

FINAL ACTIVITY REPORT

Guidelines on how to complete the activity report are included in italics.

Remember that this report will be made available on your project page on the GBIF website and therefore should not include email addresses, unless you have permission from all mentioned in the report that their email information can be published.

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Project information

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Institution/network/agency affiliation:	University of Science, Vietnam National University Ho Chi Minh City, 227 Nguyen Van Cu, District 5, Ho Chi Minh City, Vietnam Herbarium (TUR), Biodiversity Unit, University of Turku, FI-20014, Turku, Finland
BIFA Project ID:	BIFA3-032
Project title:	Data mobilization of the Cryptogam collection of the Herbarium PHH, University of Science, Vietnam National University Ho Chi Minh City, Vietnam
Start date and end date of the reporting period:	01/04/2018 – 31/3/2019
Country in which the activities take place:	Vietnam

Executive summary

Provide a brief explanation of the project and its implementation, the context and the approach taken for the final evaluation, and a summary of the objectives achieved, lessons learned and conclusions.

The project aims to transfer digitalized data of bryophyte and lichen specimens in PHH Herbarium with updated identification into GBIF and provides a valuable opportunity to fill taxonomic and geographical gaps in the GBIF database. Core activities of the project are 1) to examine and confirm identification for specimens in the PHH and 2) to publish the specimen data to GBIF. The first core activity involved the participation of notable bryologists and lichenologist around the world, such as taxonomists from ABL, BM, EGR, H, HYO, NICH, PE, TUR (abbreviations follows Index Herbariorum code), by assisting and confirming the identification of specimens. In addition, the seminar in data mobilization and training workshop in bryophyte and lichen identification has been organized in November 2018, aiming for promotion and enhancement the project capacity. By the end of the project, three datasets with more than 7000 records of bryophytes and lichens have been published to GBIF. This final self-evaluated report helps the readers, project partners and especially BIFA Coordination team understanding activities and results that have been carried out and achieved within the project time frame.

Project objectives

This section should include the list of objectives included in your original project proposal, stating for each how far you advanced towards their achievement. Also include any additional objectives that were defined during the implementation of the project. In the event of unexpected challenges prevented you to reach a planned project objective, please provide detailed explanations and indicate how you plan to reach these objectives post project.

The project has two major long-term objectives, that are 1) advance research on bryophytes and lichens in Vietnam by mobilizing and delivering the species information from the PHH Cryptogam

collection to researcher community through GBIF, and 2) contribute to capacity building for local researchers by providing reference material for identification and skills and experience on methods used in GBIF for data publishing. From now, the research community can access information of Vietnam bryophytes and lichens, one of the less studied group in Southeast Asia, more easily through GBIF. Challenges bring opportunities; the collection is not fully identified, which also means that more taxonomic studies will need to be carried out in the future. The two meetings organized in this project bring together lichenologists and taxonomists around the world, as one of the first important step preparing for the complete Vietnamese bryophytes and lichens flora. The seminar and training workshop promoted GBIF and data mobilization approach to local research community, as well as provide basic skills on identification for these taxon group. The project's activities attracted local community's attention; therefore, we have applied for a continuous BIFA4 project to make the best use of current resource, to extend the database and to provide deeper knowledge of data mobilization in Vietnam.

Activities

Please indicate the status of the activities as outlined in the project proposal, at the time of final reporting. The table below should be completed in the same way as in the full proposal but should include information and updates on the status of each activity.

In the event of unexpected delay please provide detailed explanatory notes and indicate planned completion date after the end of the project. Add as many rows as needed.

In the event of any additional activities having being completed during the implementation of the project, please add rows as required.

