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.

Contents

Project information

Main contact person and role:	Mae Lowe L. Diesmos | Principal Investigator
Institution/network/agency affiliation:	HerpWatch Pilipinas, Inc.
BIFA Project ID:	BIFA3_026
Project title:	Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System.
Start date and end date of the reporting period:	1 April 2018 to 31 March 2019
Country in which the activities take place:	Philippines

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 "*Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System (BIFA3_026),*" (herein called the "Project") was implemented from 1 April 2018 to 31 March 2019 and funded by the Ministry for the Environment of the Government of Japan through the Global Biodiversity Information Facility (GBIF) under the Biodiversity Information Fund for Asia (BIFA) programme. The main objective of this Project is to fill taxonomic, geographical, and historical gaps in species occurrence and sampling-event data, focused on the 13 alien amphibians and reptiles in the Philippines, and develop an online national platform for long-term observation and monitoring of alien species invasions, with alien amphibian and reptile as pilot group. HerpWatch Pilipinas, Inc. (HWP) lead the project in assembling species occurrence and sampling-event data, conducting herpetofaunal surveys, data analysis, preparation of data papers and original articles for publication, preparation of technical and financial reports, and official communication with GBIF-BIFA. The Biodiversity Management Bureau of the Philippine Department of Environment and Natural Resources (DENR-BMB) helped in the design and execution of project and logistics in information campaigns and training workshops. The University of Santo Tomas – Biodiversity, Ecology, Systematics, and Taxonomy Group (UST) provided consultancy and support for meeting venues, fieldwork, and laboratory.

This final report presents the evaluation of the Project's implementation (1 April 2018 to 31 March 2019). The Project was evaluated in three levels: (1) Inputs; (2) Implementation; and (3) Outputs. The Project expenditures is in line with the project's budget, with FS by expense type and FS by activity in-line with approved budget or with minimal differences (<25%). As of reporting (27 March 2019), 89% of BIFA funds of the project have been expended so far, and the remaining budget is allocated for cost of Article Processing Charges which is expected to be expended post-project (April to July 2019). As of reporting, about 80% (31 of 39) of the activities have been completed, with the rest being partially completed and projected to be accomplished post-project. The project has delivered most of the expected major outputs; particularly, the occurrence and sampling-event data, an original article, and information campaigns. However, the project has yet to produce the DAYO website and mobile application and some data papers and original articles. In light of the evaluation of

the project's inputs, implementation, and outputs, it can be concluded that the project is lagging in terms of activities and outputs but, until the remaining activities and deliverables are yet to be accomplished and produced, we should be cautious in assessing the overall success or failure of the project.

In addition to filling taxonomic, geographical, and historical gaps on alien amphibian and reptile invasions in the Philippines, this project produced and will continue to produce the much needed science-based information that can help guide the development and implementation of sound national biosecurity programmes for amphibian and reptiles invasions, contribute to the Philippines' international commitments to sustainability and biodiversity conservation, and provide a reproducible framework for similar initiatives targeting other groups of alien taxa in the Philippines and other countries.

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 MAIN OBJECTIVE of this Project is to fill taxonomic, geographical, and historical gaps in species occurrence and sampling-event data, focused on the 13 alien amphibians and reptiles in the Philippines, and develop an online national platform for long-term observation and monitoring of alien species invasions, with alien amphibians and reptiles as pilot group. This will be achieved by:

OBJECTIVE 1**.** Assembling historical and geographical data from literature and natural history collections;

Status: completed.

Notes: An occurrence dataset on alien amphibians in the Philippines, comprising of 445 records, was published in the GBIF registry (https://doi.org/10.15468/o24m0j) (Appendix A). An occurrence dataset on alien reptiles in the Philippines, comprising of 128 records, was published in the GBIF registry (https://doi.org/10.15468/cpv8vf) (Appendix A).

OBJECTIVE 2. Generating species occurrence and sampling-event data by conducting targeted herpetofaunal surveys in two key conservation areas, namely, Ilocos Norte Province, Luzon Island and Palawan Island, Palawan Province;

Status: Completed.

Notes: Herpetofaunal surveys were conducted in Palawan and Ilocos Norte in September and November 2018, respectively. A total of 206 sampling event records and 272 occurrence records were collected from Ilocos Norte (includes records from 2017 survey). The dataset was published in GBIF registry (https://doi.org/10.15468/qzmkz7) and can be accessed through the GBIF-BIFA Cloud IPT (https://cloud.gbif.org/bifa/resource?r=ilocos_norte_herps) (Appendix B). On the other hand, 58 sampling-event records and 126 occurrence records were collected from Palawan. The dataset was published in GBIF (https://doi.org/10.15468/owrzuc) and can be accessed through the GBIF-BIFA Cloud IPT (https://cloud.gbif.org/bifa/resource?r=palawan_herps) (Appendix C).

OBJECTIVE 3. Reconstruct invasion histories and develop ‘Pest Risk Maps’;

Status: Partially competed

Notes: an original article on the reconstructed invasion history of alien amphibians have been accepted in the Pacific Science, and is expected to be published in July 2019 (Appendix D). An original article on the reconstructed invasion history of alien reptiles is being drafted. An original article on pest risk mapping of the alien amphibians and reptiles are in preparation (Appendix E).

OBJECTIVE 4. Ultimately, developing an observation and monitoring system, named “DAYO” (filipino for “alien”) which we envision to be an online, open-access national platform and repository of species occurrence data and sampling-event data dedicated to invasive alien species in the Philippines, with alien amphibians and reptiles as pilot group, in the form of a web portal and a smartphone application.

Status: Partially completed.

Notes: The website and smartphone application is being refined and will be online on June 2019.

OBJECTIVE 5. In addition, Information campaigns and training workshops targeting key stakeholders (i.e., communities, environmental managers) will be conducted to promote and encourage citizen science and contributions from volunteers.

Status: Completed.

Notes: A teaser workshop was held in July and October 2018 and was attended by ~30 and ~15 participants, respectively (Appendix F,G,H). A full-workshop was held in March 2019 and was attended by 17 participants representing natural history collections institutions throughout the Philippines with the most number of Philippine biodiversity collections, in general. The workshop received positive feedback from the participants (Appendix I).

Activities

Please indicate the status of the activities as outlined in the project proposal, at the time of the final report. 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
Mobilizing species occurrence and sampling-event data from observation networks and monitoring systems					
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from scientific literature.	HWP	Contributes to Goal 1	Yes	573 occurrence records of alien amphibians and reptiles were mined, cleaned, and validated. A dataset on alien amphibians was published in the GBIF BIFA IPT in January 2019 (https://cloud.gbif.org/bifa/resource?r=herpwatch_pilipinas_bifa3_026_alien_amphibians) and in the GBIF registry (https://doi.org/10.15468/o24m0j) in March 2019. A dataset on alien reptiles was published in the GBIF BIFA IPT in May 2019 (https://cloud.gbif.org/bifa/archive.do?r=dayo_invasive_alien_reptiles_in_the_philippines) and in the GBIF registry (https://doi.org/10.15468/cpv8vf) in March 2019	Appendix A
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile	HWP, UST	Contributes to Goal 2a	Yes	Due to data ownership and copyright issues, UST will publish their dataset in GBIF. UST has a pending registration as publisher in	

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
species from University of Santo Tomas Museum.				GBIF. UST plans to publish their data before the end of 2019.	
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from Philippine National Museum of Natural History.	HWP	Contributes to Goal 2b	Yes	Due to data ownership and copyright issues, PNMNH will publish their dataset in GBIF. Registration of PNMNH in GBIF is still being deliberated. Data will be published as soon as the institution is registered, before the end of 2019.	
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from University of the Philippines Diliman Collections.	HWP	Contributes to Goal 2c	Yes	Due to data ownership and copyright issues, UPD will publish their dataset in GBIF. The Biodiversity Research Laboratory of UPD has a pending registration with GBIF. The Lab Head expressed their intent to publish their datasets in GBIF and as a data paper. UPD plans to publish data before the end of 2019.	
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from University of the Philippines Los Baños Museum of Natural History.	HWP	Contributes to Goal 2d	Yes	Due to data ownership and copyright issues, UPLB MNH will publish their datasets in GBIF. UPLB has recently registered as publisher in GBIF. The director expressed their intent to publish their dataset in GBIF and as a data paper. UPLB MNH plans to publish data before the end of 2019.	
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from Silliman University Rodolfo B.	HWP	Contributes to Goal 2e	Yes	Due to data ownership and copyright issues, SU-RBGMNH will publish their datasets in GBIF. SU-RBGMNH are registered publishers in GBIF. They	

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
Gonzales Museum of Natural History.				expressed their intent to publish their datasets in GBIF and as a data paper. RBGMNH plans to publish data before the end of 2019.	
Data mining: Mining, cataloguing, and digitizing species occurrence data of alien amphibian and reptile species from Mindanao State University – Iligan Institute of Technology Natural Science Museum.	HWP	Contributes to Goal 2f	Yes	Due to data ownership and copyright issues, MSU-IIT will publish their dataset in GBIF. The institution's registration in GBIF is being deliberated, and they will publish data in GBIF as soon as they are registered, or before the end of 2019.	
Herpetofaunal survey in Ilocos Norte Province, Luzon Island.	HWP, UST, DENR-BMB	Contributes to Goal 3a	Yes	A total of 206 sampling event records and 272 occurrence records were collected from Ilocos Norte (includes records from 2017 survey). The dataset was published in GBIF registry (https://doi.org/10.15468/qzmkz7) and can be accessed through the GBIF-BIFA Cloud IPT (https://cloud.gbif.org/bifa/resource?r=ilocos_norte_herps) (Appendix B).	APPENDIX B
Herpetofaunal survey in Palawan Island, Palawan Province.	HWP, UST, DENR-BMB	Contributes to Goal 3b	Yes	A total of 58 sampling-event records and 126 occurrence records were collected from Palawan. The dataset was published in GBIF (https://doi.org/10.15468/owrzuc) and can be accessed through the ACB IPT (https://cloud.gbif.org/bifa/resource?r=palawan_herps) (Appendix C).	APPENDIX C
"DAYO": Developing an online, open-access platform for observation and monitoring of	HWP, DENR-BMB	Contributes to Goal 5	No	Coming-up with a mutual agreement with website and app developers took a long time. The DAYO website is	

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
herpetofaunal invasions – Smartphone Application.				expected to launch in June 2019. The BIFA coordination team will be informed when the website and app is launched.	
"DAYO": Developing an online, open-access platform for observation and monitoring of herpetofaunal invasions – Webportal	HWP, DENR-BMB	Contributes to Goal 5	No	Coming-up a mutual agreement with website and app developers took a long time. The DAYO application is expected to launch in June 2019. The BIFA coordination team will be informed when the website and app is launched.	
Preparing data papers					
BIFA Capacity Enhancement Workshop	HWP	Contributes to Goal 6	Yes		
Preparation of data papers: Data paper of assembled species occurrence data from literature and natural history collections will be prepared and submitted to a peer-reviewed journal (e.g. NeoBiota, BioInvasions Records, etc.).	HWP, UST	Contributes to Goal 4,6	No	A data paper will be submitted to Biodiversity Data Journal for possible publication; manuscripts will be submitted in May 2019. The BIFA coordination team will be informed when the datapaper gets published.	APPENDIX A
Preparation of data papers: Data papers on the two herpetofaunal surveys (including data from previous surveys conducted in the sites) will be prepared and submitted to a peer-reviewed journal (e.g. NeoBiota, Check List, etc.).	HWP, UST	Contributes to Goal 4,6	No	A data paper will be submitted to Biodiversity Data Journal for possible publication; manuscripts will be submitted in May 2019. The BIFA coordination team will be informed when the datapaper gets published.	APPENDIX B, C
Other activity types					

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
Coordination and application of Permits: Wildlife Gratuitous Permit (in pursuance to Wildlife Resources Conservation and Protection Act– RA 9147) will be applied with respective local government offices and environmental offices with jurisdiction over study sites. Activities and schedules of herpetofaunal surveys will be coordinated with respective offices.	HWP, DENR-BMB	Contributes to Goal 3a,b	Yes	Coordination and application of permits were conducted in April to June 2018.	APPENDIX B, C
Formal communications and meetings with heads of natural history collections institutions: secure access to collections and form mutual agreements on data sharing/publishing.	HWP	Contributes to Goal2a–f	Yes	Issues on data ownership and copyright were the major limitations in data mining and data publishing.	
Preparation of original articles: original articles on reconstructed invasion histories and "Pest Risk Maps" of the alien amphibian and reptile species will be prepared and submitted to peer-reviewed journals (e.g. NeoBiota, Diversity and Distributions, Biological Conservation, etc.).	HWP, UST	Contributes to Goal 4,6	No	An original article on reconstructed invasion history of alien amphibians has been accepted in Pacific Science and will be published in July 2019. An original article on pest risk mapping will be submitted to PlosONE in May 2019. The BIFA coordination team will be informed when the papers are published.	APPENDIX D, E
Information campaigns: the findings of the project will be presented in Philippine Biodiversity Symposium.	HWP	Contributes to Goal 7	Yes	The findings of the reconstructed invasion histories were presented in the Philippine Biodiversity Symposium last October 2018.	APPENDIX F
Information campaigns: Information Campaign: Presentation of Field	HWP, DENR-BMB	Contributes to Goal 7	No	Field reports will be presented on the next Protected Areas	

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
Report to Protected Areas Board Meeting				Management Meeting usually held in April to July.	
Training workshops: workshop or short training will be conducted and targeting environmental managers, academe, and natural history collections managers.	HWP, UST, DENR-BMB	Contributes to Goal 7	Yes	In the Philippine Bidoiversity Symposium 2018, a teaser workshop was conducted and was attended by ~15 participants in total. Another teaser workshop was conducted in Palawan State University on July 2018 and was attended by ~30 participants. The biodiversity data mobilization workshop was conducted in March 2018 and was attended by 17 participants from natural history collections institutions with the largest collections in the Philippines. The workshop received positive feedback from participants.	APPENDIX G, H, I
Kickoff meeting of project partners	HWP, UST, DENR-BMB	Contributes to overall goal of project	Yes	Kick-off meeting was held in May 2018.	APPENDIX J
Mid-term meeting of project partners	HWP, UST, DENR-BMB	Contributes to overall goal of project	Yes	Mid-term meeting was held in October 2018. Several follow-up meetings were held soon after.	APPENDIX K
Final meeting of project partners	HWP, UST, DENR-BMB	Contributes to overall goal of project	Yes	Final meeting was held in March 2019.	APPENDIX L

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
DAYO: Invasive Alien Amphibians in the Philippines	Amphibians	445 occurrence data	Digitized	Published on March 10, 2019	A data paper of this dataset and of the dataset of alien amphibian and reptile occurrence is being prepared and will be submitted in the Biodiversity Data Journal in May 2019. The BIFA coordination team will be informed once the data paper is published.	https://doi.org/10.15468/o24m0j
DAYO: Invasive Alien Reptiles in the Philippines	Reptiles	128 occurrence data	Digitized	Published on May 5, 2019	A data paper of this dataset and of the dataset of alien reptiles occurrence is	https://doi.org/10.15468/cpv8vf

					being prepared and will be submitted in the Biodiversity Data Journal in May 2019. The BIFA coordination team will be informed once the data paper is published.	
Amphibians and Reptiles in Protected Areas in Ilocos Norte Province.	Amphibians and Reptiles	206 sampling event data; 272 occurrence data	Digitized	Published on March 27, 2019.	A data paper is being prepared and will be submitted in the May 2019. The BIFA coordination team will be informed once the data paper is published.	https://doi.org/10.15468/qzmkz7
Amphibians and Reptiles in Selected Localities in Narra and Puerto Princesa City, Palawan	Amphibians and Reptiles	58 sampling-event data; 126 occurrence data	Digitized	Published on March 27, 2019.	A data paper is being prepared and will be submitted in the May 2019. The BIFA coordination team will be informed once the data paper is published.	https://doi.org/10.15468/owrzuc

b. Other deliverables

Describe other deliverables (e.g. publication of data papers, catalogues, reports etc.) produced and/or planned to be produced/completed 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
Technical reports	Completed	A mid-term report was submitted on November 1, 2018.	https://assets.ctfassets.net/uo17ejk9rkwj/4rhb44f3O0qimOWikc4KCQ/8f1e7901f2268aee7b8fd1a1ca5ca6a3/BIFA3_26_Mid-term_activity_report__29October2018__RECEIVED_and_APPROVED.pdf

Financial reports	Completed	The mid-term financial report was not submitted due to delays caused by budget adjustment requests. The liquidation of the first tranche will be submitted along with the reimbursement of the 2nd tranche in the final financial report.	
Data papers	Partially completed; Not published	Data papers are in preparation as of reporting and will be submitted to suitable journals in May 2019. The BIFA coordination team will be informed once the data papers are published.	
Original articles	Partially completed; Not published	An original article has been submitted and accepted in the Pacific Science. It will be published in July 2019. Two more original articles are in preparation and will be submitted in May 2019. The BIFA coordination team will be informed once the original articles are published.	

