

MID-TERM NARRATIVE REPORT

Guidelines on how to complete this report are included in italics.

Use the information included in your BIFA Full Proposal (reproduced in Annex 1 of your BIFA contract) as a baseline from which to complete this report.

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

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Project information

Main contact person and role:	Rahul Khot, PI
Institution/network/agency affiliation:	Bombay Natural History Society (BNHS)
BIFA Project ID:	BIFA4_052
Project title:	Addressing the taxonomic and geographical shortfall for amphibians and reptiles using specimen data from the collection of Bombay Natural History Society, Mumbai, India.
Start date and end date of the reporting period:	May 2019 to October 2019
Country in which the activities take place:	India

Executive summary

Provide a brief explanation of the project and its implementation, the context and the approach taken for the mid-term evaluation, and a summary of progress of your project's original objectives. Also include any additional objectives that have been defined since the implementation of the project and explain why they've been added to the project's initial objectives. In the event of unexpected challenges which have prevented you to reach a planned project objective, please provide explanations and indicate how you plan to reach these objectives within the project implementation period and if you would like to receive the help of a specific project mentor. (Max. 350 words.)

The BNHS museum is one of the finest natural history collections in Asia having more than 1,35,000 faunal specimens collected from across the Indian Subcontinent over a period of 135 years. Through this project we aim to digitize the diversity and occurrence of reptiles and amphibians using preserved specimens and associated metadata at BNHS and thus address the gap in taxonomy and distribution of Indian herpetofauna and to make this information readily available for conservation assessments, policy makers and stake holders.

A major hurdle for using museum data for further analysis was unavailability of digitized information. All the raw entries are in the format of hand written notes in registers. We have initiated a process of entering verbatim data from registers into excel files. Till now we have digitized over 5000 entries for reptile and amphibian specimens in the collection. This information is now being cross checked for errors, georeferenced for gathering distributional information and updated with current taxonomic changes. BNHS museums houses a number of type specimens related to reptiles and amphibians and this number is growing regularly. Documenting the information related to type specimens is priority as it helps researchers from across the globe in their studies. To address this, we have published a catalogue of reptiles in the collection of BNHS in GBIF and we are working on similar catalogue for amphibians. Taxonomic evaluation for all species at once is time consuming and needs lots of efforts. Hence, we are targeting specific groups of taxa for which there is gap in taxonomic understanding as well as geographic information. In reference to this, we recorded and published a catalogue of sea snake specimens in the collection. Workshops targeting reptile and amphibian taxonomy and use of ERDAS imaging software were conducted to train participants in methods of morphological studies and mapping. We were unable to conduct image processing workshop in the targeted time due to unexpectedly heavy rainfall and flood during the planned time. This workshop will be conducted in the month of November.

Progress against expected milestones

Please indicate the status of the expected milestones as outlined in Annex 3 of the contract, at the time of mid-term reporting. Please provide links in the sources of verification.

In the event of unexpected delay(s), please provide detailed explanatory notes.

Expected milestones	Completed? Yes/No	Explanatory notes	Sources of verification
Gain certification at BIFA Capacity Enhancement Workshop (Mid-term report milestone)	Yes	Received Advance Level Badge for Biodiversity Data Mobilization after final grading of the workshop and submitted material.	Link of Badge attached https://openbadgepassport.com/app/badge/receive/162429?banner=7f62c7d3951bd8b417195eb1088cb10200d6b0a9baf7d8013546b0329d78d011.png
At least one dataset has been published to GBIF.org (Mid-term report milestone)	Yes	<ol style="list-style-type: none"> 1. Catalogue of sea snakes in the collection of BNHS. 2. Reptile type specimens in the collection 	https://cloud.gbif.org/bifa/resource?r=bnhs_seasnakes https://cloud.gbif.org/bifa/resource?r=bnhs_typespecimens_reptiles

		of BN HS .	
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Activities

Please indicate the status of the activities as outlined in the BIFA Full Proposal (section 4.4), at the time of mid-term reporting.

The table below should be completed in the same way as in the BIFA Full Proposal, but should include information and updates on the status of each activity. Please indicate relevant source(s) of verification and provide links, or a copy of the source of verification mentioned if no links are available. Attachments should be provided in the Annex.