Description of activity	Partners involved	Contribution of activity to goals listed in table 4.3	Status of activity as of final reporting Completed? Yes/No	Explanatory notes, inc. planned completion date if necessary	Source(s) of verification
Digitizing and publishing georeferenced species occurrence data based on specimens held in Asian collections					
Digitizing and databasing specimens for local Brahms database in PHH	PHH	This activity provides fundamental database for publishing the georeferenced species occurrence data in GBIF.	About 90% of the bryophyte and lichen collection at PHH Herbarium has been databased in Brahms and Excel; 10% of them are photographed.	The remaining undigitized specimens are not databased because lacking sufficient information.	Brahms database has been modified and published as the three datasets for GBIF. https://www.gbif.org/datasets/search?publishing_org=8dba2e07-0a91-4728-9ea7-39102c5ee8b9

Description of activity	Partners involved	Contribution of activity to goals listed in table 4.3	Status of activity as of final reporting Completed? Yes/No	Explanatory notes, inc. planned completion date if necessary	Source(s) of verification
Kick-off meeting	PHH, HYO, TUR, Dr. Hidetsugu Miwa	During kick-off meeting, partners will gather together to know each other, discuss the methods of data transfer to GBIF and after that, work on preliminary sorting and distributing specimens.	Completed	The kick-off meeting was held in 27th April–3rd May 2018 at the University of Science, VNUHCM.	https://drive.google.com/open?id=1yNm9HaY-ow-SjP2ke5FL2lhVIZEGEWYQ
Updating identifications for specimens	PHH, HYO, TUR, EGR, NICH, ABL, H, BM, PE	Correct names will improve the utility of the collections in taxonomic studies and research.	Not completed. About 40% of bryophytes and 20% of lichens are identified until species level. Half of the lichen collection, and 1/3 of the bryophytes still stay at phylum level (unidentified).	A large part of the collection has been divided into duplicates, sent out for identification by experts from H, TUR, HYO, EGR, NICH, PE, BM, ABL. However, identification takes time and depended on the personal schedule. In some taxa identification also requires additional taxonomic research. Lichen collection will be updated for identification in May–June 2019 (following the schedule of experts), as so the bryophytes.	Identifications of specimens can be viewed from the three published datasets. https://www.gbif.org/datasets/search?publishing_org=8dba2e07-0a91-4728-9ea7-39102c5ee8b9
Mid-project meeting	PHH, TUR, EGR, BM	During mid-project meeting, partners will come together to evaluate the progress, discuss about publishing data, writing report, promote the project and	Completed	Mid-project meeting was held from 22 nd –27 th November 2018 at PHH, University of Science, VNUHCM.	Annex [1] https://www.gbif.org/project/5joJ2AYB8QMwaosayloMeU/data-mobilization-of-vietnamese-herbarium-cryptogam-collections

Description of activity	Partners involved	Contribution of activity to goals listed in table 4.3	Status of activity as of final reporting Completed? Yes/No	Explanatory notes, inc. planned completion date if necessary	Source(s) of verification
		GBIF-BIFA grant by giving seminars in the host university.			
Seminar & training workshop	PHH, TUR, EGR, BM	Additional activity! Contribute in promoting the project, GBIF-BIFA, biodiversity data mobilization and providing skills in bryophyte and lichen taxonomy.	Completed	The seminar & training workshop was held from 27 th – 30 th November 2018 at PHH, University of Science, VNUHCM.	Annex [1] https://www.gbif.org/project/5j0J2AYB8QMwaosayl0MeU/data-mobilization-of-vietnamese-herbarium-cryptogam-collections Annex [3] Annex [4]
Designing a web page of Cryptogam collection in PHH	PHH	Additional activity! Besides delivering the species information, the web page is needed to store the images of specimens for GBIF publishing.	Partly completed	The web page will be continuously developed and updated information post project.	Annex [2] https://cryptogam-phh.hcmus.edu.vn/index.php/en/
Publishing the georeferenced species occurrence data in GBIF	PHH, TUR, Finnish-BIF	The final goal of the project is to deliver the species information from the Cryptogam collection of the Herbarium PHH to researcher community through GBIF.	Partly completed (will be regularly updated post project)	Dataset is hosted by Finnish-BIF node (the Natural History Museum of Finland, Helsinki). Data publisher is the University of Science, VNUHCM. Images will eventually be posted to the website and linked with the dataset on GBIF.	DOI: 10.15468/je1esr DOI: 10.15468/siajpm DOI: 10.15468/k5xaie https://www.gbif.org/dataset/search?publishing_org=8dba2e07-0a91-4728-9ea7-39102c5ee8b9
Writing report and joint publications	PHH leading, all partners involved	This activity will finalize the project and utilize scientific value of the Cryptogam	Not completed	Joint publications will be continued after project when the identification is ready.	Mid-term report: https://assets.ctfassets.net/uo17ejk9rkwj/CsJ8a8F9mgg4SlOao6Q6o/b1d5032ed727bcdfd3bdf62a34d8