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
April 2018	Kickoff meeting of project partners.	HWP	
April 2018	Coordination and application of Permits for herpetofaunal surveys.	HWP	
April 2018	Formal communications and meetings with heads of natural history collections institutions: secure access to collections and forge agreements on data sharing/publishing.	HWP	This activity was initially scheduled in May 2018 and was done earlier. Communications were sent via e-mail and meetings via calls or personal meetings.
April to August 2018	Preparation of monthly technical and financial report for April.	HWP	
May 2018	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from scientific literature.	HWP	This activity was initially scheduled in April 2018; but because of the unanticipated scattered data, this activity was conducted from April to August 2018 and conducted side-by-side with other activities.
May 2018	Preparation of monthly technical and financial report for May.	HWP	
June 2018; December to January 2019	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from Philippine National Museum of Natural History	HWP	This activity was initially scheduled in June 2018; but because of the extensive amount of uncleaned, unvalidated, and unstandardized data, this activity was rescheduled in June 2018, and December 2018 to January 2019.
June 2018	Preparation of monthly technical and financial report for June	HWP	
July 2018	Preparation of original articles: original articles on reconstructed invasion histories of the alien amphibian and reptile species will be prepared and submitted to peer-reviewed journals (e.g. NeoBiota, Diversity and Distributions, Biological Conservation, etc.).	HWP	This activity was initially scheduled in January 2019, but was rescheduled earlier (July 2018) since the Project Proponents suggested that it be submitted earlier to a journal for possible acceptance before the end of the project. Only an article on reconstructed invasion history have been accepted and an article on pest risk mapping are still being prepared.
July 2018	Preparation of monthly technical and financial report for July.	HWP	
August and October 2018	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from Silliman University Rodolfo B. Gonzales Museum of Natural History	HWP	This activity was initially scheduled in October 2018, but, due to the extensive amount of uncleaned, unvalidated, and unstandardized data, this activity was held twice: August and October 2018.
August 2018	Preparation of monthly technical and financial report for August	HWP	

September 2018	Mid-term meeting of project partners	HWP	
September 2018	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from University of Santo Tomas Museum	HWP	This activity was initially scheduled in June 2019; but to compensate for adjustments of the schedules of data mining activities at PNMNH, this activity was rescheduled in September 2018.
September 2018	Preparation of data papers: Data papers on the herpetofaunal surveys (including data from previous surveys conducted in the sites) will be prepared and submitted to a peer-reviewed journal (e.g., NeoBiota, Check List, etc.).	HWP	This activity was initially scheduled in December 2018, but was rescheduled twice: September 2018 and November 2018. This was done so to minimize the loss of information from field collection to data transcribing.
September 2018	Herpetofaunal Survey in Palawan Island, Palawan Province.	HWP	
September 2018	Preparation of monthly technical and financial report for September	HWP	
October 2018	Information campaigns: the project will be promoted in Philippine Biodiversity Symposium. Preliminary findings will be presented.	HWP	This activity was initially scheduled in July 2018, since the dates of the Philippine Biodiversity Symposium are usually scheduled in that month. However, due to unknown reasons, the symposium was scheduled far later in the year, resulting to the rescheduling of this activity.
October 2018	Preparation of Mid-Term Report	HWP	
October 2018	Preparation of Mid-Term Report and Preparation of monthly technical and financial report for October	HWP	
November 2018	Preparation of data papers: Data papers on the two herpetofaunal surveys (including data from previous surveys conducted in the sites) will be prepared and submitted to a peer-reviewed journal (e.g., NeoBiota, Check List, etc.).	HWP	This activity was initially scheduled in December 2018, but was rescheduled twice: September 2018 and November 2018. This was done so to minimize the loss of information from field collection to data transcribing.
November 2018	Herpetofaunal Survey in Ilocos Norte Province, Luzon Island.	HWP	This activity was initially scheduled in August 2019. But due to adjustments of activities and delays in the application of necessary permits, the activity was rescheduled in November 2018.
November 2018	Preparation of monthly technical and financial report for November	HWP	
December 2018	Preparation of original articles: original articles on “Pest Risk Maps” of the alien amphibian and reptile species will be prepared and submitted to peer-reviewed journals (e.g. NeoBiota, Diversity and Distributions, Biological Conservation, etc.).	HWP	This activity was initially scheduled in January 2019, but was rescheduled earlier since the Project Proponents suggested that it be submitted earlier to a journal for possible acceptance before the end of the project. Only an article on reconstructed invasion history have been accepted and an article on pest risk maps are still being prepared.
December 2018 to April 2019	DAYO: Developing an online, open-access platform for observation and monitoring of herpetofaunal invasions	HWP	Coming up with a mutual agreement with the web and application developers took a long time. The website and application is expected to be online in April 2019.

December 2018	Preparation of monthly technical and financial report for December	HWP	
January 2019	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from Mindanao State University – Iligan Institute of Technology Natural Science Museum	HWP	This activity was initially scheduled in October 2018; but to compensate for a adjustments of the schedules of data mining activities at RBGMNH, this activity was rescheduled in January 2019.
January 2019	Training workshops: workshop or short training will be conducted and targeting environmental managers, academe, and natural history collections managers.	HWP	
January 2019	Preparation of original articles: original articles on reconstructed invasion histories of the alien amphibian and reptile species will be prepared and submitted to peer-reviewed journals (e.g. NeoBiota, Diversity and Distributions, Biological Conservation, etc.).	HWP	The manuscript was revised according to the comments and suggestions of the reviewers.
January 2019	Preparation of monthly technical and financial report for January	HWP	
February 2019	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna from University of the Philippines Los Baños Museum of Natural History	HWP	This activity was initially scheduled in July 2019; but to compensate for adjustments of the schedules of writing original articles, this activity was rescheduled in February 2019.
February 2019	Data mining: Mining, cataloguing, and digitizing species occurrence data of alien herpetofauna University of the Philippines Diliman Collections,	HWP	This activity was initially scheduled in July 2019; but to compensate for adjustments of the schedules of writing original articles, this activity was rescheduled in February 2019.
January to February 2019	Preparation of data papers: Data paper of assembled species occurrence data from literature and natural history collections will be prepared and submitted to a peer-reviewed journal (e.g., NeoBiota).	HWP	This activity was initially scheduled in November 2018, but because of adjustment of data mining activities and herpetofaunal surveys, this activity was moved in January to February 2019. The dataset of alien amphibians was published in the GBIF-BIFA IPT Cloud in January 2019 and registered in the GBIF registry in March 2019. A datapaper is being prepared and will be submitted in the Biodiversity Data Journal in April 2019.
February 2019	Preparation of monthly technical and financial report for February	HWP	
March 2019	Training workshops: workshop or short training will be conducted and targeting environmental managers, academe, and natural history collections managers.	HWP	The training workshop was initially scheduled in the February 2019, but was moved to March 2019 due to the availability of facilitators and participants.
March 2019	Information Campaign: Presentation of Field Report to Protected Areas Board Meeting in Palawan Province	HWP	The information campaign was initially scheduled in March 2019 but is dependent on the schedules of the Protected Areas Management Board of Ilocos Norte and Palawan. No meetings were held in the month of March, and the next meeting is projected to be held between April to July 2019.

March 2019	Information Campaign: Presentation of Field Report to Protected Areas Board Meeting in Ilocos Norte	HWP	The information campaign was initially scheduled in March 2019 but is dependent on the schedules of the Protected Areas Management Board of Ilocos Norte and Palawan. No meetings were held in the month of March, and the next meeting is projected to be held between April to July 2019.
March 2019	Final meeting of project partners	HWP	
March 2019	Preparation of Final technical and financial reports	HWP	

a. General explanatory notes

Several adjustments have been made during the course of the project's implementation. Major reasons of the adjustments are the large amounts of occurrence data (native and alien amphibians and reptiles) in natural history institutions' holdings that need to be cleaned, validated, and standardized. Other major reasons for the adjustments include delays in processing of agreements and permits, issues in data ownership and license, and pre-emption of the length of time of review process. So far, most of the activities have been successfully accomplished, with some final activities expected to be accomplished in April to June 2019 (post-project implementation). Nonetheless, the partner institutions are processing their registration with GBIF and plans to publish data before the end of 2019.

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..

The project activities were promoted as follows:

(1) Classroom talks on Biodiversity Informatics and the Project was conducted in Palawan State University on July 2018. The classroom talks were attended by 30+ undergraduate students (Bachelor of Science in Biology) and Biology Department Staff of Palawan State University (see Appendix G)

(2) The findings of the reconstructed histories of invasion was presented 27th Philippine Biodiversity Symposium held in Pampanga State Agricultural College on October 16–19, 2018. The symposium was attended by about 150+ participants from across the Philippines. The presented study received good feedback from experts (Appendix F).

(3) Short Workshop on Biodiversity Informatics and GBIF was conducted during the 27th Philippine Biodiversity Symposium held on October 16–19, 2018. The short workshop was attended by 15+ participants, comprising of High School students, Masteral Students, Doctoral Students, and professionals. All participants expressed their intent to attend the training workshop in March 2019 (https://www.gbif.org/event/4Vwq00fffGwEcsgekgE6eA/introduction-to-biodiversity-informatics-philippine-biodiversity-symposium) (Appendix H)

(4) A three-day intensive workshop on Biodiversity Data Mobilization was organized by HerpWatch Pilipinas, inc., and UST-BEST and was held in the Hive Hotel and Convention Place, 14 to 16 March 2019. The workshop was attended by 17 participants from 8 institutions or laboratories. The workshop received positive evaluation from the participants (Appendix I).

(5) Occurrence datasets on alien amphibians (https://doi.org/10.15468/o24m0j) and alien reptiles (https://doi.org/10.15468/cpv8vf) and sample-event datasets on the herpetofaunal surveys in Ilocos Norte and Palawan (https://doi.org/10.15468/qzmkz7; https://doi.org/10.15468/owrzuc) were published in the GBIF registry (Appendix A, B, C)

(6) An original article on the reconstructed invasion histories of alien amphibians in the Philippines have been accepted in the Pacific Science and is expected to be published in July 2019 (Appendix D). The BIFA coordination team will be informed once original articles are published.

The project activities and results will continue to be communicated and shared as follows:

(1) Data papers and publications are being prepared and will be submitted in May 2019. The BIFA coordination team will be informed once data papers and original articles are published.

(2) The results of the herpetofaunal surveys will be presented to Protected Areas Management Board meeting in April to July 2019.

(3) The DAYO website and application will be presented in the Philippine Biodiversity Symposium in October 2019 and will be maintained by HerpWatch Pilipinas, Inc., post-project. The BIFA coordination team will be informed once the website and app are launched and when it is publicly presented.

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*

PROJECT EVALUATION

Inputs

An amended budget was approved by the BIFA committee/GBIF secretariat on March 16, 2019. As of submission of the final report (27 March 2019), the project expenditures amounted to Php1,710,077.00 or €27,658.00 with funding sourced from GBIF-BIFA, HerpWatch Pilipinas, inc., and UST-BEST. Of the GBIF-BIFA sourced funds, about 89% of 15,000.00 (Php825,410.00 or €13,350.00) have been expended; the remaining €1,650.00 will be expended post-project on Article Publication Charge of data papers and original articles. Meanwhile, of the co-funding sourced funds, 75% of the

estiamted €18,943.00, or Php 884,668.00 or €14,308.00, have been expended. The remaining co-funding will be expended post-project on informaiton campaigns. Except for unexpended budget (e.g., Article Publication Cost), actual expenditures (BIFA funds) in *FR by expense type* and *FR by activity* either aligned or have a variance less than 25% against the budget (BIFA funds).

Implementation

Several adjustments in the schedule of activities were made during the course of the Project's implementation. Major reasons of the changes include: (1) unprecedented amount of data to be mined, cleaned, and validated; (2) delays in permit and agreements processing; and (3) delays brought by issues on data ownership and licensing. As of reporting (27 March 2019), about 80% (31 of 39) of the activities have been completed, with the rest being partially completed and projected to be accomplished by April to July 2019.

Outputs

Two datasets collectively comprising of 573 occurrence data on alien amphibians and reptiles mined from scientific literature, observations of experts, and some natural history collections were published. Although this is low compared to the original proposed occurrence data to be mined (1,500), partner stakeholders (i.e., natural history collections institutions) raised issues on data ownership and licensing of their data and expressed their intent to publish it themselves in the GBIF along with the rest of their natural hisotry collections data. Occurrence dataset on alien amphibians in the Philippines is published in the GBIF registry (https://doi.org/10.15468/o24m0j) and an occurrence dataset on alien reptiles is is published in the GBIF registry (https://doi.org/10.15468/cpv8vf)

In terms of sample-event data, we produced 206 sample-event data and 272 occurrence data from the Herpetofaunal survey in Ilocos Norte (https://doi.org/10.15468/qzmkz7) and 58 sample-event data and 126 occurrence data from the herpetofaunal survey in Palawan (https://doi.org/10.15468/owrzuc). This is more than the original 50 sample-event data proposed. Although the number of records in the occurrence dataset produced from the palawan herpetofaunal survey is below the projected 200 records, the project members plan to survey the areas in a regular, annual basis as part of the overarching scheme of monitoring biodiversity and threats of invasive species and establish more sites in Palawan.

In terms of original articles and data papers submitted, we have one (1) article that was favourably accepted for publication in the Pacific Science Journal (see appendix D). Moreover, an original article on pest risk mapping and data papers are being prepared for submission. The BIFA coordination team will be informed once papers are published.

In terms of scientific conferences where the project was presented, we have presented the findings of the reconstruction of invasion history of alien amphibians in the Philippines at the 27th Philippine Biodiveristy Symposium on October 2018 (see appendix F), which was attended by 150+ participants, comprising of highschool, undergraduate, and graduate students and professionals and experts in Philippine wildlife conservation. The presented study received positive feedback from experts. The BIFA coordination team will be informed of future public presentations relating to the project.

In terms of the number of classroom and community talks and information campaigns, the project members held one (1) classroom talk at Palawan State University in July 2018 (see appendix G) which was attended by 30+ students and 10+ professionals, one (1) mini-workshop in the 27th Philippine Biodiverstiy Symposium (see appendix H) in October 2018 which was attended by 15+ graduate students and professonals, and (3) a 3-day intensive workshop on Biodiversity Data Mobilizaiton in March 2019 (see appendix I) which was attended by 17+ participants. Majority of the participants in the Biodiversity Data Mobilization Workshop expressed their intent to register their insitution to the GBIF as publisher, share their biodiversity data in GBIF registry, and publish data papers. The BIFA coordination team will be informed of future public presentations and data publications relating to the project.

ASSESSMENT OF THE PROJECT

The aim of the Global Biodiversity Information Facility's (GBIF) Biodiversity Information Fund for Asia (BIFA) programme's third call, under which this project was awarded, is to enhance knowledge of Asian biodiversity through access to data from biological collections and monitoring programme in the region and support GBIF nodes in Asia to develop or improve biodiversity information portals.

This project produced significant number of records of occurrence and sampling-event data on alien and native amphibians and reptiles in the Philippines. To date (March 27, 2019), the total number of occurrence records published by Filipino institutions (except Cornel Laboratory of Ornithology) was 1,556, wherein 53% constitute records published through this project. Moreover, this project produced the first published sample-event dataset in the Philippines.

Further, with the development of DAYO, this project will spearhead the first biodiversity information portal, in the form of a website and online application, dedicated to providing information on invasive alien species and repository of biodiversity data (occurrence data) on invasive alien species in the Philippines. The DAYO website and mobile application is expected to be online on June 2019.

In addition to filling taxonomic, geographical, and historical gaps on alien amphibian and reptile invasions in the Philippines, this project produced and will continue to produce the much needed science-based information that can help guide the development and implementation of sound national biosecurity programmes for amphibian and reptile invasions, contribute to the Philippines' international commitments to sustainability and biodiversity conservation, and provide a reproducible framework for similar initiatives targeting other groups of alien taxa in the Philippines and other countries.

COMMENTS

In light of the fact that several of the project's activities were rescheduled, that some activities are yet to be completed, and that some of the project's deliverables were untimely, it can be said that the project is lagging behind schedule, requiring an extension of one to three months to fully-accomplish its promised deliverables. On the aspects of the number of biodiversity data mobilized by the project and the information campaigns conducted under the project, undoubtedly, the project made great leaps in the advancement of biodiversity informatics and the mobilization of biodiversity data in the Philippines. The project has greatly increased the number of biodiversity data on Philippine wildlife mobilized in the GBIF (with Filipino institutions as publishers). Moreover, several major natural history institutions benefited from the information campaigns on biodiversity data mobilization organized by HerpWatch Pilipinas, Inc. Until the remaining activities and deliverables are yet to be accomplished and produced, we should be cautious in assessing the overall success or failure of the project.

RELEVANCE TO PARTNERS AND STAKEHOLDERS

The Biodiversity Data Mobilization Workshop (Appendix I) organized by HerpWatch Pilipinas, Inc., received positive feedback from the participants. The participants particularly found sessions on data cleaning, standardization, validation, and publishing most useful in their daily work.

CHANGES TO THE PROJECT'S ORIGINAL PLANS & ACTIONS TO FOLLOW-UP

Several activities are yet to be completed and will require an extension of one to three months to complete. These activities include mainly publishing datasets in the GBIF, publishing of original articles and data papers, and the development of DAYO. The BIFA coordination team will be informed of any publications arising from the project.

MANAGEMENT ARRANGEMENTS AND SUPPORT FROM THE GBIF SECRETARIAT

The GBIF secretariat and the BIFA coordinating team was helpful in advising us in the conduct of several activities. More importantly, the GBIF Secretariat generously provided access to an IPT where we were able to publish our datasets.

The ASEAN Centre for Biodiversity became our partner in the conduct of the Biodiversity Data Mobilization Workshop and provided a test mode IPT which was critical in the Data Publishing session of the workshop.

AREAS OF SUCCESS

One of the major successes of the project is the generation and publishing of occurrence data on alien amphibians and reptiles in the Philippines (Appendix A), which is envisioned to be regularly supplemented with additional data collected through DAYO website and mobile application.

The project was able to help in cleaning, validation, and standardization of the amphibian and reptile datasets of several institutions, (e.g., 7000 ready-to-publish occurrence data of PNMNH and 3200 occurrence data of RBGMNH, 500 occurrence data of UST, etc.). Hopefully, the institutions can publish their datasets in the GBIF in the future.

The Biodiversity Data Mobilization Workshop and other *teaser* workshops received positive feedback from the participants, being very relevant to their work as a natural history collections manager and as a scientist/researcher. We plan to continue conducting workshops (e.g., during the Association of Systematic Biologists of the Philippines) that target other natural history collections institutions and biodiversity scientists/researchers. We further aim to promote the mobilization of biodiversity data, publishing of data papers, and use of data in the GBIF.

SUMMARY AND CONCLUSION

The Project expenditures is in line with the project's budget, with FS by expense type and FS by activity in-line with approved budget or with minimal differences (<25%). As of reporting (27 March 2019), 89% of BIFA funds of the project have been expended so far, and the remaining budget is allocated for cost of Article Processing Charges which is expected to be expended post-project (April to July 2019). As of reporting, about 80% (31 of 39) of the activities have been completed, with the rest being partially completed and projected to be accomplished post-project. The project has delivered most of the expected major outputs; particularly, the occurrence and sampling-event data, an original article, and information campaigns. However, the project has yet to produce the DAYO website and mobile application and data papers and original articles. In light of the evaluation of the project's inputs, implementation, and outputs, it can be concluded that the project is lagging in terms of activities and outputs but, until the remaining activities and deliverables are yet to be accomplished and produced, we should be cautious in assessing the overall success or failure of the project.

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.

Goal 4 of this proposed project is to develop an observation and monitoring system in the form of "Philippine Alien Amphibian and reptile species Database" which is envisioned to be an online,

open-access platform and repository of species occurrence data and sampling-event data dedicated to alien amphibians and reptiles in the Philippines. This online database will be made accessible to the public through the website of DENR-BMB and HerpWatch Pilipinas, Inc.., and will be maintained and updated by HerpWatch Pilipinas, Inc.

HerpWatch Pilipinas, Inc.. will work closely with the DENR-BMB IAS Technical Working Group and Expert Group, policy makers, and environmental authorities to communicate effectively the findings of the project to help guide in developing ecologically-sound and cost-effective biosecurity programmes for current and future alien amphibian and reptile invasions.

HerpWatch Pilipinas, Inc., will proactively participate post-project in education and public awareness initiatives and education and outreach campaign programs. This includes participation in IAS information and awareness campaigns, providing quality and consistent training among relevant government agencies and stakeholders, incorporation of IAS issues to school curriculum, organizing control/eradication activities, among others.

HerpWatch Pilipinas, Inc., will pro-actively provide consultation and assistance to project partners and stakeholders in data cleaning, validation, standardization and data publishing in the GBIF registry.

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.

We recommend future projects to conduct their training workshops soon after the BIFA Capacity Enhancement Workshop, so that the partner stakeholders and other natural history collections institutions can have a better understanding of biodiversity informatics and data sharing through the GBIF.

We recommend to have a weighted prioritization of natural history collections institutions based on the number and geographic and taxonomic scope of their collections and of science institutions/organizations based on active involvement in bidoiversity research and with a strong passion for biodiversity conservation. In our case, we invited natural hisotry collections institutions and science research institutions/organizations who we know have large collections and are actively engaged in biodiversity conservation research. We are positive that these institutions will be active in sharing their datasets in the GBIF registry, in publishing data papers, and in using data from the GBIF database.