In the event of unexpected delay(s), please provide detailed explanatory notes and indicate new planned completion date(s) within the project implementation period.

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

Activity name	Expected deliverable	Contribution to goals listed in table 4.3 of the BIFA Full Proposal	Status of activity as of mid-term reporting Provide % complete and state either on-track or delayed	Explanatory notes, inc. new planned completion date if necessary	Source(s) of verification
Entering raw data from registers into excel sheets and inter-related tables	Digitized catalogue of species and updated checklist	This activity will contribute specific data towards creating and updating digital database of museum collection.	70% completed and on-track	Raw data from hand written registers is being entered in excel sheets. This is periodically being checked for errors, duplicate entries etc. Full data entry and correction is expected to be completed by 31 st December 2019.	Part of corrected and cleaned data has been published as occurrence records.
Identifying and sorting amphibian and reptile specimens using morphological characters and measurements followed by statistical assessments like PCA.	Digitized catalogue of species and updated checklist Checklist and species identification templates Potential new records	This activity will contribute specific data towards creating and updating digital database of museum collection. This activity will help address taxonomic	30% completed and on-track	Morphological studies on specific groups of reptiles like sea snakes have been completed. Studies on specific groups of cryptic species is in process.	The study on sea snakes was used to create occurrence records for preserved specimens in the museum. Published in GBIF

		ambiguities of complex and cryptic species and create updated checklist of species.			
Georeferencing species occurrence localities	Digitized catalogue of species and updated checklist Species occurrence and distribution records New locality records	This activity will contribute towards mapping species distribution ranges based on species occurrence records	20% completed and on-track	Many of the specimens in the collection lack precise collection locality records or have older names. Hence, georeferencing is taking lot of time. Old literature review is in process to acquire authentic locations for collections. It is expected to be completed by February 2020.	Georeferenced data is used to provide occurrence records for both published datasets.
Specimens will be photographed from multiple angles with high-end DSLR cameras with macro lenses and stereo microscopes with attached DSLR cameras to create focus stacked high resolution clear images. A workshop will be conducted for research staff and volunteers working in the project to train them in specimen photography and image processing.	Compiled Image database	This activity will contribute towards creating a digital database of species-specific images to be linked with the species catalogue	30% complete and on-track	Species specific photography is in process and completed for all the type specimens of reptiles. Due to flooding in Mumbai region the photography and image processing workshop was postponed. It will be conducted in November 2019.	Example image template attached as Annex 1.
A digitization and project promotion meeting will be conducted to communicate the project highlights and to influence future long-term	Inform researchers, stakeholders and cofounders on the prospects of digitization	This activity will contribute towards overall digital database creation as well as understand potential use of archived data.	Not conducted yet	This workshop will be conducted in the month of January 2020 to promote project achievements	Workshop images will be uploaded on completion.



work		Additionally, this activity will influence stakeholders and other museums towards data mobilization and collaboration			
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Deliverables

This section should summarize the project deliverables as outlined in the BIFA Full Proposal (section 4,5), at the time of mid-term reporting. Please highlight any changes from the original plans.

If no result has been achieved on a specific point, please clearly indicate this and provide expected date of completion.

In the event of unexpected delay(s), please provide detailed explanatory notes and indicate new planned completion date(s) within the project implementation period.

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

a. Data

Details of datasets published and/or pending publication as an outcome of the project. The table below should be completed in the same way as in the BIFA Full Proposal but should include information and updates on the status of each dataset. Please provide links in sources of verification.

If the dataset is not yet published, please provide a detailed explanation, % of digitization and expected date of publication. Add rows as required.

Title of dataset	Data type (checklist/occurrences/sampling event) ¹	Estimated number of records (specimens)	Status of dataset: Published or % of digitization/pending publication and expected date of publication	Data holding institution agreed to publish its data via GBIF.org (Yes/No)	Explanatory notes	Source(s) of verification: DOI or URL
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¹ Dataset classes: <http://www.gbif.org/publishing-data/summary#datasetclasses>

