=1687979132000 Passcode: o.?XF!B1

Communications and visibility

On June 28th we had a closing workshop with project partners to demo the Catalog and there we decided to do a hard launch in August for which the Ministry of the Environment offered logistical and financial support. Project partners will also assist in disseminating the Catalog and other project results through their networks. We will liaise with the media via the Universidad Nacional's media office. Project partners in Government agencies will also assist with outreach to stakeholders in local communities that they work with to get the word out about the Catalog. Presentations on the project were given this past March at the National Zoology Congress and in future congresses we will continue to disseminate the project and recruit students and specialists to participate. We will also communicate the news of the Catalogue and Checklists publications to FishBase and Catalogue of Life.

Monitoring and evaluation

Final Evaluation

The main project activities were successfully completed: update of the freshwater checklist, completion of the two marine checklists, integration of the lists to create the backbone for the Catalog of the Fishes of Colombia, development of backend database for editors and authors and publication of the online Catalog with user-friendly interface and an API. Specimen datasets for Caribbean and Pacific marine fish were created at Universidad del Atlántico and Universidad del Valle, respectively. For each of the 3797 Colombian fish species we report current taxonomy and distribution information at the basin level. We had hoped to deliver the Catalog populated with descriptive content for each species, but in the end the checklists took longer than expected to assemble and we had to give this task priority. We will be working with our authors and editors to complete this information in the future and recruiting students to participate. At the project outset we had commitments from about 75 authors to contribute their taxonomic expertise. Over the course of the project this number grew to 104, which at times presented challenges to try to keep everyone on schedule. We had expected it would be necessary to give our authors a gentle (at times more forceful) push, but it really did come down to the wire on the delivery of the marine lists. Some authors were also resistant to the idea of digital publication of the checklists versus a traditional publication, but we convinced them of the merits of having a dataset to point to, and of the increased visibility their work would gain.

Our project partners are very enthusiastic about the Catalog. Expectations from the Ministry of the Environment and the National Natural Parks agency are that it will be extremely useful for decision making, resource management, and also facilitate communication about fishes with local stakeholders in the communities that they work with around the country. Our partners at WWF coordinate Red Listing activities for Colombian fish and they are also eager to use the Catalog and pursue greater integration at a systems level. The National Fisheries Agency unfortunately could not attend the closing workshop, but we will maintain contact with them and follow up on how they implement the API.

There were no major changes to the project. We requested a budget amendment last year to be able to support a specimen digitization initiative at Universidad del Valle in order to have better specimen representation of marine fish species and this activity was approved.

Apart from the expert review of the marine checklist, other activities also took longer than expected. In order to host the Catalog on the servers of the Universidad Nacional de Colombia there are many bureaucratic hurdles involved, and the permissions came through at the last minute. The University has also fallen prey to numerous cyberattacks in recent years and security protocols have been modified several times during the course of the project, which has also created delays in our testing and implementation schedule.

Project funds were used to support visits by specialists to ichthyology collections at the University of Tolima, Universidad de la Salle, Universidad Nacional, Universidad del Valle and Universidad del Atlántico. The intention of these visits was to confirm or reject the inclusion of doubtful species in the Catalog. In all cases the collections benefitted from curation and as a result of the visits, new records for Colombia were discovered and in at least one case, a new species was discovered. An additional positive outcome of these visits was that the Universidad de la Salle and Universidad del Atlántico will now provide specimen datasets to GBIF, so this was certainly a worthwhile activity to invest in.

Follow up actions include completing publication of the Univ. del Atlántico specimen dataset, completing the programming tasks for linking of live fish images from CavFish (fresh water) and Invemar (marine) to species pages, planning and execution of the launch event, and completion of the descriptive information (diagnostic characters, ecological information, common names, etc.) for the freshwater and marine species that lack this kind of content. Some of these tasks have already been assigned to authors and editors. We will also be tracking use of the API and of the Catalog itself via analytics software and maintaining communication with our partners to respond to their needs.