There is a huge issue on data management in natural history collections institutions in the Philippines. We observed that the partner institutions (which has the largest collections) does not have a clear or effective framework for data management (particularly data cleaning, validation, and standardization), which is critical for data mobilization. Although this is outside the objectives of GBIF, this problem should be addressed, through increased efforts in enhancing capacities, if we aim to help more institutions mobilize their data.

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.

Appendix A

Abstract of data paper of dataset of alien amphibian occurrence records in the Philippines.

DAYO: Invasive Alien Amphibians in the Philippines

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Resource Citation

Pili A, Diesmos ML, and Diesmos AC (2019): Invasive Alien Amphibians in the Philippines. v1. HerpWatch Pilipinas, Inc. Dataset/Occurrence. https://cloud.gbif.org/bifa/resource?r=herpwatch_pilipinas_bifa3_026_alien_amphibians&v=1.0

Abstract

The dataset comprises of occurrence data (400+ data points as of December 2018) on five fully invasive (category “E”) alien amphibian species (Class Amphibia: Order Anura: *Eleutherodactylus planirostris; Hoplobatrachus rugulosus; Hylarana erythraea; Kaloula pulchra; Rhinella marina*) in the Philippines obtained from published and unpublished scientific literature, personal observations of experts, and from selected Natural History Institutions. The dataset was published and will be updated biannually by HerpWatch Pilipinas, Inc. The development of this dataset was made possible through project of HerpWatch Pilipinas, Inc. (HWP), in collaboration with the Biodiversity Management Bureau of the Philippine Department of Environment and Natural Rersources (BMB-DENR) and The University of Santo Tomas – Biodiversity, Ecology, Systematics, and Taxonomy Group (BEST): “Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System” Project (BIFA03_26) funded by the Ministry of the Environment, Government of Japan.

Keywords: Occurrence, Invasive Alien Species, Alien Species, Non-Indigenous Species, Amphibians

DAYO: Invasive Alien Reptiles in the Philippines

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Resource Citation

Pili A (2019). DAYO: Invasive Alien Reptiles in the Philippines. HerpWatch Pilipinas, Inc.. Occurrence dataset https://doi.org/10.15468/cpv8vf accessed via GBIF.org on 2019-05-05.

Abstract

The dataset comprises of occurrence data (100+ data points as of May 2019) on six alien reptiles species (Class Reptilia: Order Squamata: *Calotes versicolor; Lycodon capucinus; Indotyphlops braminus*; Order Testudines: *Pelodiscus sinensis; Trachemys scripta; Chrysemys scripta*) in the Philippines obtained from published and unpublished scientific literature, personal observations of experts, and from selected Natural History Institutions. The dataset was published and will be updated biannually by HerpWatch Pilipinas, Inc.

The development of this dataset was made possible through project of HerpWatch Pilipinas, Inc. (HWP), in collaboration with the Biodiversity Management Bureau of the Philippine Department of Environment and Natural Rersources (BMB-DENR) and The University of Santo Tomas – Biodiversity, Ecology, Systematics, and Taxonomy Group (BEST): “Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System” Project (BIFA03_26) funded by the Ministry of the Environment, Government of Japan.

Appendix B

Abstract of data paper of dataset of sample-event data derived from the herpetofaunal surveys conducted in Protected Areas in Ilocos Norte Province.

Amphibians and Reptiles in Protected Areas in Ilocos Norte Province, Luzon Island, Northern Philippines

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Resource Citation

Pili AN, Alameda PAS, Damasco JCR Jr., Lagasca RAS, Navarro EJG, Del Prado YLC, Endozo MCE, Sanchez KX, Uy CM, Realubit-Van de Ven ND, Diesmos MLL, and Diesmos AC (2019): Amphibians and Reptiles in Protected Areas in Ilocos Norte Province, Luzon Island, Northern Philippines. v1.1. HerpWatch Pilipinas, Inc.. Dataset/Samplingevent. https://cloud.gbif.org/bifa/resource?r=ilocos_norte_herps&v=1.1

Abstract

We report here a sample-event dataset of our herpetofaunal surveys in Protected Areas (PAs) in Ilocos Norte Province, Luzon Island, the Philippines, conducted from 2017 to 2018. We used a combination of systematic sampling using standardized techniques and opportunistic sampling to survey the diversity of amphibians and reptiles in three Protected Areas -- (1) Paoay Lake National Park, (2) Metropolitan Ilocos Norte Watershed Forest Reserve, and (3) Kalbario Patapat Natural Park, and their environs in Ilocos Norte Province. Our survey resulted in distribution records of 38 alien and native amphibian and reptile species (including new provincial records of seven reptile species), bringing to a total of 65 amphibian and reptile species for the province of Ilocos Norte (see Brown et al., 2012, Check List 8[3]: 469-490).

This survey is part of an invasive alien species-targeted survey and a long-term monitoring programme of HerpWatch Pilipinas, Inc., and respective Protected Areas. The dataset will be updated annually by HerpWatch Pilipinas, Inc. The development of this dataset was made possible through the project of Arman N. Pili with the National Geographic Science and Exploration Asia (ASIA 57-16): "Aliens versus natives: understanding the dynamics of competition in food and habitat resources between invasive alien frogs and endemic frogs in a global biodiversity hotspot"; and a project of HerpWatch Pilipinas, Inc. (HWP), in collaboration with the Biodiversity Management Bureau of the Philippine Department of Environment and Natural Rersources (BMB-DENR) and The University of Santo Tomas – Biodiversity, Ecology, Systematics, and Taxonomy Group (BEST): "Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and

Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System" Project (BIFA03_26) funded by the Ministry of the Environment, Government of Japan.

Keywords: Samplingevent, Herpetofauna, Philippines, Biodiversity, Reptile, Amphibian, invasive alien species

Appendix C

Abstract of data paper of dataset of sample-event data derived from the herpetofaunal surveys conducted in selected sites in Palawan Province.

Amphibians and Reptiles in Selected Sites in Palawan Province, the Philippines

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Resource Citation
Pili AN, Del Prado YLC, Endozo MCE, Sanchez KX, Uy CM, Realubit-Van de Ven ND, Diesmos MLL, Diesmos AC (2019): Amphibians and Reptiles in Protected Areas in Ilocos Norte Province, Luzon Island, Northern Philippines. v1.1. HerpWatch Pilipinas, Inc.. Dataset/Samplingevent. https://cloud.gbif.org/bifa/resource?r=ilocos_norte_herps&v=1.1

Abstract

We report here a sample-event dataset of our herpetofaunal surveys in selected sites in Palawan Province, the Philippines. We used a combination of systematic sampling using standardized techniques and opportunistic sampling to survey the diversity of amphibians and reptiles in the following sites: (1) Mabentangen Creek, Barangay Poblacion 6, Municipality of Coron, Busuanga Island; (2) Estrella River Falls Park, Barangay Estrella, Municipality of Narra, Palawan Island; (3) Palawan Wildlife Rescue and Conservation Center, Barangay Irawan, Puerto Princesa City, Palawan Island; (4) Palawan Center for Sustainable Development Training Center, Barangay Irawan, Puerto Princesa City, Palawan Island. Our survey resulted in distribution and abundance records of 14 species of frogs and toads (Class Amphibia: Order Anura: seven families), seven species of snakes, lizards, and geckos (Class Reptilia: Order Squamata: three families) and one turtle (Class Reptilia: Order Testudines:Family Geomydidae). Several species have yet to be identified. These results contribute to the growing body of knowledge on the distribution of many species in the region.

This survey is part of an invasive alien species-targeted monitoring programme and a long-term biodiversity monitoring programme of HerpWatch Pilipinas, Inc. The dataset will be updated annually by HerpWatch Pilipinas, Inc. The development of this dataset was made possible through the project of HerpWatch Pilipinas, Inc., in collaboration with the Biodiversity Management Bureau of the Philippine Department of Environment and Natural Resources (BMB-DENR) and The University of Santo Tomas – Biodiversity, Ecology, Systematics, and Taxonomy Group (BEST): “Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System” Project (BIFA03_26) funded by the Ministry of the Environment, Government of Japan.
Keywords: Samplingevent, Herpetofauna, Amphibians, Reptiles, the Philippines

Appendix D

Abstract of original article on reconstructed invasion history of the alien amphibians in the Philippines.

Island hopping in a biodiversity hotspot archipelago: reconstructed invasion history and updated status and distribution of alien frogs in the Philippines

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Abstract

Six alien frogs have been introduced in the Philippines: chronologically, *Hylarana erythraea, Rhinella marina, Lithobates catesbeianus, Hoplobatrachus rugulosus, Kaloula pulchra,* and *Eleutherodactylus planirostris*. Here, we collected and synthesized historical and geographical data to reconstruct their history of invasion and to update their current invasion status and distribution in the Philippines. Four pathway categories (falling in 8 subcategories) have facilitated their introduction: (1) intentional 'release' for biological control and hunting in the wild; (2) 'escape' from farms; (3) 'contamination' of agricultural commodities, fish stocks, and ornamental plants/nursery materials; and (4) 'stowaway' on container/bulk and (hitchhiker on) ship/boat – of which the last two were important in most recent introductions. The spatio-temporal pattern of distribution showed a stratified-diffusion process of spread involving primarily leading-edge and long-distance dispersal. The pathways that facilitated their secondary (post-introduction) long-distance dispersal were either the same as those of their introduction or shifted over time. Estimation of rate of spread showed that *H. erythraea*, *R. marina*, *H. rugulosus*, and *K. pulchra* have not reached spatial saturation and are conditioning to spread, with the latter spreading fastest. The status of *Lithobates catesbeianus*, whether it successfully established or not, is undetermined. Meanwhile, the other alien frogs are now considered fully invasive species, of which *R. marina* is the most widespread, whereas *E. planirostris* is the least distributed. Our study provides science-based information that can help guide the development and implementation of pathway-specific measures to prevent and control future and current invasions by alien frogs.

Appendix E

Initial report of the pest risk mapping of alien amphibians (and reptiles) in the Philippines

Geographic risk assessment of alien amphibian species in the Philippines: Estimating their potential and current geographic distribution

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Abstract

The Philippines' uniquely diverse amphibian fauna includes six introduced alien anuran species, namely the American bullfrog (*Lithobates catesbeianus*), Asiatic painted frog (*Kaloula pulchra*), cane toad (*Rhinella marina*), Chinese bullfrog (*Hoplobatrachus rugulosus*), green paddy frog (*Hylarana erythraea*), and greenhouse frog (*Eleutherodactylus planirostris*). There is currently a huge knowledge gap in several aspects on the science and management of alien anuran species biological invasion in the Philippines, of which among the most pressing their understudied geographic risk. Here, we assessed the current geographic risk of the six alien anuran species to the Philippines by predicting climatically suitable areas for the species in the Philippines through Ecological Niche Modelling, and delineating current and potential geographic distribution of the species by Gaussian kernel density smoothing species distribution data. The findings showed that all of the species are, to some extent, climatically suitable to the Philippines under current climate conditions. Estimates of current and potential distribution indicate that none of the alien anuran species has realized its full potential distribution. Several Philippine key conservation areas are at risk of invasion based on the projections of both Philippine Models and Native Models, wherein eight key conservation areas are found in the hottest of invasion hotspots, based on projections of Native Models. The findings of our study produced critical science-based information that can help guide policies and management strategies against invasive alien species.

Keywords: Invasive Alien Species, Risk assessment, Risk analysis, Ecological niche modelling, Climate change, Biosecurity

Methods:

Species Distribution Data. Species distribution data of the six alien anuran species from the Philippine invaded range were assembled from published literature, personal observations, and experts, and natural history collections (https://doi.org/10.15468/o24m0j) either obtained from respective curators or downloaded from GBIF). Meanwhile, species distribution data from each species' respective native range were downloaded from the GBIF. To reduce the negative effects of

spatial autocorrelation and sampling bias to model fitting, species distribution data were corrected by removing duplicate records and systematic subsampling neighbouring species distribution data to a resolution of one distribution data per five square kilometres (Elith et al., 2010; Syfert et al., 2013; Boria et al., 2014). Then, given the unavailability and the caveats in dealing with absence data, a random sample of 1 000 to 10 000 pseudo-absences were generated for each species using sdm package (v. 2016.04.01; Naimi & Araújo, 2016) carried out in R platform (R core team, 2016). This assumes that the species are absent in areas with no presence records. Pseudo-absence data that were set in areas with presence records were removed. Two sets of psudoabsence data were generated for each species based on the (1) Philippine invaded range and (2) species' native range.

Environmental Variables. Current climate data were obtained from WorldClim (v. 1.4; Hijmans et al., 2005). The original set of environmental variables includes 19 bioclimatic datasets. Data were downloaded at a spatial resolution of two and a half arc minutes and had a coverage equal to (1) the Philippines and (2) each species native range. The environmental variables used for model fitting were pre-selected to provide a combination of means, extremes and seasonality that are known to be most ecologically relevant to the species and are not highly inter-correlated (Wells, 2007; Austin, 2002). Correlation between variables was assessed using pair-wise Pearson's correlation coefficient using stats package (v. 3.3.0; R core team, 2017) carried out in R platform (R core team, 2017) and, subsequently, selected only the putatively ecologically most relevant variable from each group of highly inter-correlated variables ($|r| \geq 0.7$) (Austin, 2002; Dormann et al., 2013). The final set of environmental variables used for model fitting include (1) diurnal temperature, (2) temperature seasonality, (3) maximum temperature of warmest month, (4) minimum temperature of coldest month, (5) annual precipitation, (6) precipitation seasonality, and (7) precipitation of wettest quarter. Environmental variables were prepared using Quantum GIS (v. 2.18; QGIS Development Team, 2017) and with WGS 1984 projection.

Ecological Niche Modelling. Here, Philippine suitable areas for the alien anuran species were projected based on eight state-of-the-art ecological niche modelling techniques (Marmion et al., 2009) using sdm Package (v. 2016.04.4; Naimi & Araújo, 2016) carried out in R platform (R core team, 2016). These statistical techniques include: classical logistic techniques – (1) Generalized Additive Model (GAM; Hastie & Tibshirani, 1990), (2) Generalized Linear Model (GLM; McCullagh, 1984), (3) Multivariate Adaptive Regression Splines (MARS; Friedman, 1991); classification techniques – (4) Classification and Regression Trees (CART; Breiman et al., 1984), (5) Mixture Discriminant Analysis (MDA; Hastie & Tibshirani, 1996); machine learning techniques –(6) Random Forests (RF; Breiman, 2001), (7) Boosted Regression Trees (BRT; Friedman, 2001), and (8) Maximum Entropy Model (Maxent; Phillips et al., 2006a). Ecological niche models were fitted with data from (1) the Philippine invaded range, and (2) each species respective native range, as defined by the seven environmental variables. Ecological niche models fitted with data from the Philippine invaded range are hereunto collectively called Philippine Models whereas those fitted with data from the native range are hereunto collectively called Native Models.

Model evaluation. Model performance of the Philippine Models of *R. marina*, *H. rugulosus*, and *H. erythraea* and for Native Models of all alien anuran species except *E. planirostris* were evaluated using the area under receiver operating characteristic (ROC) curve (AUC) by subsampling (randomly splitting presence/pseudo-absences into two subsets with 70% of the records used for model fitting and the remaining 30% to evaluate the models) and was repeated 10 times (Pearce & Ferrier, 2000; Allouche et al., 2006; Araújo & Guisan, 2006; Jeschke & Strayer, 2008; Elith & Leathwick, 2009). Meanwhile, due to the limited number of species distribution data used, model performance of the Philippine Models of *L. catesbeianus, K. pulchra*, and *E. planirostris* and Native Models of *E. planirostris* were evaluated using the AUC values by 10-fold cross-validation and was

repeated 5 to 10 times (Pearce & Ferrier, 2000; Allouche et al., 2006; Araújo & Guisan, 2006; Jeschke & Strayer, 2008; Elith & Leathwick, 2009) (Table 3.1). The AUC values were interpreted based on Swets (1988) recommendation where values >0.90 = excellent, >0.80<0.90 = good, >0.70<0.80 =fair, >0.60<0.70 =poor, and >0.50<0.60 = fail.

Ensemble modelling. To predict Philippine suitable areas for the alien anuran species, both the Philippine Models and Native Models of each alien frog were projected to Philippine geographic space under current climate. The projections were then converted into binary maps of suitable-unsuitable areas using a threshold maximizing sensitivity (i.e., the percentage of presence correctly predicted) and specificity (i.e., degree of predicted randomness) (Fielding & Bell, 1997; Liu et al., 2005). Areas equal to or above the threshold are referred to as suitable areas whereas those below are unsuitable areas. A (1) frequency histogram approach and (2) bounding box of majority consensus approach (i.e., identifying areas predicted to be suitable by at least five of eight ecological niche models) (Araújo & New, 2007; Beaumont et al., 2009b), with each models being given equal weights (Marmion et al., 2009), were used to create ensembles of ecological niche model projections. The spatial extent of projected suitable areas of majority consensus were then quantified in Quantum GIS (v.2.18; QGIS core team, 2017). Lastly, spatial aggregation of projected suitable areas of majority consensus by the Philippine Models and Native models of the alien anuran species were combined into an exclusive map, hereunto called Invasion Hotspots (Beaumont et al., 2009b).

Geographic risk assessment. The invasion risk of the alien anuran species were assessed based on their suitability to key conservation areas, following Beaumont et al. (2009b) and Barbosa et al. (2017). Assessment focused on Protected Areas that coincide with terrestrial Key Biodiversity Areas. Polygon shapefiles of Protected Areas in the Philippines were obtained from the World Database on Protected Areas website (http://www.protectedplanet.org/), whereas polygon shapefiles of Key Biodiversity Areas in the Philippines were obtained from the World Database of Key Biodiversity Areas website (http://www.keybiodiversityareas.org/). The Protected Areas were filtered to retain only Protected Areas that coincide/intersect with terrestrial Key Biodiversity Areas. To assess the risk of invasion, maps of the candidate Protected Areas were than overlaid to projected Philippine suitable areas of majority consensus for each alien frog.

Delineating current and potential distribution. The current and potential distribution of the alien anuran species, except for L. catesbeianus and E. planirostris due to limited species distribution data, were estimated and delineated following Gormley et al. (2011). The geographic range of the alien anuran species in the Philippines was first estimated by two-dimensional Gaussian kernel smoothing species distribution data conducted using kde2d function of MASS v.7.45 R package (Ripley et al., 2016). This method applies a two-dimensional Gaussian kernel to compute distribution of an animal within a landscape (Worton, 1989). The solve-the-equation method using width.SJ function of MASS package (Sheather & Jones, 1991) in R platform (R core team, 2016) was used to select the bandwidth for kernel smoothing and was defined to include 99.5% of species' distribution data. The estimated geographic range was then overlaid onto maps of Philippine suitable areas of majority consensus based on projections of the Philippine Models and Native Models to delineate occupied suitable areas (i.e., current distribution) and unoccupied suitable area (i.e., potential distribution) (Gormley et al., 2011).