Title of dataset	Data type (checklist/occurrences/sampling event) ¹	Estimated number of records (specimens)	Status of dataset: Published or % of digitization/pending publication and expected date of publication	Data holding institution agreed to publish its data via GBIF.org (Yes/No)	Explanatory notes	Source(s) of verification: DOI or URL
Catalogue of type specimens of reptiles in the collection of BNHS	Occurrence	226	<i>Published</i>	Yes	This includes a list of all type specimens of reptiles currently housed in BNHS. It will be updated periodically	https://cloud.gbif.org/bifa/resource?r=bnhs_typespecimens_rept
Catalogue of sea snakes in the collection of BNHS.	Occurrence	235	Published	Yes	This includes a list of all sea snake specimens in BNHS. It will be updated periodically	https://cloud.gbif.org/bifa/resource?r=bnhs_seasnakes
A catalogue of reptiles and	Occurrence	10000	<i>25% digitized, expected date of publication April</i>	Yes	A complete catalogue of all	

Title of dataset	Data type (checklist/occurrences/sampling event) ¹	Estimated number of records (specimens)	Status of dataset: Published or % of digitization/pending publication and expected date of publication	Data holding institution agreed to publish its data via GBIF.org (Yes/No)	Explanatory notes	Source(s) of verification: DOI or URL
amphibians in the collection of BNHS			2020		specimens in collection is in process, addressing taxonomic changes for older specimens and cryptic species requires detailed study	
List of reptiles in the collection of BNHS	Checklist	400	50% digitized, expected date of publication February 2020	Yes	Digitization and data cleaning in process	
List of amphibians in the collection of BNHS	Checklist	250	50% digitized, expected date of publication February 2020	Yes	Digitization and data cleaning in process	

Title of dataset	Data type (checklist/occurrences/sampling event) ¹	Estimated number of records (specimens)	Status of dataset: Published or % of digitization/pending publication and expected date of publication	Data holding institution agreed to publish its data via GBIF.org (Yes/No)	Explanatory notes	Source(s) of verification: DOI or URL
Catalogue of extralimital herpetofauna in the collection of BNHS	Occurrence	100	60% digitized, expected date of publication January 2020	Yes	Digitization and data cleaning in process	
Catalogue of type specimens of amphibians in the collection of BNHS	Occurrence	300	50% digitized, expected date of publication February 2020	Yes	Digitization and data cleaning in process	

b. Other deliverables

Describe other deliverables (e.g. publication of data papers, analysis, reports etc.) produced and/or planned to be produced/completed as part of the project. Please provide percentage complete and status of deliverable, together with an indicative dates/estimated time for completion.

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

Name and type of deliverable	Status of deliverable Provide % complete and on-track/ delayed	Explanatory notes	Source(s) of verification
Data paper related to occurrence of sea snakes in the museum	40% completed, on-track	expected to be completed by February 2020	
Data paper on checklist of reptiles and amphibians in BNHS museum	20% completed	expected to be completed by April 2020	
Atlas for data deficient species		Georeferencing in process, atlas is expected to be completed by April 2020	

Events organized as part of the project

Please indicate the status of the events as outlined in the BIFA Full Proposal (section 4.6), at the time of mid-term reporting.

The table below should be completed in the same way as in the BIFA Full Proposal, but should include information and updates on the status of each event. Please provide links to any documents or web pages documenting the event(s) in the sources of verification. Attachments should be provided in the Annex

In the event of unexpected delay(s), please provide detailed explanatory notes and indicate new planned completion date(s) within the project implementation period.

In the event of any additional events having being completed, please add rows as required.

Event title	Organizing institution	Date held / expected dates	Number of participants	Explanatory notes	Source(s) of verification
An introduction to reptiles and amphibians	BNHS	2 nd June 2019	25	This event was organised to introduce participants to reptiles and amphibians and also to provide training on	Event description and images attached as Annex 2.

Event title	Organizing institution	Date held / expected dates	Number of participants	Explanatory notes	Source(s) of verification
				taxonomy using museum specimens	
An introduction to ERDAS Imagine software	BNHS	13 th -14 th May 2019	15	This training session was conducted to train participants in Georeferencing, using and creating maps using ERDAS Imagine software	Event description and images attached as Annex 3.
Photography and image processing workshop		November 2019		Due to flooding in Mumbai region during monsoon the photography and image processing workshop was postponed. It will be conducted in November 2019.	
Stakeholder meeting towards digitization and project promotion	BNHS	January 2020			

Calendar of activities

The calendar should be completed in the same way as in the BIFA Full Proposal (section 4.7) but should also clearly indicate and include any changes (e.g. use of colour-coding to indicate expected changes and/or delays). Please provide explanations for any changes in the “Notes” column and/or the explanatory notes section.