Description of activity	Partners involved	Contribution of activity to goals listed in table 4.3	Status of activity as of final reporting Completed? Yes/No	Explanatory notes, inc. planned completion date if necessary	Source(s) of verification
		collection in PHH and species occurrence data on GBIF.			1596/BIFA3_32_Mid-term_activity_report_complete_and_APPROVED.pdf
Compiling inventories of biodiversity data holdings (for example, by implementing metadata catalogues)					
Preparing data papers					
Other activity types					

Deliverables

This section should summarize the project deliverables completed by the final reporting date, with a description of the associated outputs. Please highlight any changes from the original plans provided in the full project proposal.

In the event of unexpected delay, please provide detailed explanatory notes and indicate planned completion date. Add as many rows as needed.

In the event of any additional deliverables having being completed during the implementation of the project, please add rows as required.

a. Data

Details of datasets mobilized and/or pending mobilization as an outcome of the project: Please use list from mid-term report and update this as at final reporting.

If the dataset is not yet published, please indicate it as “not published” and provide a detailed explanation and expected date of publication. Add rows as required.

Title of dataset	Taxonomic/ geographic scope	Approximate number of records (specimens)	Current format (e.g. undigitized, digitized)	Status of dataset: Published/not published – inc. date/expected date of publication	Explanatory notes	DOI or URL
Bryophytes of Vietnam (PHH Herbarium, Cryptogam collection)	Bryophytes of Vietnam	3800 specimens	Digitized	Published	Title of dataset was changed, because we divided the originally planned dataset into 3 datasets to better match with taxonomic & geographic scope.	DOI: 10.15468/je1esr
Lichenized fungi of Vietnam (PHH Herbarium, Cryptogam collection)	Lichens of Vietnam	3300 specimens	Digitized	Published	Title of dataset was changed, because we divided the originally planned dataset into 3 datasets, to better match with taxonomic & geographic scope.	DOI: 10.15468/siajpm

Miscellaneous Bryophytes (PHH Herbarium, Cryptogam Collection)	Non-Vietnamese Bryophytes	400 specimens	Digitized	Published	Title of dataset was changed, because we divided the originally planned dataset into 3 datasets, to better match with taxonomic & geographic scope.	DOI: 10.15468/k5xaie
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b. Other deliverables

Describe other deliverables (e.g. publication of data papers, catalogues, reports etc.). produced and/or planned to be produced as a post-project deliverable. Please provide indicative dates/estimated time for completion for planned post-project deliverables.

Please provide links in the sources of verification. Attachments should be provided in the Annex.

Name and type of deliverable	Status of deliverable Published/not published – inc. date/expected date of publication or estimation of time for completion	Explanatory notes	Source(s) of verification
Updates for Brahms database for own herbarium use	Available for internal use.	Brahms database is the source for published datasets on GBIF.	https://www.gbif.org/dataset/search?publishing_org=8dba2e07-0a91-4728-9ea7-39102c5ee8b9
Webpage on the herbarium database	Published	The web page will be continuously developed and updated after project.	Annex [2] https://cryptogam-phh.hcmus.edu.vn/index.php/en/
Updated checklist of bryophytes and lichens in Vietnam	Not published (expected to be published after BIFA4 project)	The list of species is being accumulated. However, some species should be revised taxonomically before publishing.	
Taxonomic articles	In preparation (to be published in 2019-2020)	Online key for the genera of Meteoriaceae and related genera in Vietnam is under preparation. About 5 other articles is planned and under preparation.	