Preliminary results:

*Ecological Niche Modelling .T*he performance of the Ecological niche models varied, ranging from failed (only MDA of Native Models testing data of *E. planirostris*) to excellent. Different sets of environmental variables were found to be important in fitting the models of each alien frog. Similarly, in most alien frog, environmental variables important in fitting the *Philippine Models* were moderately or not important in fitting the *Native Models* and vice versa (Table E1). Interestingly, diurnal temperature (Bio 2), maximum temperature of warmest month (Bio 5), and minimum temperature of coldest month (Bio 6) were consistently the most important variables among ecological niche models. Based on the ensembles of both the Philippine Models and Native Models, all alien anuran species are, to some extent, suitable to the Philippines (Figure E1 to E8). It is noteworthy that the alien anuran species' *Philippine Models* and *Native Models* varied in projected Philippine suitable areas of majority consensus, wherein the *Native Models* consistently projected a relatively broader extent. Among the projected Philippine suitable areas of majority consensus by the *Philippine Models*, those of *R. marina* projected the broadest extent (30%), whereas those of *E. planirsotris* projected the narrowest extent (<1%). Meanwhile, among the projected Philippine suitable areas of majority consensus by the *Native Models*, *H. rugulosus* and *E. planirostris* were found to be suitable to at least half of the Philippines.

The spatial aggregation of the projected Philippine suitable areas of majority consensus for the six alien frogs by the *Philippine Models* and *Native Models* showed contrasting results on *Invasion Hotspots*, wherein *Native Models* projected a broader extent. Based on the projections by *Philippine Models* (Figure E9 and E10), *Invasion Hotspots* are in northwestern parts of Luzon Island (lowland areas of Ilocos Region), central and southcentral Luzon Island (Central Luzon Region and provinces of CALABARZON Region on Luzon Island), Mindoro Island (coastal and lowland areas), Tablas Island (Romblon Province), and Panay Island. Meanwhile, most of Mindanao Island, Palawan Island and northern Luzon (Cordillera Administrative Region, Cagayan Valley Region) are only suitable to one or none of the alien frogs. In contrast, projections by *Native Models* (Figure E9 and E10), *Invasion Hotspots* are in most of Luzon Island (with exception to Cordillera Administrative Region), Polilio Island, Catanduanes Island, Mindoro Island, Busuanga Island, Panay Island, Masbate Island, and some parts of Mindanao Island (Liguasan Marsh and CARAGA region).

Potential and Current Distributions. Maps indicate that Batanes Island Group is the only remaining area in the Philippines not occupied by any of the alien anuran species. Maps showed that *R. marina* has occupied almost all of the projected Philippine suitable areas of majority consensus (86% based on *Philippine Models* and 88% based on *Native Models*), being found on almost all major islands in the Philippines, except Palawan and Batanes Island Group. Meanwhile, *K. pulchra, H. rugulosus,* and *H. erythraea* has occupied only less than half of its projected Philippine suitable areas by majority consensus based on *Native Models* but has occupied most (ca. >80%) based on *Philippine Models* (Table E2; Figure E11 to E14).

Invasion Risk of Protected Areas. A total of 120 terrestrial Protected Areas that coincide with terrestrial Key Biodiversity Areas in the Philippines were assessed for invasion risk. Findings showed that about 32% and 53% are at risk of invasion from at least one alien frog based on projections of *Philippine Models* and *Native Models*, respectively (Table E3). Moreover, based on the projections of the Philippine Models, none of the assessed Protected Areas are at high risk of invasion to all six alien frogs.

Table E1 Variable importance of the seven environmental variables to model fitting. ■ corresponds for variable importance ≥ 50%, ■ for ≥ 40% < 50%, ■ for ≥ 20% < 40%, ■ ≥ 1% < 20%, blank corresponds to 0%. Environmental variables include diurnal temperature (Bio 2), temperature seasonality (Bio 4), maximum temperature of warmest month (Bio 5), minimum temperature of coldest month (Bio 6), annual precipitation (Bio 12), precipitation seasonality (Bio 15), and precipitation of wettest quarter (Bio 17).

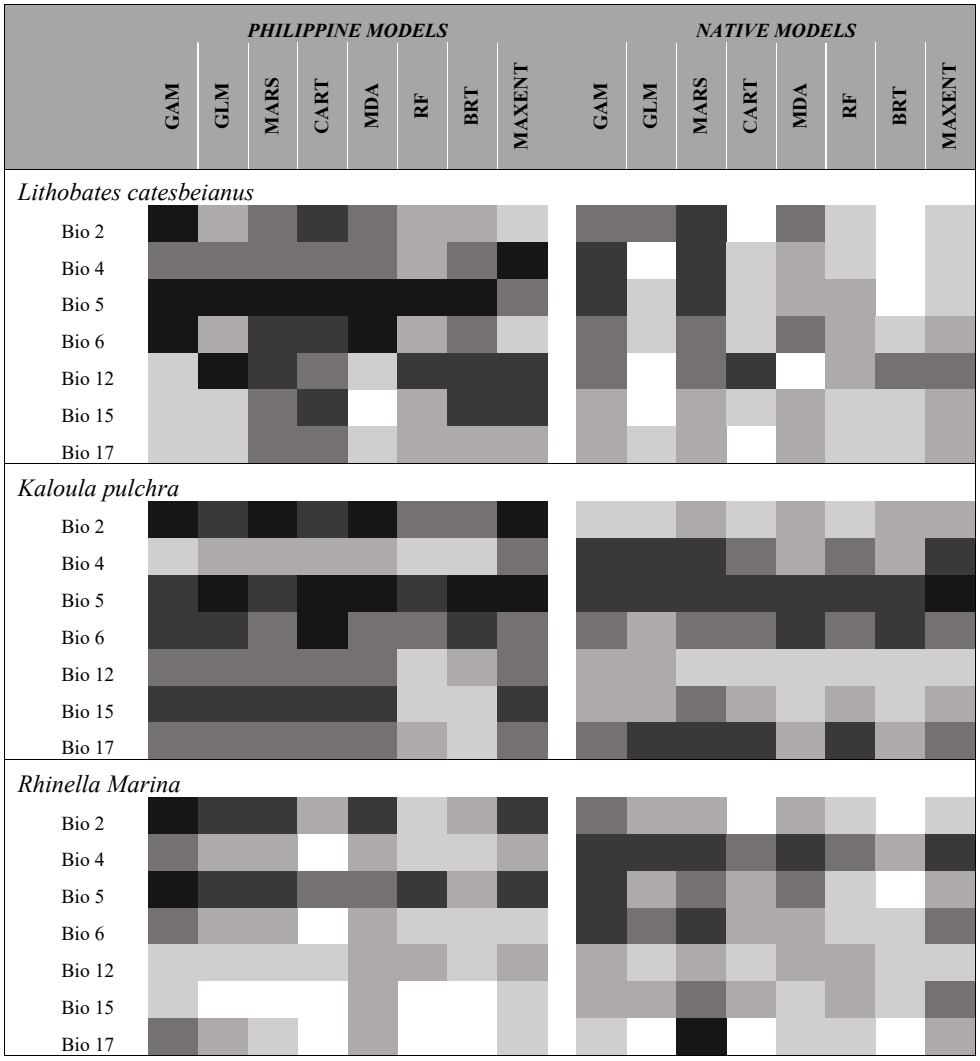


Table E1 cont.

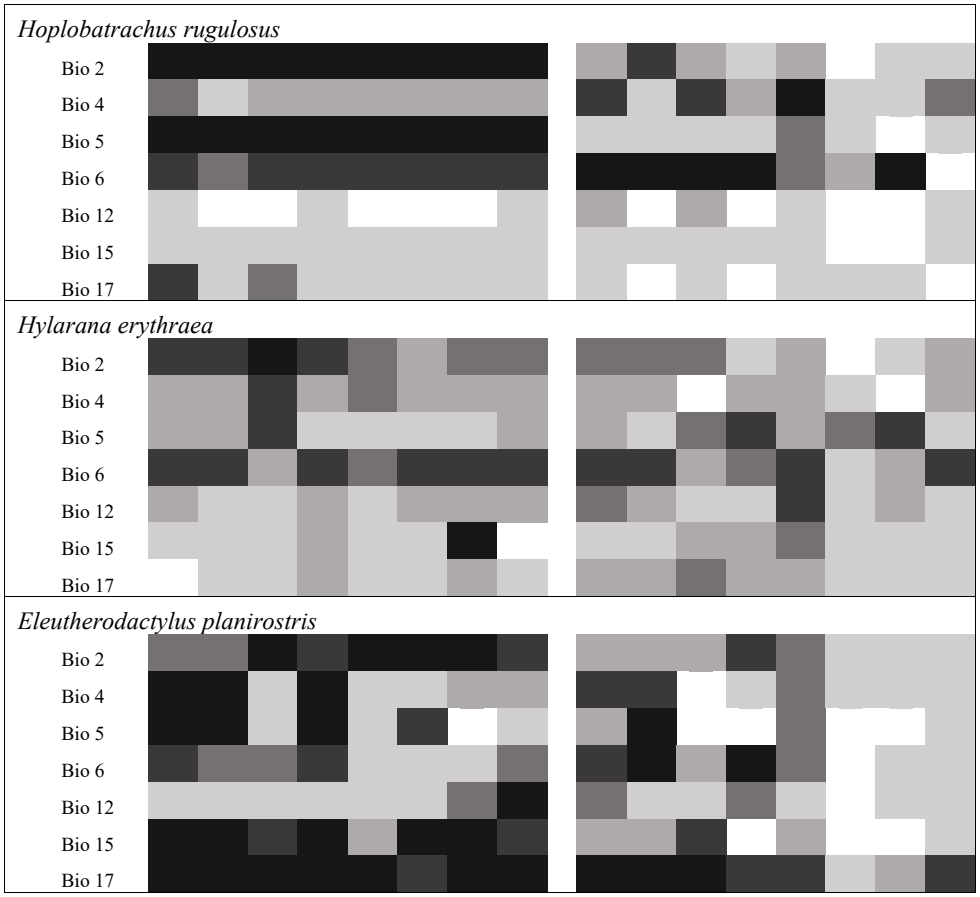


Table E2 Current Philippine distribution of the alien anuran species. Current distribution was estimated by Gaussian Kernel Density smoothing species distribution data and overlaying maps onto Philippine suitable areas based on majority rule and projected by *Philippine Models* and *Native Models*. Values are expressed as percentage (%) of total Philippine land area.

	Suitable areas			Unsuitable areas
	Total	**Current Distribution (*occupied*)**	**Potential Distribution (*unoccupied*)**	
PHILIPPINE MODELS				
Kaloula pulchra	8.25	6.97	1.28	91.75
Rhinella marina	30.52	26.31	4.21	69.48
Hoplobatrachus rugulosus	14.16	11.62	2.54	85.84
Hylarana erythraea	21.43	19.56	1.87	78.57
NATIVE MODELS				
Kaloula pulchra	24.46	12.07	12.40	75.54
Rhinella marina	44.25	39.31	4.94	55.75
Hoplobatrachus rugulosus	57.57	25.18	32.38	42.43
Hylarana erythraea	19.70	7.19	12.51	80.30

Table E3. Assessment of invasion risk of Key Conservation Areas in the Philippines. A total of 120 Protected Areas that coincide with terrestrial Key Biodiversity Areas in the Philippines were assessed. Invasion risk was assessed based on suitability of alien anuran species to the 120 terretrial Protected Areasas based on projected Philippine suitable areas of majority consensus by *Philippine Models* and *Native Models.*

	Native Models	**Philippine Models**
At least 1 alien frog	113	68
1 alien frog	3	27
2 alien anuran species	26	16
3 alien anuran species	51	10
4 alien anuran species	19	12
5 alien anuran species	6	3
6 alien anuran species (hottest hotspots of invasion)	8	0

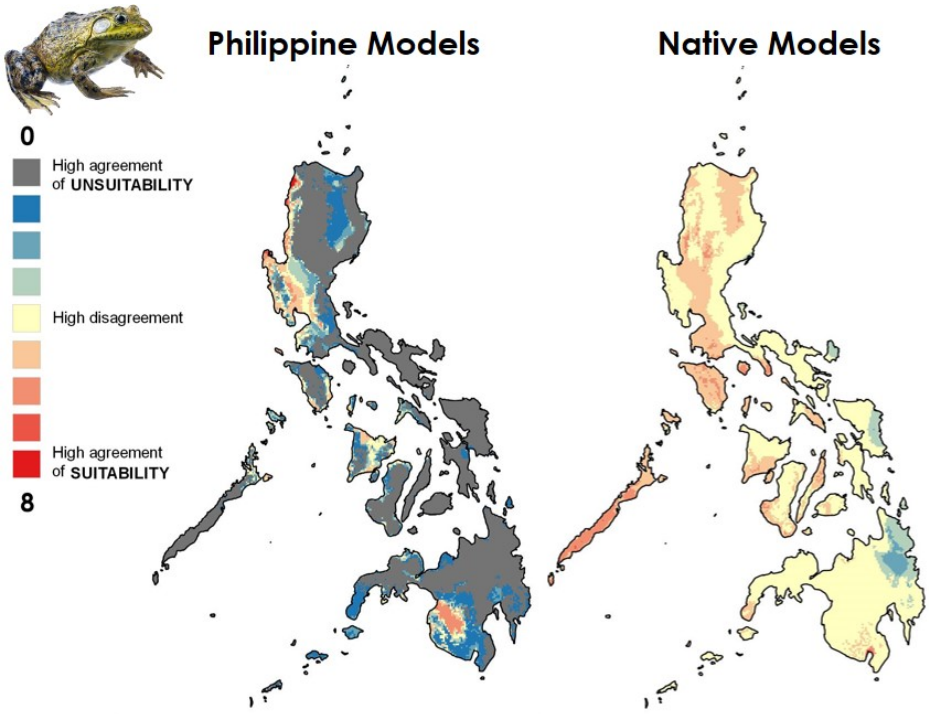


Figure E1 Frequency histograms of Philippine suitable areas for *Lithobates catesbeianus*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

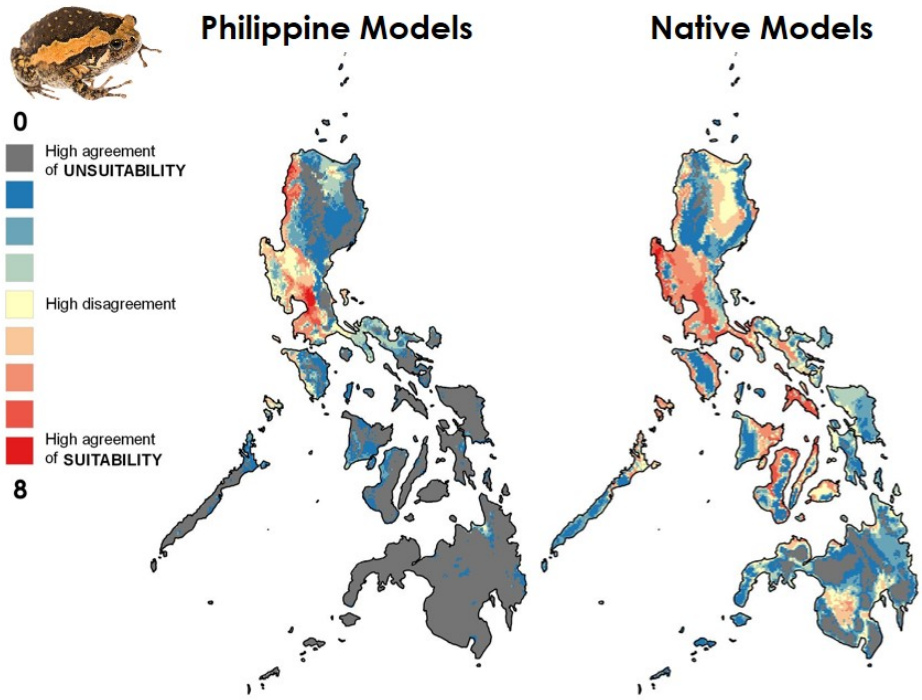


Figure E2 Frequency histograms of Philippine suitable areas for *Kaloula pulchra*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

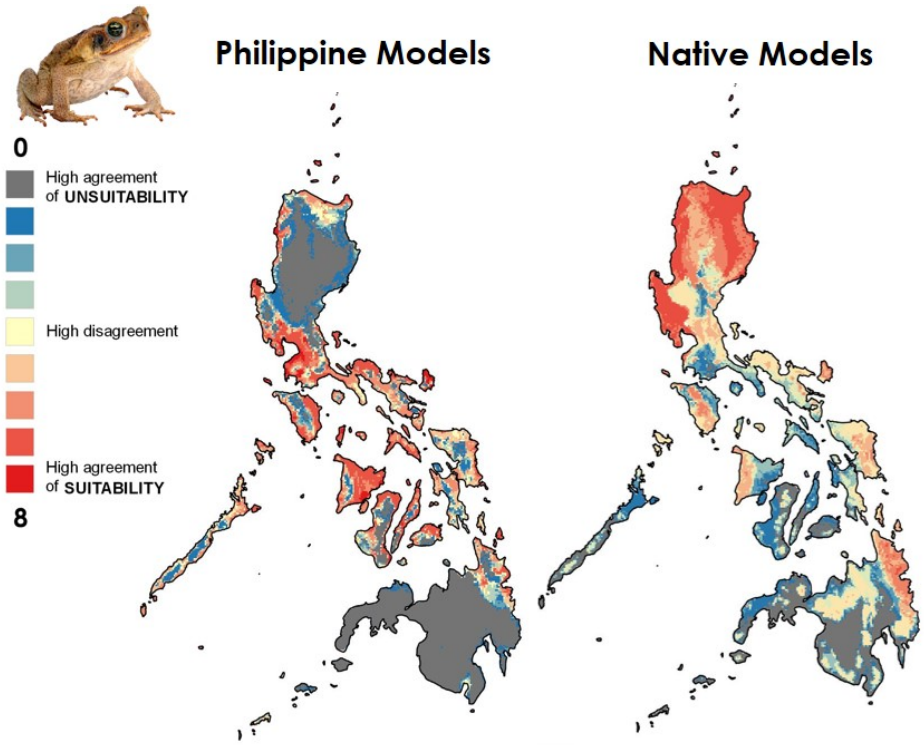


Figure E3 Frequency histograms of Philippine suitable areas for *Rhinella marina*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

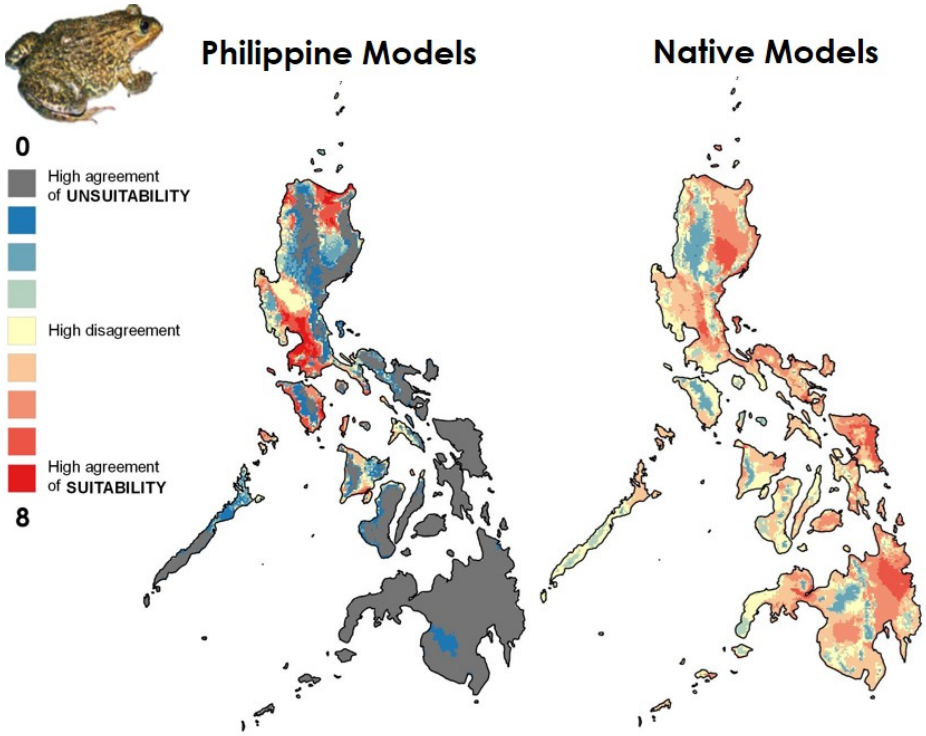


Figure E4 Frequency histograms of Philippine suitable areas for *Hoplobatrachus rugulosus*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