Activity	2019								2020				Notes
	M	J	J	A	S	O	N	D	J	F	M	A	
Activity: Project initiation: Meeting of team members to brief about project requirements, design schedule and standardize data tables, acquire essential equipment and compile raw data	X												
Activity: Entering raw data from registers into excel sheets and inter-related tables	X	X	X	X			X	X	X				Raw data entry will be extended due to data cleaning and correction issues
Activity: Photography and image processing workshop								X					Workshop time was changed due to unavoidable circumstances (flood and heavy rains in monsoon)
Activity: Specimen photography using focus stacking and image processing	X	X		X		X	X	X	X	X			
Mandatory attendance of a project team member to the BIFA Capacity Enhancement Workshop (expenses for attending the workshop are covered by the BIFA programme)			X										
Activity: Meeting of team members to discuss and rework project plan based on learning from BIFA Capacity Enhancement Workshop				X									
Activity: Identifying and sorting amphibian and reptile specimens using morphological characters and measurements, data analysis for species delimitation		X	X	X	X		X	X		X	X		

Activity	2019								2020				Notes
	M	J	J	A	S	O	N	D	J	F	M	A	
Activity: Preparing interim report and uploading publishing dataset					X	X							
Deadline for mid-term report – 31 October 2019 Mandatory milestones attached to the mid-term report: - Gain certification at BIFA Capacity Enhancement Workshop - At least one dataset has been published to GBIF.org						X							
Activity: Georeferencing species occurrence localities			X	X	X		X	X	X	X	X		Georeferencing might be extended due to unavailability, uncertainty of proper location data
Activity: Visiting local museums to study type specimens and resolve taxonomic ambiguities								X	X	X			Museum visits will be conducted after image processing workshop
Activity: Stakeholder meeting towards digitization and project promotion									X				
Activity: Create species distribution maps and refer historical data to fill gaps								X	X	X	X		Mapping for selected species will start after corrected georeferencing
Activity: Compile and update data, create updated data sets, data papers and final report										X	X		
Deadline for final reporting – 30 April 2020 Mandatory milestones attached to the final report: - All deliverables have been produced - Sustainability and next steps have been documented												X	

a. Explanatory notes

Cleaning data for errors in taxonomic names, spellings, locations is a time-consuming process and needs to be done thoroughly to avoid misrepresentation. Hence, we estimate that even though entry of raw data will be completed in time but data cleaning might require extended attention.

Lot of the location data associated with older specimens is either missing or not precise. Many of the location names have changes over time which causes delay in getting a precise collection locality. To address this lack of information we have to verify the locations from literature. Thus, georeferencing might be extended due to unavailability, uncertainty of proper location data.

Project communications and visibility

Describe the plans and how the results of your project have been and will 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> and highlight any additional documents, events, news items or links that you would like to add to your page and provide links/attachments in the Annex.

Workshops like the introduction to reptiles and amphibians using museum specimens helped in creating awareness and interest among participants in the importance of museum collections and associated information. Similar workshops and meetings will be conducted in towards the end of the project to promote study of museum collections as well as importance of digitization. Images, datasets from the project will be shared with GBIF community through the project page as well as related social media sources once published.

Mid-term evaluation findings and recommendations for the remaining project

implementation period

This section should cover for example:

- *An evaluation of the project activities by mid-term and their outputs/deliverables*
- *Comments on the project implementation, 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 during the remaining project implementation period*
- *Any request for guidance and/or assistance in the form of a specific project mentor*

(Max. 300 words)

A total of over 5000 records digitized for reptiles and amphibians occurrence; cleaning, correction and georeferencing of the same is in process. 235 occurrence records for 30 species of sea snakes belonging to three families published in GBIF. Additionally, a catalogue of reptile type specimens including 226 occurrence records has been published. Some of the major challenges observed during the project work are missing data, in the form of collection localities, badly preserved specimens causing hurdles in conducting taxonomic investigations and missing proper registration numbers especially for really old specimens. Also, poor condition of raw data in the form of damaged old registers, missing pages were some of the other hurdles that extended the process of data entry. Old registers need to be handled very carefully to avoid damage, some of the writings has also become faint over time causing trouble in accurate data entry. To avoid further damage of the registers we are photographing each page and these photographs will be used instead to original registers to extract data in the future. This might reduce the efforts in data entry and help in finishing task faster. Publishing two occurrence datasets have helped in understanding the who data publishing process and was also a learning process which will enhance future dataset publications.