Calendar of activities

The calendar should be completed in the same way as in the Full Project Proposal (4.6) but should include any changes. Please provide reasons for any changes in the Notes column in the table below.

Proposed dates	Activity	Lead partner	Notes
June 2018	Attendance of project team member at BIFA Capacity Enhancement Workshop	PHH	As scheduled
April 2018	Kick-off meeting in PHH	PHH	As scheduled
April 2018 – March 2019	Digitizing and databasing specimens in Brahms	PHH	The activity was slower than expected because a large portion of the specimens had hand written labels and incomplete information that was updated from personal field notes. Part of digitization was also done by inexperienced students.
April 2018 – December 2018	Updating identifications for specimens	PHH, TUR, H, HYO, EGR, NICH, BM, ABL, PE	Because of the large number of unidentified specimens, lack of taxonomist for certain taxa and depended on personal schedules, this activity will continue after project.
November 2018	Mid-project meeting in PHH	PHH	As scheduled. Meeting developed into a seminar and training workshop with more participants than in original plan.
December 2018 – March 2019	Publishing the georeferenced species occurrence data to GBIF	PHH	The data host was changed. GBIF Finland agreed to host our datasets, and the University of Science, Ho Chi Minh City is a data publisher.

a. General explanatory notes

In general, most of the activities took place as scheduled. About 90% of the total specimens in PHH-Cryptogams has been digitized and published on GBIF, although about half of them still needs to be checked and identification updated. The remaining 10% are either specimens used for teaching or other material with incomplete label information. The collection will be continuously updated for identification and add-on images after the project.

Project communications and visibility

Describe the way the results of your project have been and will continue to be communicated and shared with the project stakeholders and broader GBIF community. Please also review the page describing your project available from <http://www.gbif.org/programme/bifa> . Highlight any additional documents, events, news items or links that you would like to add to your page and provide links/attachment in the Annex.

A seminar and workshop about the GBIF-BIFA project and data digitalization in November 2018 has been recorded on the University's homepage, and Ho Chi Minh City television daily news. News about the event also appears on the GBIF-BIFA project's homepage, on Facebook group for Southeast Asia Bryophytes and Lichens (SEABAL <https://www.facebook.com/SEABAL2011/>), and will be shared on the leaflet by International Association of Bryologist (IAB).

After published, links to the databases will be shared will all project partners and made visible for public on University homepage, SEABAL Facebook page, etc. We also created a webpage for Cryptogam collection in PHH herbarium (<https://cryptogam-phh.hcmus.edu.vn/index.php/en/>) with direct link to GBIF database.

Final evaluation findings and conclusions

This section of the report should cover for example:

- *An evaluation of the project activities and their outputs/deliverables*
- *An assessment of the overall outcomes, impacts of the project and how it contributes to the overall objective of the BIFA programme*
- *Comments on the project implementation and completion, and its efficiency and effectiveness, strength and weaknesses etc.*
- *Any feedback on the project's relevance from the partners and stakeholders*
- *Indications and reasons for any changes which have been made to the project's original plans, and actions to follow-up*
- *The management arrangements for the project, including support from the GBIF Secretariat*
- *Areas of success to build on, after the project's implementation period*
- *Conclusions from your experience during the implementation of the project*

Changes to the original project plan:

- The host of published data was is changed. The Finnish Biodiversity Information Facility agreed to host our datasets, and the University of Science, Ho Chi Minh City is a data publisher. This decision was made after discussing with the GBIF Secretariat and BIFA Coordination Team during the BIFA Capacity Enhancement Workshop in Beijing, June 2018, and was confirmed by the GBIF Finland node in October 2018.
- More partners, Dr. Gothamie Weerakoon (Senior Curator of Lichens and Slime Moulds, the Natural History Museum, London, UK), and the PE Herbarium of Chinese Academy of Sciences (Beijing, China), were included in the project. They helped in identification the lichen and bryophyte collections in PHH.
- We have developed and organized the Seminar and Workshop for larger group of participants (about 50-55 persons), instead of organizing just a small internal meeting for 10 persons (report on the event is now on the project website). With support from the experts,

we think this is a good chance to promote our project, bryophyte-lichen study in Vietnam as well as GBIF & BIFA. Personally, I consider that the event was success and attracted attention from the community, therefore we have applied for the BIFA4 call to continue the work.