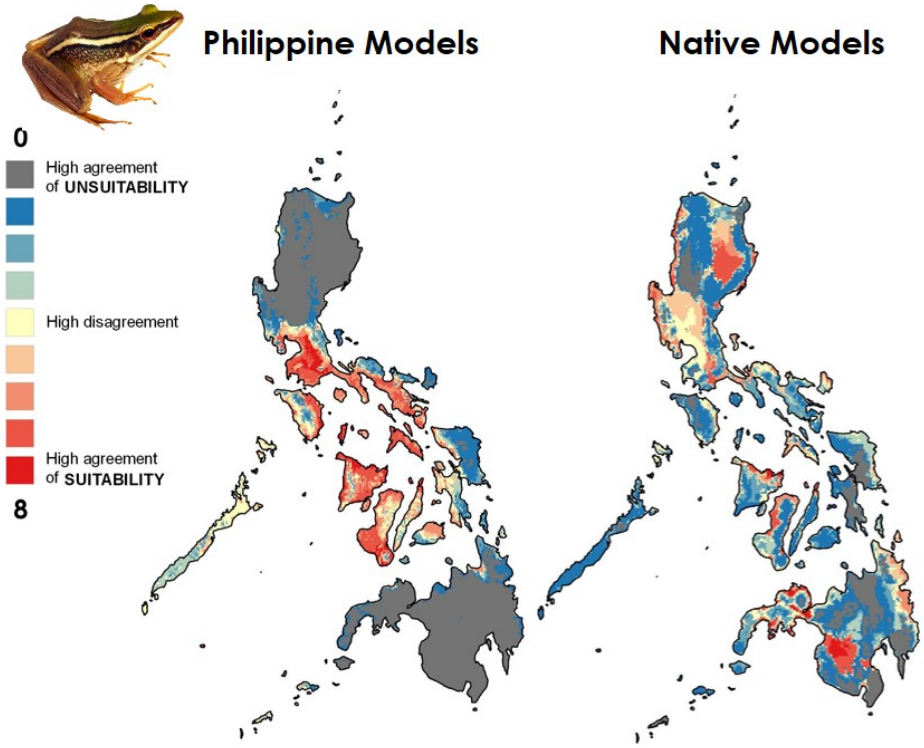


Figure E5 Frequency histograms of Philippine suitable areas for *Hylarana erythraea*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

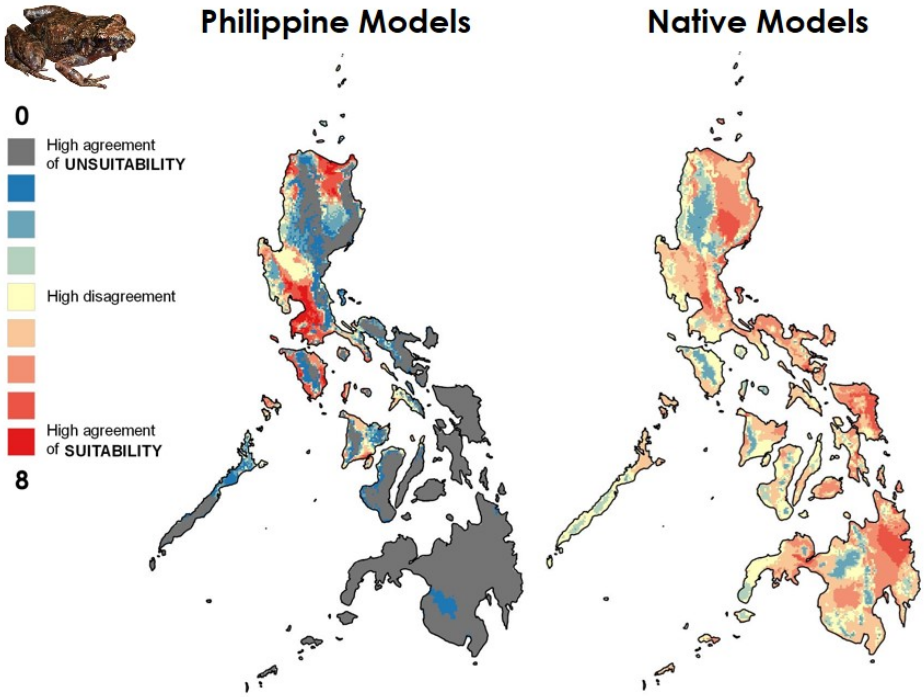


Figure E6 Frequency histograms of Philippine suitable areas for *Eleutherodactylus planirostris*, projected by eight ecological niche models fitted with data from (left) the Philippine invaded range (*Philippine Models)* and (right) their respective native ranges (*Native Models*). Grey and shades of blue indicate high agreement of climate unsuitability among ecological niche models, white indicate high disagreement of climate suitability/unsuitability among ecological niche models, and shades of red indicate high agreement of climate suitability among ecological niche models.

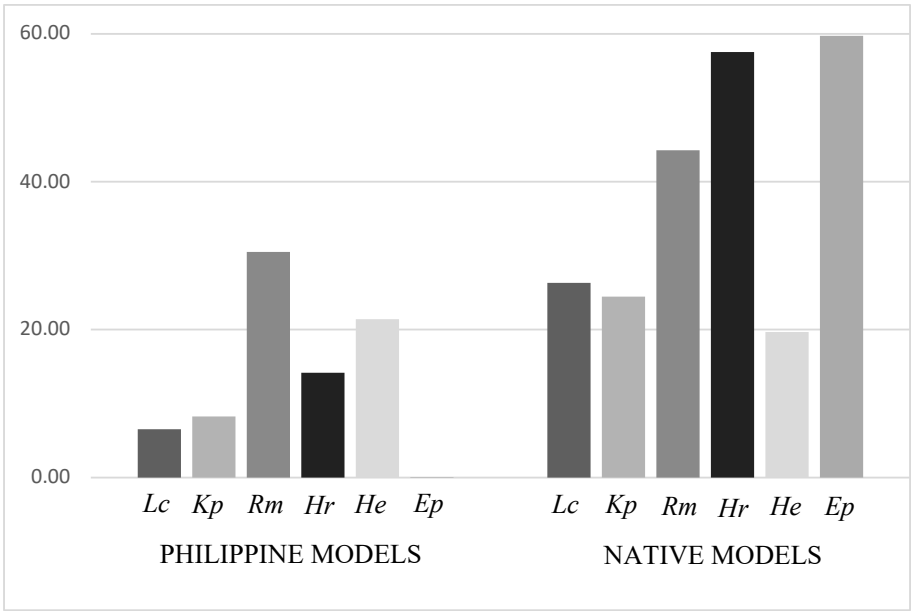


Figure E7 Bar graph of estimated extent of Philippine suitable areas of majority consensus for (*Lc*) *Lithobates catesbeianus,* (*Kp*) *Kaloula pulchra*, (*Rm*) *Rhinella marian*, (*Hr*) *Hoplobatrachus rugulosus,* (*He*) *Hylarana erythraea*, and (*Ep*) *Eleutherodactylus planirostris* as projected by the (left) *Philippine Models* and the (right) *Native Models*.

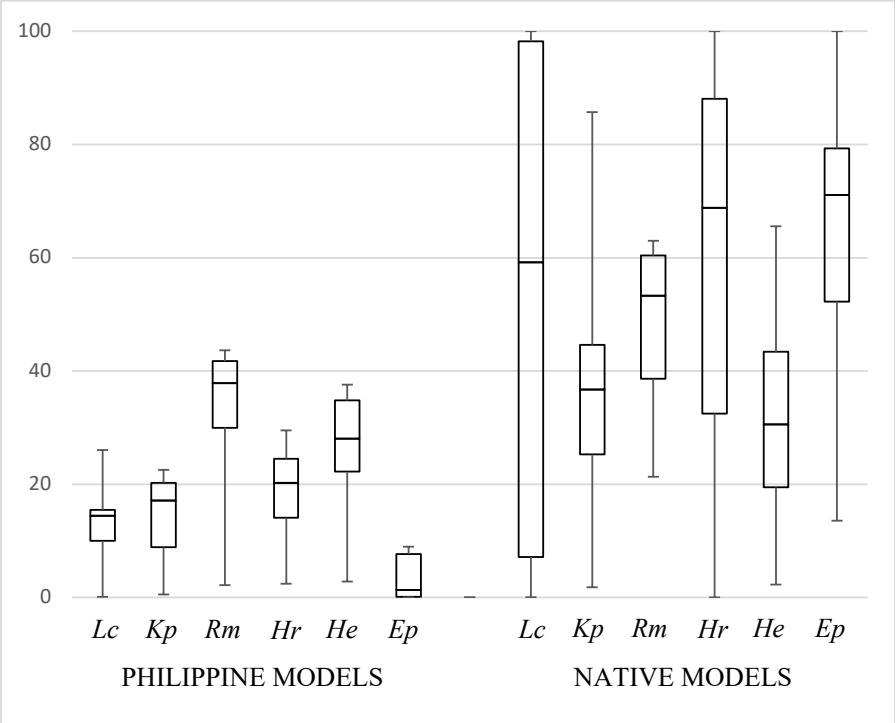


Figure E8 Box-and-whisker plot of the estimated extent of Philippine suitable areas for (*Lc*) *Lithobates catesbeianus,* (*Kp*) *Kaloula pulchra*, (*Rm*) *Rhinella marian*, (*Hr*) *Hoplobatrachus rugulosus,* (*He*) *Hylarana erythraea*, and (*Ep*) *Eleutherodactylus planirostris* as projected by the *Philippine Models* (left) and the *Native Models* (right).

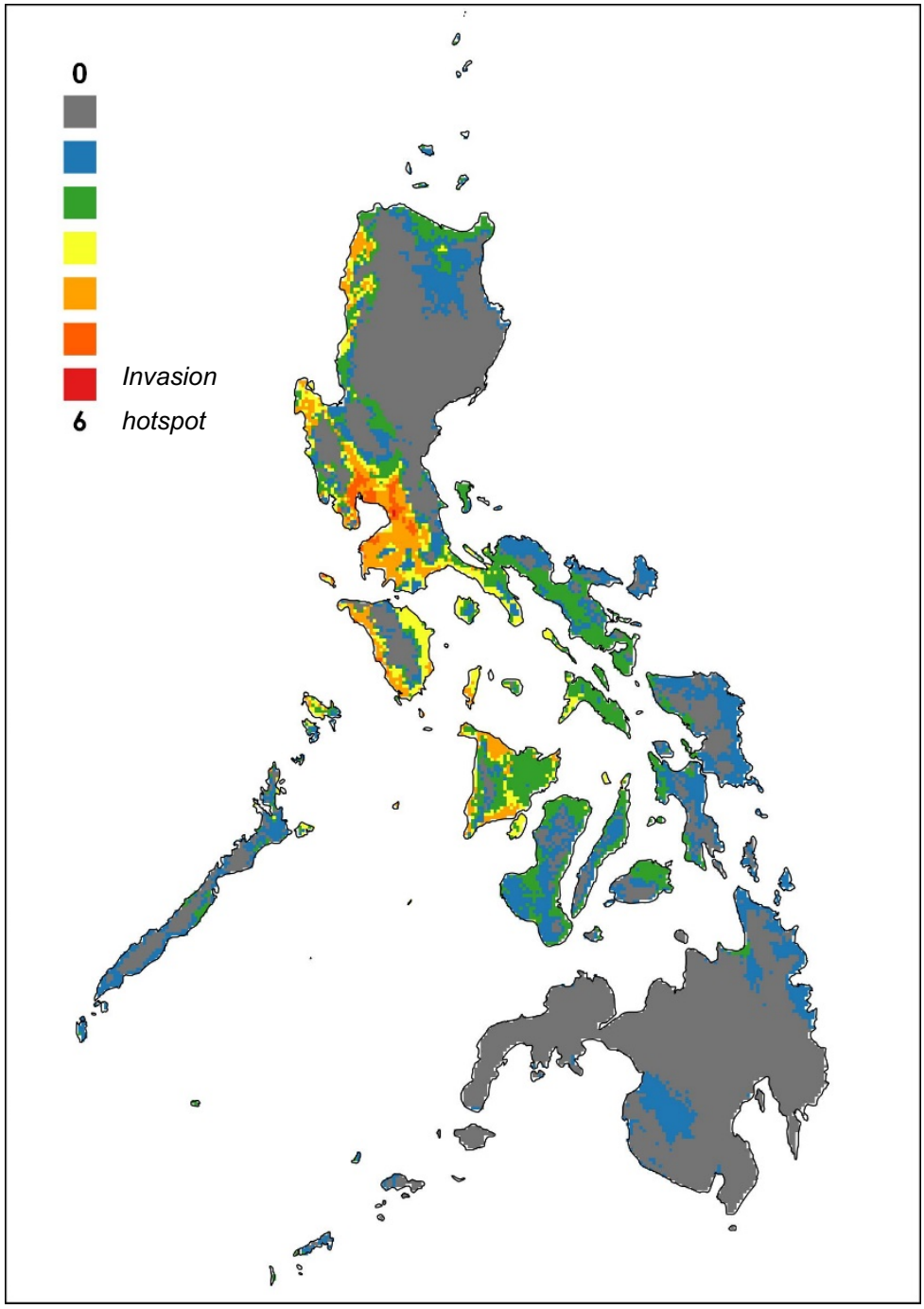


Figure E9 Spatial aggregation of the projected Philippine suitable areas of majority consensus for the six alien anuran species by the *Philippine Models.*

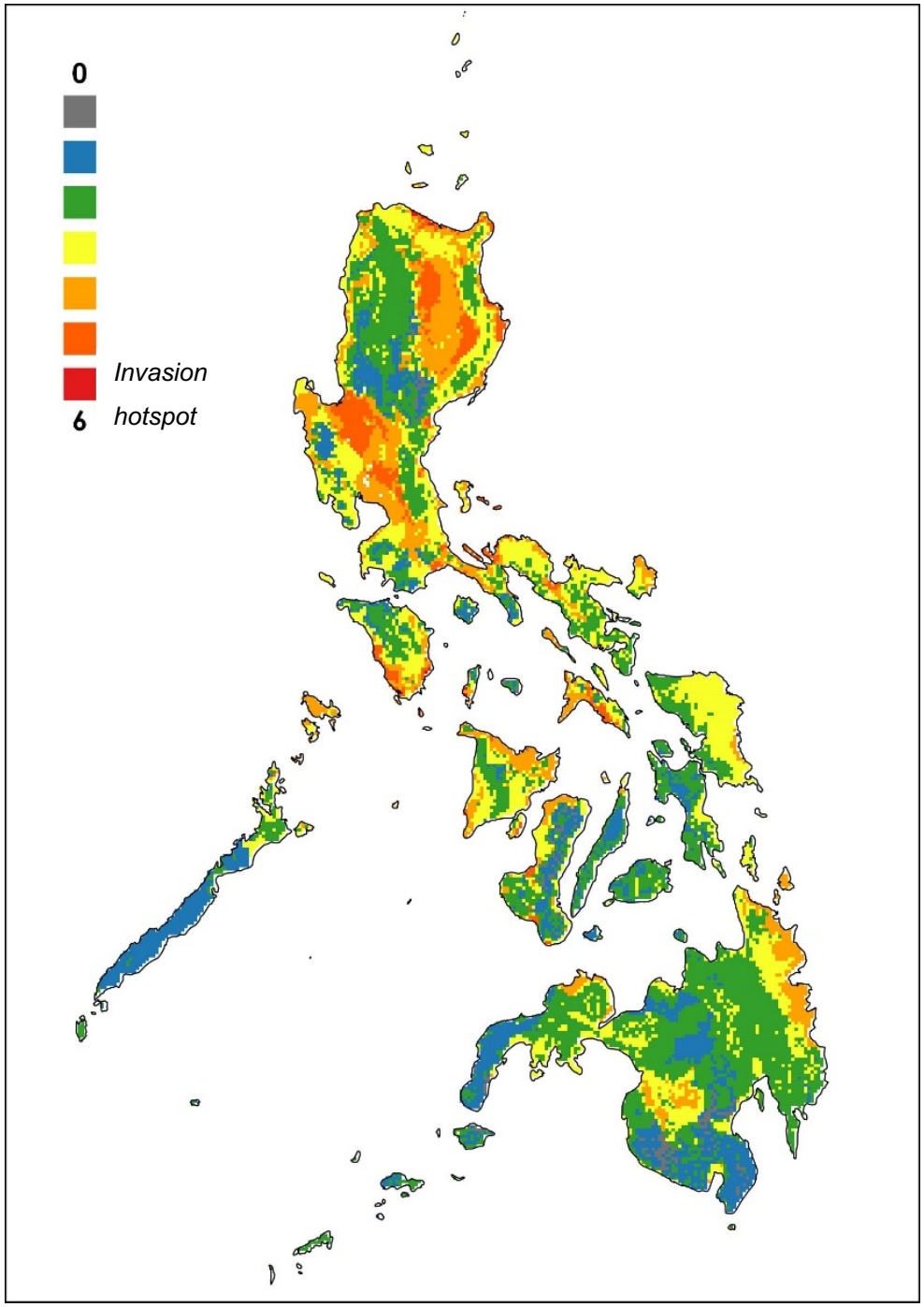


Figure E10 Spatial aggregation of the projected Philippine suitable areas of majority consensus for the six alien anuran species by the *Native Models*.