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. (Max. 200 words).

To promote the importance of museum specimens and associated metadata, the natural history collection department at BNHS has initiated a long-term digitization of the entire collection. This project in digitizing the reptiles and amphibian collection will contribute to the larger goal of digitizing museum specimens of various organisms. This collection is also growing dew to contribution of specimens from researchers from all across India.

The experience and knowledge gained during this project work is helping in creating a framework for mitigating problems which might occur during the digitization process. The data acquired during this project will be updated frequently based on new specimen additions to the museum. Occurrence data for selected groups of reptiles and amphibians like endangered and data deficient species will be used in association with bodies like the IUCN to address data gaps. On successful completion of the project, similar work would be planned in collaboration with other museums that house specimens like the Zoological Survey of India to strengthen and update the database. A workshop would be conducted towards the later phase of the project to promote importance of data mobilization and seek potential collaborations for long-term data digitization projects. This will also provide better understanding of the Indian biodiversity.

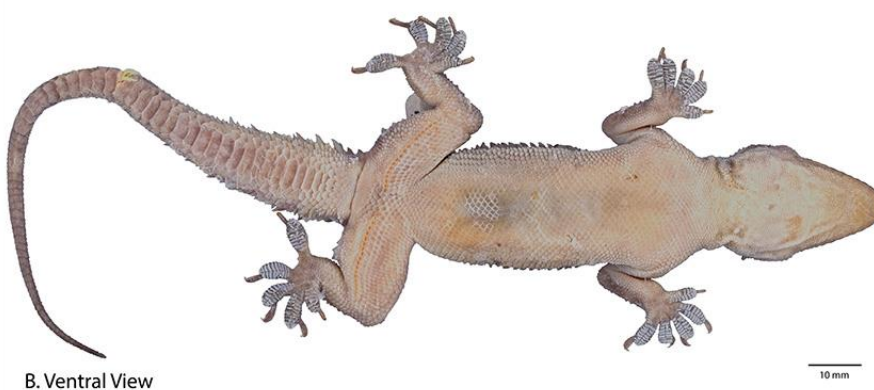
Annex – Additional sources of verification

Sources of verification are for example links to relevant digital documents, news/newsletters, brochures, workshop related documents, pictures, etc.

1. Example template of species-specific image layout

Hemidactylus kangerensis

Holotype BNHS 2484, adult male, in a forest rest house near Kailash caves, Kanger Valley National Park, Bastar District, Chhattisgarh, India (18.8411708, 81.9973108, 464 m). Collected on 2 December 2016 by Harshal Bhosale and Zeeshan Mirza.



2. An introduction to reptiles and amphibians

A workshop was conducted on 2nd June 2019 to introduce participants to the study of reptiles and amphibians and to promote importance of museum specimens. A total of 25 individuals participated in this workshop which included volunteers, staff as well as students from various educational institutes.

The aim of this workshop was to provide a brief introduction to reptile and amphibian diversity in India and the general methods used to conduct morphological studies. The workshop also provided an opportunity to discuss the status and importance of preserved specimens and how information from museums can be used to address biodiversity data gaps. Participants got an opportunity to handle and study preserved specimens, collect morphological data and identify characters important for taxonomy.



3. An introduction to ERDAS Imagine software

A workshop was conducted in the month of May 2019 to introduce and provide hands on training to participants in the use of ERDAS Imagine software. **Erdas Imagine** is an image processing software package that allows users to process both geospatial and other imagery as well as vector data. Participants were introduced to fundamentals of Remote-Sensing, Georeferencing using toposheets and satellite images, Topographic analysis etc. Understanding the fundamentals and use of this software will be helpful for georeferencing location data as well as designing maps for species distribution.