Pros:

- This project receives a great support from the community of bryologists and lichenologists around the world. Potential for new scientific findings in bryology and lichenology in Vietnam attracts voluntary from professional community even if only limited funding was available for the project.
- Support and advices from the GBIF Secretariat and BIFA Coordination team were very valuable for the smooth project implementation, especially when we had to make changes in the original plans. The BIFA Capacity Enhancement Workshop in Beijing, June 2018 provided useful and important knowledge about data mobilization and digitalizing process.

Cons:

- The project involved partners from several institutions around the world, which sometimes hampered fluent communication. Monitoring and implementing the project required thus more work than expected but this did not risk completing the project according the original plan.
- Tropical bryophytes and lichens are not well studied in general, and taxonomists working on them are scattered and literature scarce. Therefore, part of the collection have to be left as unidentified waiting for further taxonomic work on certain taxa. We hope that publishing the information onto GBIF will attract more studies on Vietnamese bryophyte and lichen flora.

In summary, the project has mainly followed the original plan and met our aims and expectations. Deviations from original plan still assure the final results.

Sustainability plans

Please provide a description of how the partners involved will build on the results of this project in their future work. This could include future collaborative activities, such as plans to complete any unfinished project activities and how the future impact of the project could be monitored and/or measured.

Through this project, we had chance to collaborate with many partners, which can be grouped as two:

- For taxonomic identification: This task involved lichenologists and bryologists from institutions worldwide such as ABL, BM, EGR, H, HYO, NICH, PE, TUR (abbreviations follow Index Herbariorum code). Experts in these institutions have assisted us in identification and verified names for more than 2000 specimens. This great work helped to assure the scientific value of each occurrence since about 80–90% of the collection in PHH was unidentified before the project started. New records found during the project will be included in the upcoming manuscripts. The collaboration will continue after the project since there is still material that needs identification, especially if our BIFA4 project is granted. This continuation will also help us to regularly update the records in GBIF. The future

publications will cite the project datasets, which can be monitored and measured from GBIF site.

- For publishing data: Dr. Hidetsugu Miwa and Finnish Biodiversity Information Facility have given us advice and instruction in data publishing. Finnish Biodiversity Information Facility hosts our data and the support will continue after the project.

Recommendations and lessons learned

This section should describe your experiences that could help in designing and implementing biodiversity mobilization projects more effectively, including the best practices to adopt and the pitfalls to avoid.

- Because of lack of experience herbarium and museum work, as well as digitization still lack guidelines and routinized workflows in Vietnam. Our group is one of the pioneers in this field, and the progress can be slow because we need create standardized workflow and often redo part of work due to earlier fails. Most importantly, we have learned and grown from challenges. From our experience, fundamental training in herbarium work, especially digitization and data mobilization should be provided for students and local staff at the beginning of the project.
- Checking and verifying identification with help of expert network was efficient and ensured the best available knowledge. However, it is important that all experts should compromise and have sufficient time dedicated to the project, although the work is voluntary. Negotiations on any changes during the project may easily require additional work for coordinator.
- Full support from the institutional administration is extremely important. Miscommunication and disruption may affect and slow down the progress.

Annex – Sources of verification

Sources of verification are for example links to relevant digital documents, news/newsletters, brochures, copies of agreements with data holding institutions, workshop related documents, pictures, etc.

[1] Link to the project' page on GBIF, with news & event report

<https://www.gbif.org/project/5joJ2AYB8QMwaosayloMeU/data-mobilization-of-vietnamese-herbarium-cryptogam-collections>

[2] Cryptogam collection PHH Herbarium Homepage

<https://cryptogam-phh.hcmus.edu.vn/index.php/en/>

[3] List of participants of seminar (attachment)

[4] List of participants of training workshop (attachment)

Signed on behalf of the project partners

Date