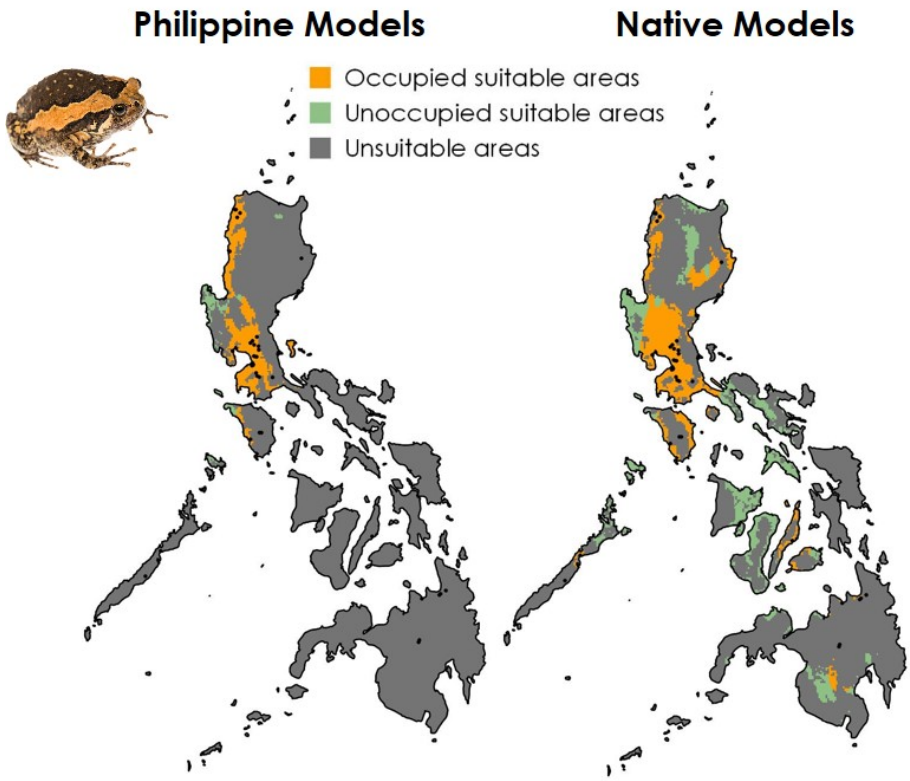


Figure E11 Current and potential Philippine distribution of *Kaloula pulchra.* Current and potential distributions were estimated by Gaussian Kernel Density smoothing species distribution data and overlaying output maps to projections of suitable areas of majority consensus for each species. Suitable areas were defined as areas agreed upon by atleast five of eight ecological niche models to be climatically suitable. Ecological niche models were fitted with data from species' Philippine invaded range (top; *Philippine Model*) and respective native range (bottom; *Native Models*). *Occupied* suitable areas correspond to current distribution while *unoccupied* suitable areas correspond to potential distribution.

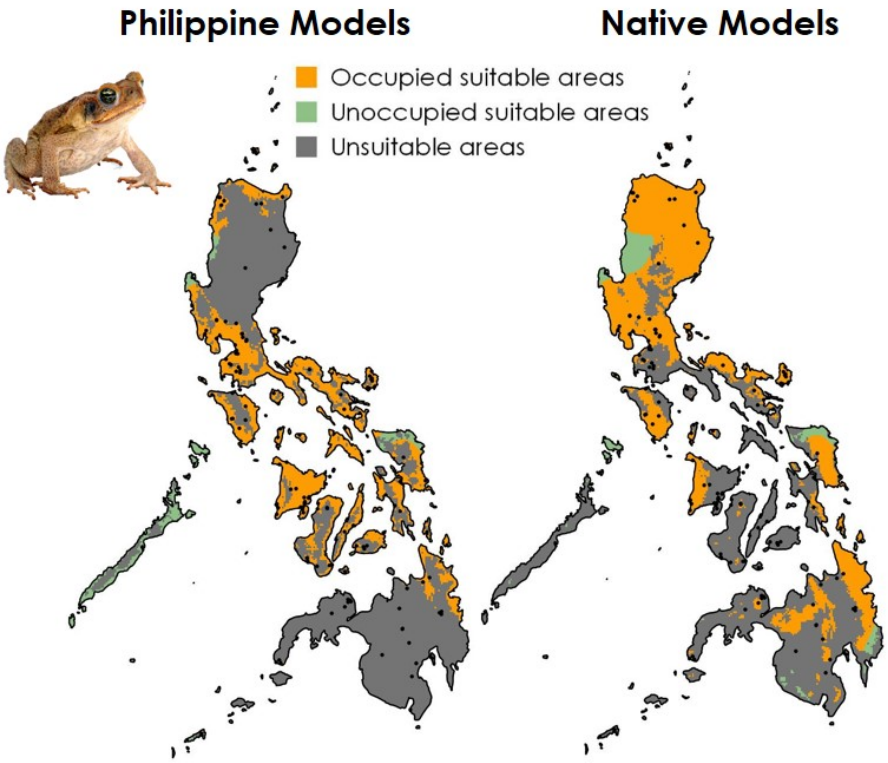


Figure E12 Current and potential Philippine distribution of *Rhinella marina*. Current and potential distributions were estimated by Gaussian Kernel Density smoothing species distribution data and overlaying output maps to projections of suitable areas of majority consensus for each species. Suitable areas were defined as areas agreed upon by atleast five of eight ecological niche models to be climatically suitable. Ecological niche models were fitted with data from species' Philippine invaded range (top; *Philippine Model*) and respective native range (bottom; *Native Models*). *Occupied* suitable areas correspond to current distribution while *unoccupied* suitable areas correspond to potential distribution.

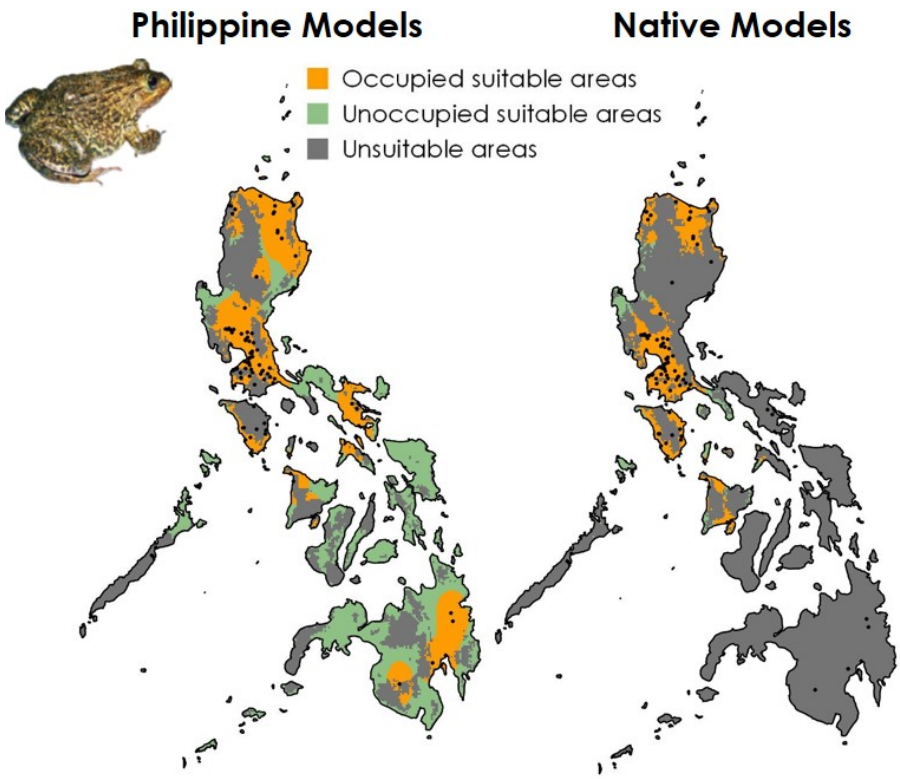


Figure E13 Current and potential Philippine distribution of *Hoplobatrachus rugulosus*. Current and potential distributions were estimated by Gaussian Kernel Density smoothing species distribution data and overlaying output maps to projections of suitable areas of majority consensus for each species. Suitable areas were defined as areas agreed upon by atleast five of eight ecological niche models to be climatically suitable. Ecological niche models were fitted with data from species' Philippine invaded range (top; *Philippine Model*) and respective native range (bottom; *Native Models*). *Occupied* suitable areas correspond to current distribution while *unoccupied* suitable areas correspond to potential distribution.

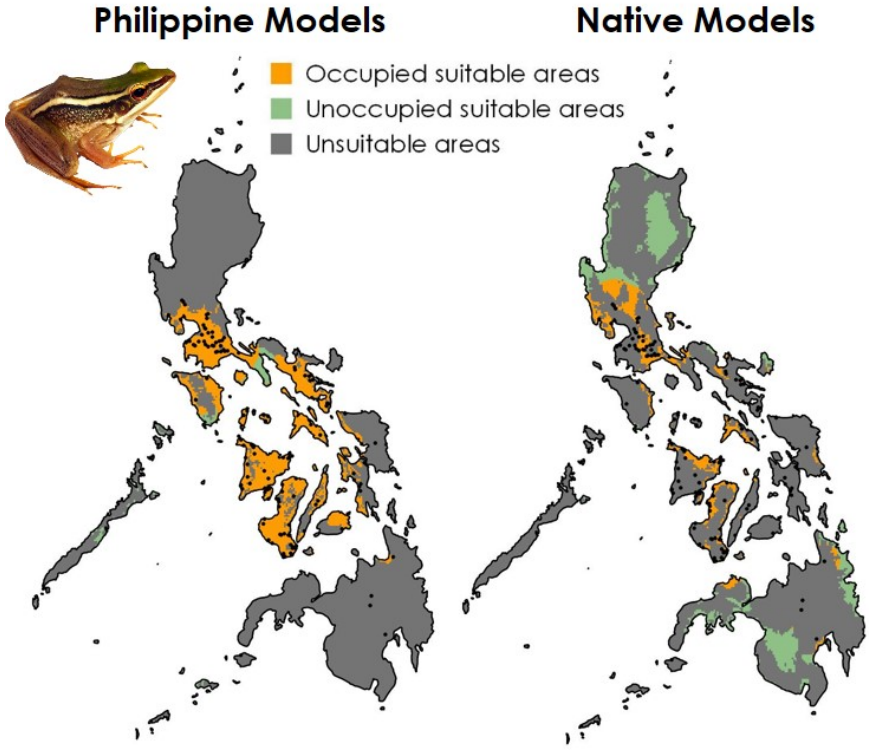
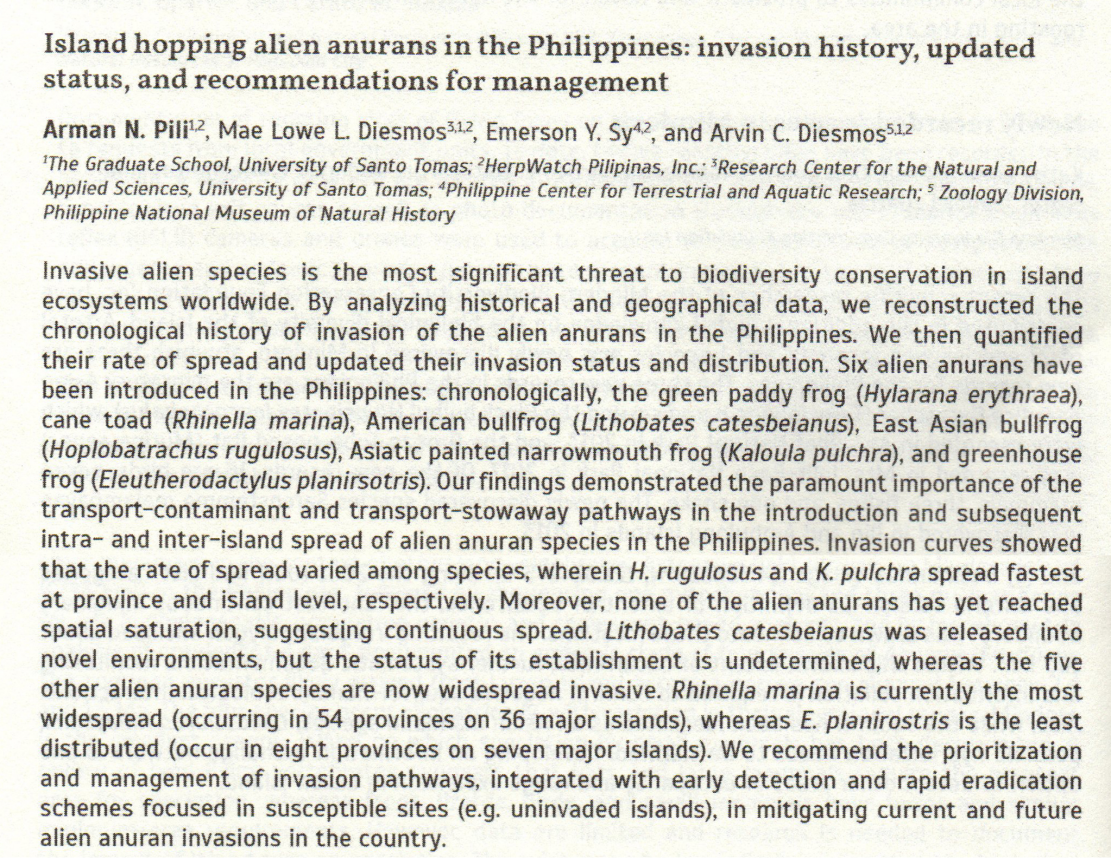


Figure E14 Current and potential Philippine distribution of *Hylarana erythraea*. Current and potential distributions were estimated by Gaussian Kernel Density smoothing species distribution data and overlaying output maps to projections of suitable areas of majority consensus for each species. Suitable areas were defined as areas agreed upon by atleast five of eight ecological niche models to be climatically suitable. Ecological niche models were fitted with data from species' Philippine invaded range (top; *Philippine Model*) and respective native range (bottom; *Native Models*). *Occupied* suitable areas correspond to current distribution while *unoccupied* suitable areas correspond to potential distribution.

Appendix F



Island hopping alien anurans in the Philippines: invasion history, updated status, and recommendations for management

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Invasive alien species is the most significant threat to biodiversity conservation in island ecosystems worldwide. By analyzing historical and geographical data, we reconstructed the chronological history of invasion of the alien anurans in the Philippines. We then quantified their rate of spread and updated their invasion status and distribution. Six alien anurans have been introduced in the Philippines: chronologically, the green paddy frog (*Hylarana erythraea*), cane toad (*Rhinella marina*), American bullfrog (*Lithobates catesbeianus*), East Asian bullfrog (*Hoplobatrachus rugulosus*), Asiatic painted narrowmouth frog (*Kaloula pulchra*), and greenhouse frog (*Eleutherodactylus planirsotris*). Our findings demonstrated the paramount importance of the transport-contaminant and transport-stowaway pathways in the introduction and subsequent intra- and inter-island spread of alien anuran species in the Philippines. Invasion curves showed that the rate of spread varied among species, wherein *H. rugulosus* and *K. pulchra* spread fastest at province and island level, respectively. Moreover, none of the alien anurans has yet reached spatial saturation, suggesting continuous spread. *Lithobates catesbeianus* was released into novel environments, but the status of its establishment is undetermined, whereas the five other alien anuran species are now widespread invasive. *Rhinella marina* is currently the most widespread (occurring in 54 provinces on 36 major islands), whereas *E. planirostris* is the least distributed (occur in eight provinces on seven major islands). We recommend the prioritization and management of invasion pathways, integrated with early detection and rapid eradication schemes focused in susceptible sites (e.g. uninvaded islands), in mitigating current and future alien anuran invasions in the country.

Figure F1. Abstract of the study on reconstructing the invasion history and updating the status and distribution of alien amphibians in the Philippines presented in the 27th Philippine Bidoiversity Symposium on October 2018.

Figure F2. Acknowledgement slide presented at the beginning and at the end of the presentation.

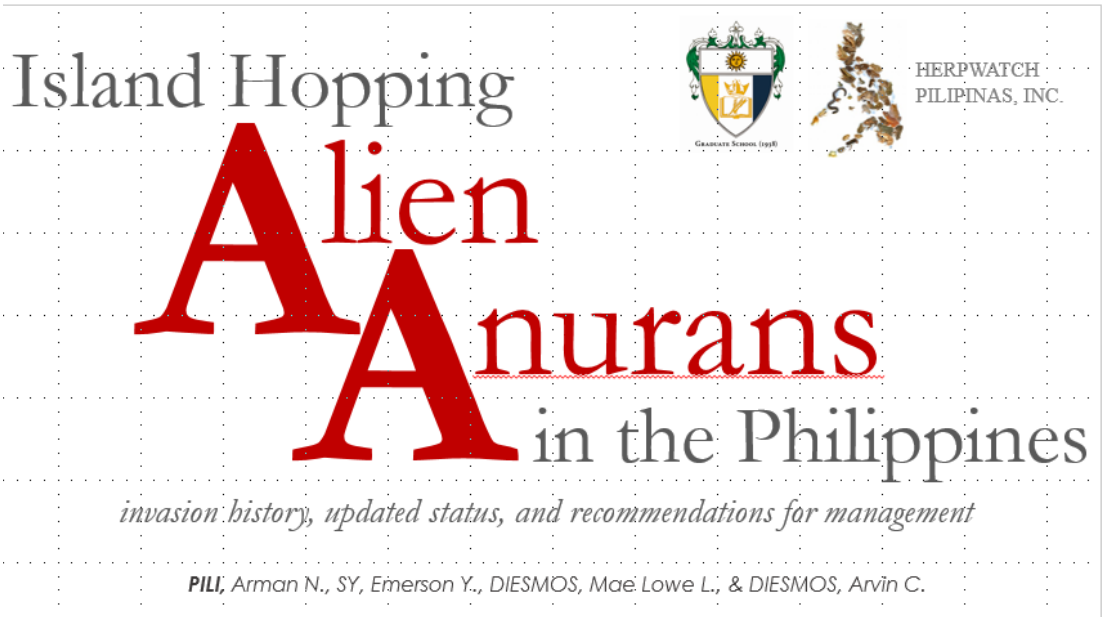


Figure F3. Title slide of the presented study.

Appendix G

Figure G1. Classroom talks on Introduction to Biodiversity Informatics and GBIF held at Palawan State University on July 2018.

Appendix H

Intro to bio(diversity)informatics and answers to FAQs on biodiversity data.

An information campaign organized as part of the GBIF-BIFA project (BIFA03_26) lead by HerpWatch Pilipinas, Inc. and in coordination with the Biodiversity Conservation Society of the Philippines (BCSP) and Pampanga State Agricultural University (PSAU). This short-workshop is a 'teaser' to a more intensive capacity enhancement workshop on biodiversity data mobilization that HerpWatch Pilipinas, Inc., in partnership with the Biodiversity Management Bureau of the Philippine Department of Environment and Natural Resources (DENR-BMB) and the Biodiversity, Ecology, Systematics, and Taxonomy group of the University of Santo Tomas (UST-BEST), will organize on February 2019.

Workshop abstract: Biodiversity informatics is a relatively young science that deals with the application of informatics techniques to biodiversity information for improved capture, cleaning, management, improvement, analysis, and interpretation. The Global Biodiversity Information Facility (GBIF) is an international open data infrastructure funded by governments that allow anyone, anywhere to access data on all types of life on Earth, shared across national boundaries via the Internet. As of August 2018, the GBIF database contains about 1.1M occurrence data available for species in the Philippines; of which, only about 10% are contributed by publishers from the Philippines. This workshop aims to provide a brief introduction to biodiversity informatics and the general process of biodiversity data mobilization; discuss the status and promote biodiversity data use and mobilization in the Philippines; explore how to use the website www.gbif.org, particularly how to obtain and visualize biodiversity data; explore research topics that utilizes biodiversity data; introduce the GBIF-BIFA project alien amphibians and reptiles of the Philippines (https://www.gbif.org/project/2xGhurLsnOmI0Qgo8iYu2A/alien-reptiles-and-amphibians-of-the-philippines) and future training workshops on biodiversity data mobilization facilitated by HerpWatch Pilipinas, Inc. This workshop will be particularly useful for anyone working on taxonomy, biogeography, and conservation biology.