Best Practices and Lessons learned

Coordinating the work of 104 taxonomists is like herding cats, but communication has generally been smooth and free of conflict. Task management software has been helpful at times for coordination of project activities at Universidad Nacional de Colombia. In the wake of all our cybersecurity woes at the University we have learned you can never have enough backups. Fortunately no project data were lost or compromised.

Throughout the project we understood the importance of having clear channels of communication from the beginning. We also learned the importance of having a clear list of activities to ensure the goals are accomplished. It is important to enforce and communicate realistic deadlines but also is necessary to check in often to ensure the activities are completed on time.

Project management was shared among the Biodiversity Informatics Program (technical and administrative affairs) and the Catalog of the Fishes Editorial Committee (scientific affairs and sociological issues). Development and deployment of an integrated back-end editing tool for the Catalog was a new experience for us, compared to our prior experience with the Catalogue of Plants and Lichens of Colombia. Authors reported a positive user experience and we certainly saw efficiency gains (the plant Catalogue was assembled from over 180 spreadsheets!). We expect this tool will also be key to the project's longevity (see section on sustainability).

The decision to separate the production of the Taxonomic Backbone from descriptive content of the Catalog was another difference compared to our experience with the Catalogue of Plants and Lichens of Colombia. This has a lot to do with the genesis of this project, which was conceived from the start to be an online Catalog, while the Catalogue of Plants and Lichens was originally conceived as a book and later adapted to deliver an online product. The development of resources like Checklist Bank was not yet a blip on the radar when the plant catalogue was conceived. Separating these components allows us to more easily keep up with taxonomic changes.

Post Project activities

Most of the following activities are discussed in other sections of the report. Here is a summary.

1. Completing assignments of orphan species to taxonomic specialists for review.
2. Completing descriptive data for species pages
3. Inclusion of static URLs for CavFish and Invemar live fish photographs
4. Publication of ICN fish specimen photographs on www.biovirtual.unal.edu.co and integration with Catalog

4. Official launch event
5. Analytics on usage of platform, additional trainings if necessary
6. Review of API's functionality
7. Publication of Univ. de Altántico specimen dataset (currently under review at SiB Colombia)

Sustainability

Sustainability Plans

Maintenance of the resources: The Catalog will be continuously updated after the project ends. The freshwater fish list has been updated since its publication in a yearly basis and we plan to continue with the same schedule. The marine list will be updated in a similar schedule and any changes made to either of the lists will be included automatically in the Catalog. The link between the front and back end of the platform will allow that any information added to the species gets published in the front end. For this matter, we can plan monthly updates of the information while the completion of species is still happening.

How project partners will build on the work done here:

We will continue to interact with project partner ACICTIOS for the updating of the Catalog and recruitment of additional specialists for orphan taxa. As mentioned elsewhere, the Min of the Environment will sponsor a hard launch for the Catalog in August at its headquarters in Bogotá. It will be an in person event, possibly with a live stream component. The Ministry expects to integrate the taxonomic information from the Catalog into its systems for monitoring of biodiversity and decision making. Both the Ministry and the National Parks Agency plan to use the Catalog in their community based projects. The Ministry, National Parks Agency, and the National fisheries Authority for the first time have a list of all of the marine and freshwater species of the country which will be a major boon to coordinating interagency activities and facilitating interagency communication. The taxonomic backbone of the Catalog will also serves as a primary input for Red Listing programs, led by our partner WWF and coordinated with the Ministry of the Environment, which is the agency responsible for publishing official lists of threatened species. Over the coming months and years we will track use of the Catalog, API, and downloads of the checklists in GBIF and SiB Colombia, as well as citations of the new datasets, and of the checklists to help measure the impact of all these products. We will maintain close collaboration with our partners in Government, as our institution is an official advisor to the Min. of the Environment on biodiversity matters.

Impact of COVID-19 pandemic on project implementation

Early in the project one of the editors was ill, but fortunately recovered completely. Another of our editors sadly passed away in July 2022 due to complications from lung cancer, although he did contract COVID-19 early in the pandemic and certainly that made his ordeal more difficult. In terms of travel, budget execution and task management, COVID-19 didn't really have a direct impact.

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.