Workshop facilitators:

Arman N. Pili, M.Sc. | HerpWatch Pilipinas, Inc., #1198 Benavidez Street, Unit 1202, Tondo, 1003 Manila City, the Philippines | armannorciopili@gmail.com
Asst. **Prof. Mae Lowe L. Diesmos, M. Sc.** | Research Center for the Natural and Applied Sciences, University of Santo Tomas, 1015 Manila City, the Philippines; Department of Biological Sciences, College of Science, University of Santo Tomas, España Boulevard 1015 Manila, Philippines; HerpWatch Pilipinas, Inc., #1198 Benavidez Street, Unit 1202, Tondo, 1003 Manila City, the Philippines | maediesmos@yahoo.com
Arvin C. Diesmos, Ph.D. | Zoology Division, Philippine National Museum of Natural History, Ermita 1000 Manila, Philippines; The Graduate School, University of Santo Tomas, España Boulevard, 1015 Manila City, the Philippines; HerpWatch Pilipinas, Inc., #1198 Benavidez Street, Unit 1202, Tondo, 1003 Manila City, the Philippines | Arvin.diesmos@gmail.com

Workshop was conducted during the 27th Philippine Biodiversity Symposium at Pampanga State Agricultural University in Mabalacat, Pampanga, the Philippines on 19th October 2018.

ATTENDANCE SHEET

Intro to bio(diversity)informatics and answers to FAQs on biodiversity data.
Pampanga State Agricultural University, 19 October 2018
The 27th Philippine Biodiversity Symposium

"Biodiversity Information Fund for Asia (BIFA) – BIFA3_026: Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System"

Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

Name – Sig	Affiliation	E-mail Address
JOHN PAUL M. PAYOPAY	LYCEUM - NORTHWESTERN UNIVERSITY / UP BAGUIO	
JAY S. FIDELINO	BIODIV. RES. LAB, UP DILIMAN INST. OF BIOL.	
JANSALIN, JEREMIAH GLENN	UPLB / FISHBASE	
MARLON V. ELVIRA	UPLB / CSU	
GERALD M. SALAS	UPLB / PSAU	
[illegible] JOHN [illegible]	UP / [illegible]	
GERONIMO, ABEGAIL F.	PSAU	
GABO, LEI ESTHER B.	DENR - BMB	
JOAN DARYL V. ABELLERA	LNU - Dagupan City	
RENZ ANGELO DUCO	BRL / UP Diliman	
GERONIMO, ABEGAIL F.	PSAU	
GABO, LEI ESTHER B.	BMB - DENR	
ABELLERA, JOAN DARYL V.	LNU - Dagupan	
SANTOS, MARK LANCE ELDRICK	HEDCEN	
ABAUA, DIEGO	HEDCEN	
SILVESTRE, Joaquin Rafael P.	DENR - BMB	

GBIF 環境省

Figure H1. Participants of the Project's workshop on biodiversity inforamtics and the Global Biodiversity Information Facility held during the 27th Philippine Biodiversity Symposium at Pampanga State Unviversity on 19 October 2018.

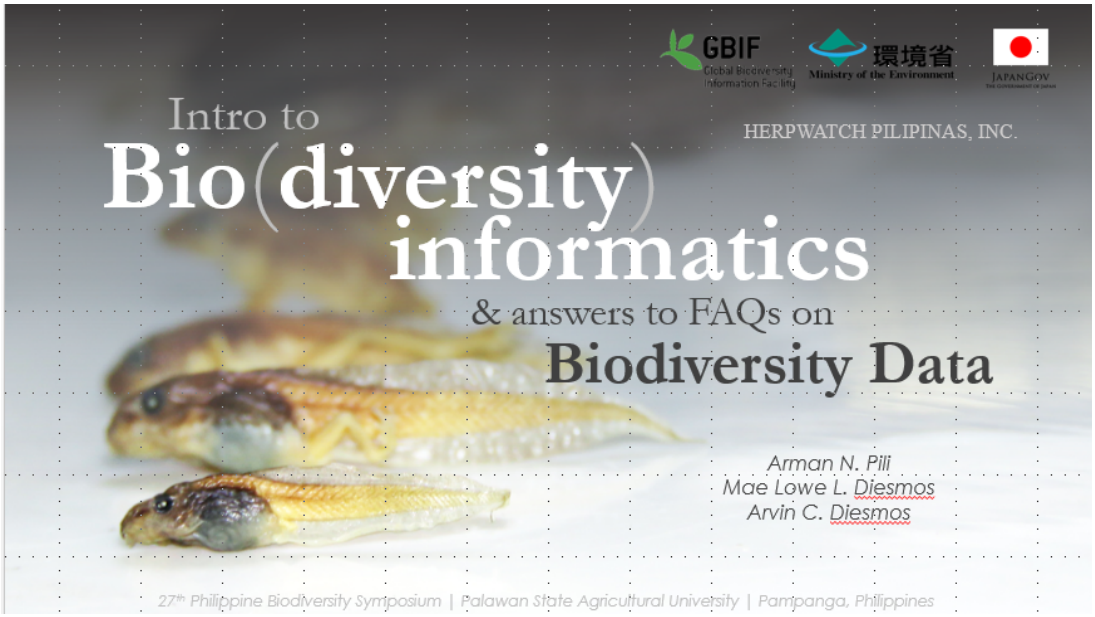


Figure H2. Title slide of the workshop presentation.

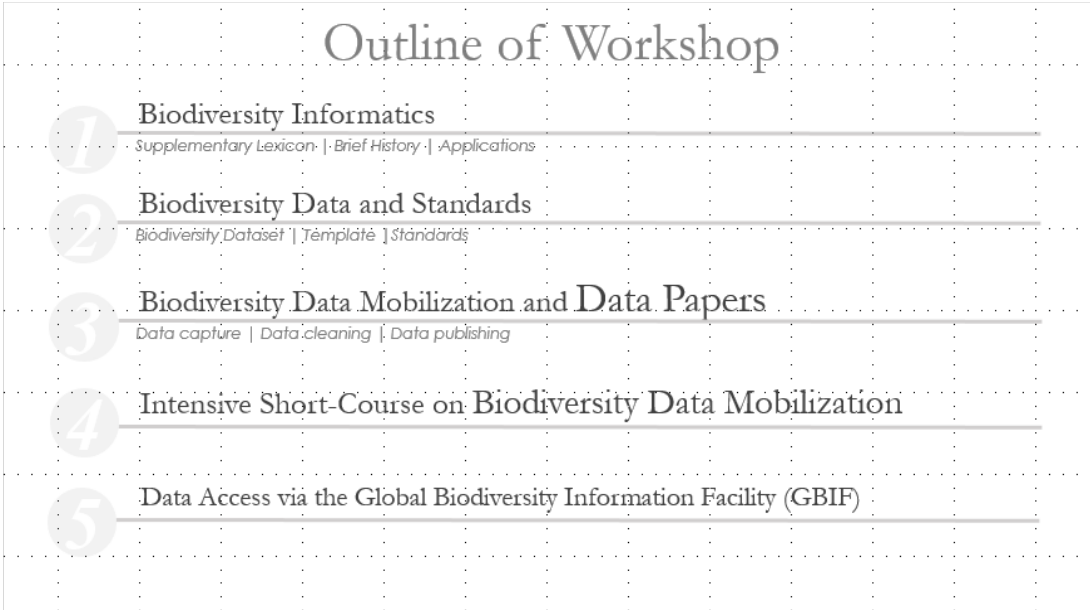
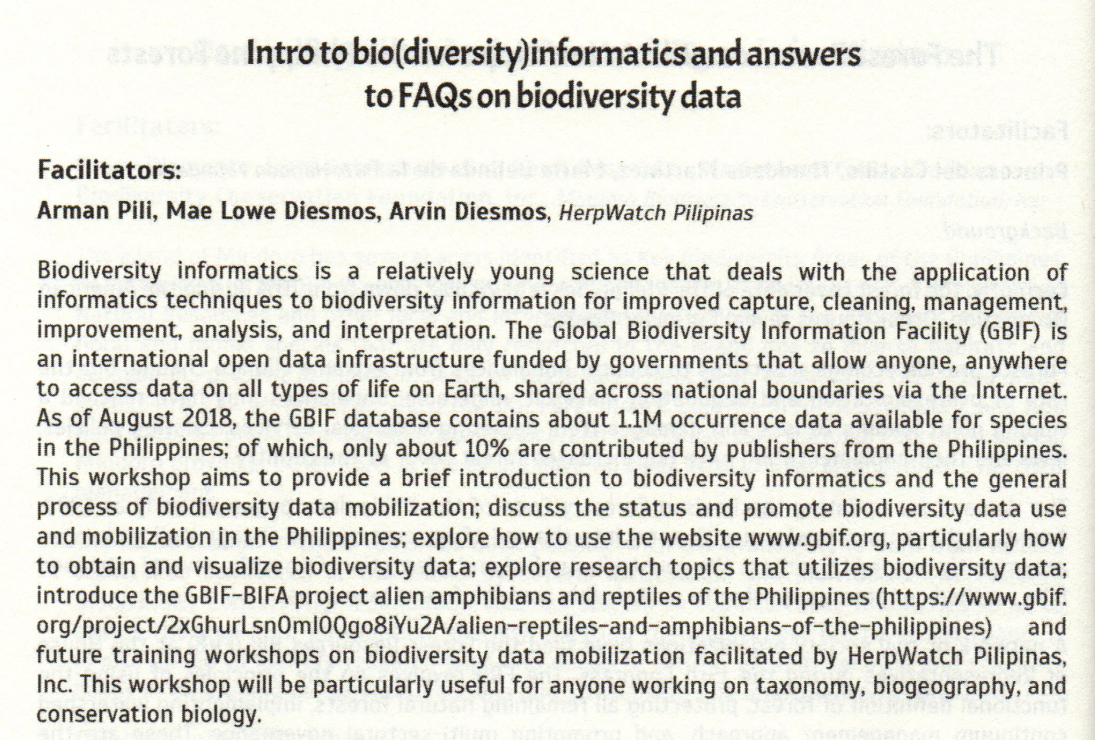


Figure H3. Outline slide showing the outline of the workshop.



Intro to bio(diversity)informatics and answers to FAQs on biodiversity data

Facilitators:

Arman Pili, Mae Lowe Diesmos, Arvin Diesmos, *HerpWatch Pilipinas*

Biodiversity informatics is a relatively young science that deals with the application of informatics techniques to biodiversity information for improved capture, cleaning, management, improvement, analysis, and interpretation. The Global Biodiversity Information Facility (GBIF) is an international open data infrastructure funded by governments that allow anyone, anywhere to access data on all types of life on Earth, shared across national boundaries via the Internet. As of August 2018, the GBIF database contains about 1.1M occurrence data available for species in the Philippines; of which, only about 10% are contributed by publishers from the Philippines. This workshop aims to provide a brief introduction to biodiversity informatics and the general process of biodiversity data mobilization; discuss the status and promote biodiversity data use and mobilization in the Philippines; explore how to use the website www.gbif.org, particularly how to obtain and visualize biodiversity data; explore research topics that utilizes biodiversity data; introduce the GBIF-BIFA project alien amphibians and reptiles of the Philippines (https://www.gbif.org/project/2xGhurLsn0ml0Qgo8iYu2A/alien-reptiles-and-amphibians-of-the-philippines) and future training workshops on biodiversity data mobilization facilitated by HerpWatch Pilipinas, Inc. This workshop will be particularly useful for anyone working on taxonomy, biogeography, and conservation biology.

Figure H4. Abstract of the workshop held during the 27th Philippine Biodiversity Symposium at Pampanga State University on 19 October 2018, as shown from the Symposium's Programme.

Appendix I

Workshop programme

Biodiversity Data Mobilization Workshop

March 14–16, 2019

The Hotel & Convention Place, 68 Sct. Tuason cor. Sct. Madrinan, Brgy. South Triangle, Quezon City

Programme

Version 5, 12 March 2019

Introduction

This workshop aims to enhance the capacity of local institutions to effectively mobilize biodiversity data in accordance to the standards of the Global Biodiversity Information Facility (GBIF). It will comprise of 7 modules, focusing mainly on data mobilization – data capture, data cleaning and quality checking, data standardization, and online publishing. Through this workshop, we hope to contribute to the growing amount of high-quality biodiversity data on Philippine biodiversity and encourage local institutions to mobilize their biodiversity data through the GBIF network.

This workshop is funded by the Ministry for the Environment of the Government of Japan through the Biodiversity Information Fund for Asia (BIFA) programme of the Global Biodiversity Information Facility and is under the *BIFA3_26: Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptiles Inventory and Occurrence Database and an Observation and Monitoring System* project. It is organized by HerpWatch Pilipinas, Inc., in collaboration with the Biodiversity Management Bureau (BMB) of the Department of Environment and Natural Resources (DENR), the ASEAN Centre for Biodiversity (ACB), and the University of Santo Tomas (UST) – Biodiversity, Ecology, Systematics, and Taxonomy (BEST) group.

Participants of the workshop include select representatives from the Zoology Division and Botany Division of the Philippine National Museum of Natural History, UST-BEST, UST-Herbarium, Biodiversity Research Laboratory of the University of the Philippines – Diliman, the Museum of Natural History of the University of the Philippines –Los Baños, Rodolfo B. Gonzales Museum of Natural History and Department of Biological Sciences of the Silliman University, the Natural Science Museum of the Mindanao State University – Iligan Institute of Technology, and the Department of Biological Sciences of the Rizal Technological University.

Workshop Outline:

Module 1: Introduction to Biodiversity Informatics | *This module aims to teach the basic concepts of biodiversity informatics and to help participants familiarize with the basic characteristics of biodiversity datasets.*

Module 2: Introduction to the Global Biodiversity Information Facility and similar local initiatives | *This module aims to introduce the complexities of the 21st century biodiversity informatics initiatives, with special focus on GBIF.*

Module 3: Biodiversity data capture | *This module aims to introduce the different biodiversity data types and the best practices for data capture.*

Module 4: Data cleaning and standardization | *This module aims to introduce the basic tools and concepts used for data validation, cleaning, and how data can be standardized for publishing as Darwin Core.*

Module 5: Data mobilization and publishing using IPT | *This module aims to introduce the process of making biodiversity data freely available online using the GBIF Integrated Publishing Toolkit.*

Module 6: Practical exercise | *This module aims to test the attained knowledge and skill sets of participants through 2 Use Cases.*

Module 7: Data access via GBIF.org | *This module aims to teach the procedures in accessing biodiversity data in the GBIF website.*

Learning Outcomes:

- Capacitate local institutions in capture and publishing of biodiversity data.
- Use software tools designed to facilitate biodiversity data mobilization.
- Apply data cleaning protocols to evaluate the fitness-for-use of a biodiversity dataset.
- Use software tools designed for (biodiversity) data cleaning.
- Use the GBIF IPT to publish biodiversity datasets using the appropriate extensions.

Workshop Schedule

Day 1 | March 14 |

1200–1300H Registration and Lunch break

1300–1330H Session 1 | Welcome and introduction to the workshop

1330–1400H Module 1 | Session 2 | Introduction to Biodiversity Informatics

1400–1430H Module 2 | Session 3 | Introduction to the Global Biodiversity Information Facility

1430–1500H Session 4 | GBIF Philippines and DENR-BMB initiatives for Biodiversity Data Mobilization

1500–1515H Coffee Break

1515–1600H Session 5 | "Biodiversity data" and its origins (30 min.)
The origin and types of biodiversity data will be introduced.

1600–1630H Session 6 | Why publish data? Biodiversity data mobilization and data papers

1630–1700H Module 3 | Biodiversity data capture
Session 7 | Biodiversity data terminologies, standards, and the Darwin Core (30 min.)
The concepts of standards, in particular, the Darwin Core standard and its components, which will be used throughout the remainder of the course, will be introduced.

1700–1730H Session 8 | Data Quality (30 min.)
During this session we will learn key concepts of data quality

1730–1830H Dinner Break

Day 2 | March 15

0830–0900H Registration

0900–1000 H Session 9 | Data capture (60 min.)
Theoretical and practical session focused on best practices and data quality principles in the context of data capture. Includes a short presentation on data quality and coherence (especially on subjects such as georeferencing, dates, names and taxa cross-checking), followed by a practical exercise using simple spreadsheets.
Introduction to Species Encoder of the ASEAN Centre for Biodiversity
Introduction to use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1000–1100H Module 4 | Data cleaning and standardization
Session 10 | Basic concepts of Data Cleaning (60 min.)
Main concepts, related tools, and best practices for data cleaning and standardization will be introduced, followed by a practical exercise with examples of technical and consistency validation checks.
Use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1100–1130H Session 11 | OpenRefine (90 min.)
Introduction to OpenRefine -- an easy tool to standardize and improve the quality of datasets -- followed by a practical exercise using the default features, existing web services and regular expressions.
Use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1130–1230H Lunch break

1230–1345H Session 12 | Other data management tools (75 min.)
Introduction to other tools used to validate and clean datasets in three main categories: nomenclatural, format, and geographical.
Use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1345–1400H Coffee Break

1400–1600H Module 5 | Data mobilization and publishing using Integrated Publishing Toolkit
Session 13 | Data publishing using IPT (120 min.)
Presentation and discussion on subjects such as licenses, metadata, mandatory fields, hosting of data sets of different institutions on the same IPT installation, etc. Presentation and demonstration covering the basics of publishing using the IPT tool (principles, user interface, workflow, metadata, dataset visibility, etc). Additional demonstration and discussion covering IPT features and publication of a complex, sample-based dataset where emphasis will be put on the use of extensions and the core/extension relationship. (Presentation, demonstration, and exercise)
Use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1600:1700H Session 14 | Preparing data paper manuscripts for submission (60 min.)
Use case 1: A Data Mobilization Project in a Regional Herbarium © GBIF

1700–1800H Dinner

Day 3 | March 16

0830–0900H Registration

0900–945 Module 6 | Session 14 | Data access via GBIF.org (45min)
Introduce the GBIF website, and how to navigate and access the database.
Mr. Arman N. Pili

0945–1030H Module 7 | Session 15 | Practical exercise
Introduction to use case 2, use case 3, use case 4 © GBIF, or institution's dataset

1030–1045H Coffee break

1045–1200H Module 7 | Session 15 | Practical exercise

1200–1300H Lunch break

1300–1500H Module 7 | Session 15 | Practical exercise

1500–1515H Coffee break

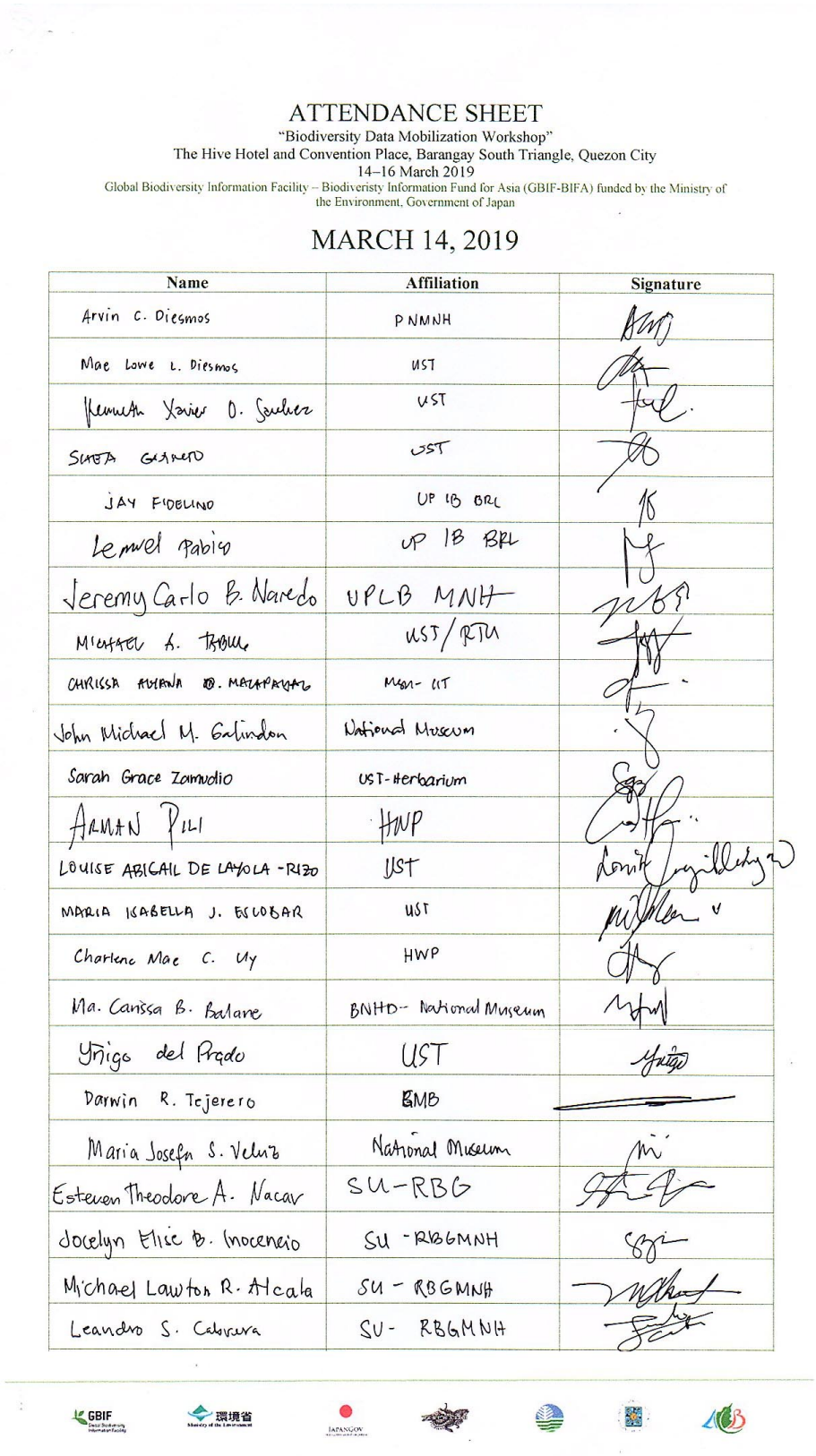
1515–1630H Module 7 | Session 15 | Practical exercise

1630–1700H Onsite conclusion, End of the training event

Participants of the workshop

Seventeen participants representing six natural history institutions attended the workshop. The six institutions have some of the largest and historically significant natural history collections in the Philippines. These institutions include: The botany division and the zoology division of the Philippine National Museum of Natural History (post-world war 2 collections; 1,300,000 collections), the University of the Philippines Los Baños Museum of Natural History (+600,000 collections), the University of Santo Tomas (legacy collections <1900s), Silliman University RB Gonzales Museum of Natural History (largest collections in Central Philippines), Biodiversity Research Laboratory of the University of the Philippines – Diliman, and Mindanao State University – Iligan Institute of Technology.

Figure I1. Participants, facilitators and organizers of the workshop. A total of 17 participants representing six natural history collections institutions in the Philippines attended the Biodiversity Data Mobilization Workshop held at the Hive Hotel and Convention Place, March 14 to 16, 2019.



ATTENDANCE SHEET

"Biodiversity Data Mobilization Workshop"
The Hive Hotel and Convention Place, Barangay South Triangle, Quezon City
14–16 March 2019
Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

MARCH 14, 2019

Name	Affiliation	Signature
Arvin C. Diesmos	PNMNH	
Mae Lowe L. Diesmos	UST	
Kenneth Xavier O. Sanchez	UST	
SHEA GERARD	UST	
JAY FIDELINO	UP IB BRL	
Lemuel Pabico	UP IB BRL	
Jeremy Carlo B. Naredo	UPLB MNH	
MICHAEL A. TRAMIL	UST/RTU	
CHRISSA AURORA M. MALAPAYAG	MSU-IIT	
John Michael M. Galindon	National Museum	
Sarah Grace Zamudio	UST-Herbarium	
ARMAN PILI	HWP	
LOUISE ABIGAIL DE LAYOLA-RIZO	UST	
MARIA ISABELLA J. ESCOBAR	UST	
Charlene Mae C. Uy	HWP	
Ma. Carissa B. Balane	BNHD-National Museum	
Yñigo del Prado	UST	
Darwin R. Tejerero	BMB	
Maria Josefa S. Veluz	National Museum	
Esteven Theodore A. Nacar	SU-RBG	
Jocelyn Elise B. Inocencio	SU-RBGMNH	
Michael Lawton R. Alcala	SU-RBGMNH	
Leandro S. Cabrera	SU-RBGMNH	

Figure I2. Attendees of day one of the workshop.

ATTENDANCE SHEET

"Biodiversity Data Mobilization Workshop"
The Hive Hotel and Convention Place, Barangay South Triangle, Quezon City
14–16 March 2019
Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

MARCH 15, 2019

Name	Affiliation	Signature
[illegible]	UST	
Lemuel Pabico	BRL UP-IB	
JAY FIDELINO	BRL UPIB	
Jeremy Carlo B. Naredo	UPLB MNH	
John Michael M. Galindon	National Museum	
Ma. Canssa B. Balane	BNHD - National Museum	
MICHAEL TABUS	UST / RSU	
ARMAN PILI	HWP	
MARIA ISABELLA V. ESCOBAR	UST	
ABIGAIL DE LAYOLA	UST	
MAE LOWE L. DIESMOS	UST	
CHARLENE MAE C. UY	HWP	
Leticia Afuang	HWP	
Juan Carlos Gonzalez	UPLB	
Arvin C. Diesmos	PNMNH	
Yñigo Luis C. del Prado	UST	
Kenneth Sanchez	UST	
Esteven Theodore A. Nacar	SU - RBGMNH	
Michael L. R. Alcala	SU - RBGMNH / Biology	
Jocelyn Ehie B. Inocencio	Silliman Univ.	
Leandro S. Cabrera	SU - RBGMNH	

Figure I3. Attendees of day two of the workshop.

ATTENDANCE SHEET

"Biodiversity Data Mobilization Workshop"
The Hive Hotel and Convention Place, Barangay South Triangle, Quezon City
14–16 March 2019
Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

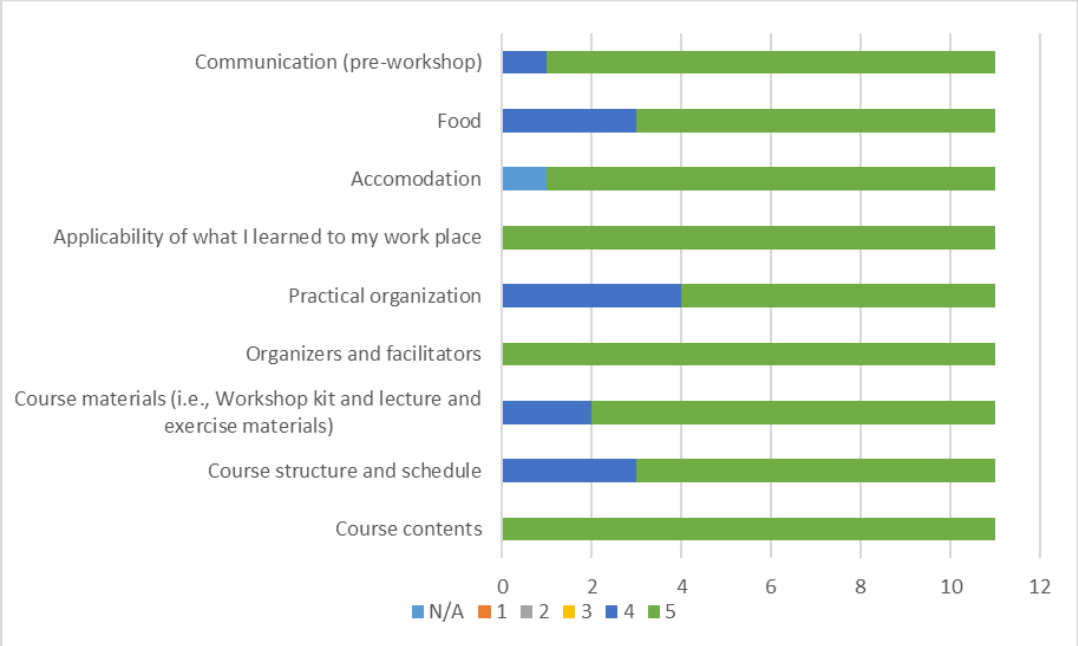
MARCH 16, 2019

Name	Affiliation	Signature
ARMAN PIN	HWP	
Sarah Grace Zamudio	UST - Herbarium	
Jocelyn Elise B. Inocencio	SU - RBGMNH	
John Michael M. Galinden	National Museum	
Ma-Carissa B. Balane	BNHD- National Museum	
Lemuel Pabico	BRL UP-IB	
Jay Fidelino	BRL UP-IB	
Juan Carlos T. Gonzalez	UPLB- MNH	
Maria Josefa S. Velez	National Museum	
CHRISSA ALYANA O. MACAPAYAG	MSU-IIT NSM	
MICHAEL S. TRONE	UST / RTN	
Esteven Theodore A. Nacar	SU-RBGMNH	
Leticio E. Afuang	HWP	
Mae Lowe L. Diesmos	UST	
Michael L. R. Arcala	SU-RBGMNH/SU Biology	
SHEA GUIMTO	UST	
CHARLENE MAE C. UY	HWP	
ABBY ESCOBAR	UST	
LOUISE ABIGAIL DELAYOLA-RIZO	UST / HWP	
Kenneth Xavier O. Sanchez	UST / HWP	
CHRISSA ALYANA O. MACAPAYAG	MSU-IIT NSM	double entry
Jeremy Carlo R. Naredo	UPLB MNH	
ARVIN C. DIESMOS	PNMNH	
Yñigo Luis C. del Prado	UST/HWP	

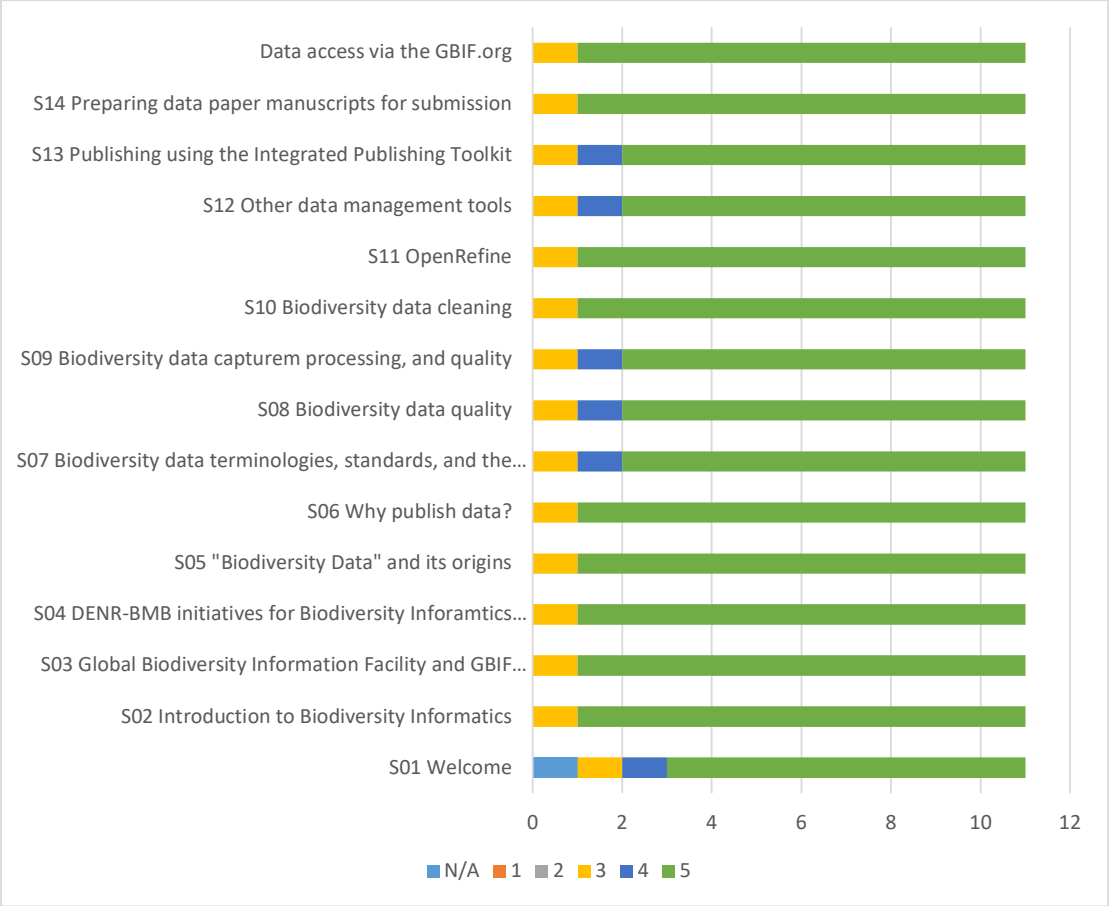
Figure I4. Attendees of day three of the workshop.

Workshop evaluation by participants

Question: Please rate your satisfaction on the topics listed below



Question: Please rate your level of satisfaction with the different sessions.



Question: In which area did you increase your knowledge the most?

- Data Validation and Cleaning
- Data cleaning, data management tools
- All workshop modules were really helpful
- all sections
- Museum data cleaning
- Use of IPT
- DarwinCore and OpenRefine techniques
- Data Mobilization
- Data Capture, the Darwin Core standard and its components, Data cleaning and standardization
- Open Refine and Other Data Management Tools

Question: Which of the topics studied will be the most useful in your daily work?

- OpenRefine Software
- Data cleaning, data management tools
- All topics - being part of a coherent whole
- the data base and for taxonomic verification
- Data Cleaning and Standardization
- Publication of dataset using GBIF
- DarwinCore, OpenRefine and IPT Publishing
- Data cleaning
- Data capture, processing and quality, Data cleaning and standardization

- GBIF

Question: Is there anything you would have added to this course? Any follow-up after it?

- Run-through of essential Darwin Core terms and application to our data
- Maybe a follow-up workshop on what the participants have done so far and any issues that we may have encountered
- training in museum techniques, networking and museum cross visits
- Scheduled museum tour
- national directory of university museums and collections
- More time to use institution datasets and be able to share the results

Question:

Appendix J

ATTENDANCE SHEET

KICKOFF MEETING WITH PROJECT MEMBERS AND PARTNERS

Graduate Commons, Rm. 708, Central Lab, University of Santo Tomas, 1003 Manila, the Philippines

4 MAY 2018

"Biodiversity Information Fund for Asia (BIFA) – BIFA3_026: Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System"

Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

Name	Contact No./ E-mail Address	Role in Project (P.I./member)	Project Partner (HWP/BEST/BMB)
MARIA ISABELLA J. ESCUBAR			HWP
ANTONIO N. LORENZO II			HWP
Maria Crisselda Endozo			HWP
Yñigo Luis C. del Prado			HWP
LOUISE ABIGAIL A. DE LAYOLA			HWP
LEVY V. NELECITO			HWP
DIANDRA BEATRICE A. MANALILI			HWP
GERALD THOMAS A. SOLIVEN			HWP
JONATHAN CARLO A. BRIONES			BEST
Russell Venturina			HWP
[signature]		P.I	[signature]
Mae Louie Diesmo		P.I	[signature]

Figure J1. Participants of the Project's kick-off meeting represented by twelve (12) project members from HerpWatch Pilipinas, Inc. (HWP) and the Biodiveristy, Ecology, Systematics, and Taxonomy group of the University of Santo Tomas (UST-BEST).

Appendix K

ATTENDANCE SHEET

MID-TERM MEETING WITH PROJECT MEMBERS AND PARTNERS

Graduate Commons, Rm. 708, Central Lab, University of Santo Tomas, 1003 Manila, the Philippines

29 AUGUST 2018

"Biodiversity Information Fund for Asia (BIFA) – BIFA3_026: Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System"

Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

Name	Contact No./ E-mail Address	Role in Project (P.I./member)	Project Partner (HWP/~~BEST~~/BMB)
Mae Loue Diesmos		P.I.	HWP, BEST
Arman N. Pili		member	HWP
LEVY V. HECKEITO		member	HWP
Nikki Dyanne Realubit		member	HWP
ARMIN C. [illegible]		P.I./member	HWP
ANTONIO N. LORENZO II		member	HWP
KEINO ANDREE LOUIS E. CAGUIMBAL		member	HWP
[illegible] A. TAGLE		member	HWP
KRISTOPHER RENNEKT M. MARINAS			
Maria Crisselda A. Endozo		member	HWP
Kenneth Xavier O. Sanchez		member	HWP
Arvin Jet B. Marcaida		member	HWP
Yñigo Luis C. del Prado		member	HWP
Russell Gran Ventanina		member	HWP
Gerald Soliven		member	HWP
Sarah Zamudio		member	BEST

Figure K1. Participants of the Project's mid-term meeting represented by sixteen (16) project members from HerpWatch Pilipinas, Inc. (HWP) and the Biodiveristy, Ecology, Systematics, and Taxonomy group of the University of Santo Tomas (UST-BEST).

Appendix L

ATTENDANCE SHEET

FINAL MEETING WITH PROJECT MEMBERS AND PARTNERS

Graduate Commons, Rm. 708, Central Lab, University of Santo Tomas, 1003 Manila, the Philippines

19 MARCH 2019

"Biodiversity Information Fund for Asia (BIFA) – BIFA3_026: Alien Amphibians and Reptiles, a Threat to Philippine Biosecurity: Developing a National Invasive Alien Amphibian and Reptile Species Inventory and Occurrence Database and an Observation and Monitoring System"

Global Biodiversity Information Facility – Biodiveristy Information Fund for Asia (GBIF-BIFA) funded by the Ministry of the Environment, Government of Japan

Name	Role in Project (P.I./member)	Project Partner (HWP/BEST/BMB)	Signature
Mae Lowe Diesmos	P.I.	HWP	
Louise Abigail De Leyola	Project member	HWP/member	
Antonio Lorenzo II	" member	" HWP	
Perry Buenavante	member	PNMNH	
Maria Criselda Endoso	member	HWP	
Charlene Mae C. Uy	member	HWP	
Russell Venturina	member	HWP	
MARIA ISABELA J. ESCOBAR	MEMBER	HWP	
PILI. ARMAN N.	MEMBER	HWP	
Kenneth Xavier O. Sanchez	Member	HWP	

Figure L1. Participants of the Project's mid-term meeting represented by tex (10) project members from HerpWatch Pilipinas, Inc. (HWP) and the Biodiveristy, Ecology, Systematics, and Taxonomy group of the University of Santo Tomas (UST-BEST).

Signed on behalf of the project partners Date

7 May 2019
