Advancing freshwater biodiversity data and information access, utility and relevance for conservation decision making in Uganda

Programme: BID
Project ID: BID-AF2020-145-USE
Project lead organization: National Fisheries Resources Research Institute, Jinja, Uganda
Project implementation period: 1/4/2021 - 31/3/2023
Report approved: 14/3/2022

Narrative Midterm report

Executive Summary

This project is working to improve quality of data available within GBIF from NaFIRRI, publish more data, develop biodiversity information products, and increase user capacity to mainstream the products into conservation decision making. Our team members completed modules of the data mobilization and data use training workshops. We have published four datasets through GBIF and are on track to achieve all our dataset deliverables within planned timeline. Development of biodiversity information from available data is on track and most of the information products will be completed ahead of time, giving ample time for stakeholder engagement. The national red list and the index for prioritizing habitats for conservation are highlighted. A total of 147 of 284 fish species have been assessed for the national red list. The assessed species include all fish species in Uganda apart from those in Haplochromis. The assessed fish species are accompanied by fish distribution maps, and distribution notes. By the end of May 2022, all the species will be assessed, and distribution maps will be obtained for all the fish species including threatened species. We have a working index for prioritizing habitats for conservation, and a map of biodiversity hotspots based on the index. After May, the index will be modified to include national level conservation status of fish species. Since inception, we have harnessed multiple events for engaging stakeholders and media. Progress of the project has been monitored through regular engagements among partners and quarterly reporting at NaFIRRI. This was to ensure that all activities are on track and that mid term milestones are met. Generally, the project is on track to deliver with in planned timelines.

Progress against milestones

Has your project published at least one dataset through GBIF.org?: Yes

Dataset published:

Dataset	DOI
Taxa occurrences and composition of benthic macroinvertebrates in Lake Edward system, Uganda	https://doi.org/10.15468/puth4m
Zooplankton occurrences and abundance in the Lake Kyoga system, Uganda.	https://doi.org/10.15468/kc6dy5
Fish Biodiversity Assessments for Conservation and Hydropower Developments	https://doi.org/10.15468/js65th
Fish species observations from a monitoring survey of two Lake Victoria affluent rivers (Rivers Kagera and Sio)	https://doi.org/10.15468/wsxmk6
Diversity, distribution and abundance of macro-invertebrates in areas with different pollution levels in Lake Victoria	https://doi.org/10.15468/j8qbhw

Has at least one member of your project team received certification following the BID capacity enhancement workshop?: Yes

Name of the workshop participant: Mark Olokotum

Certification obtained: Advanced Badge

Report on Activities

Activity progress summary

Project inception

The project inception meeting was held on 16th August 2021, following the ease of Covid-19 restrictions from 1st August 2021. Please refer to pictures taken at the meeting and a screen shot of an associated tweet here: https://www.dropbox.com/s/xgrw8lnw8x5lx7e/incenception%20pictures.docx?dl=0. The number of participants was limited by the standard operating procedures to limit the spread of the disease. The meeting was attended by one representative from Maritime Institute of Busitema University (project partner), one representative from Directorate of Fisheries Resources (project partner and main data user), three representatives from Nugsoft technologies (partner), the national GBIF node manager, and the project team at NaFIRRI, including members involved in data mobilization. The meeting (i) introduced the project to the research community of NaFIRRI and the national node, and (ii) refined plans for data mobilization, development of biodiversity information and stakeholder engagement. Partners retaliated their commitment to work together to achieve the project deliverables.

Data mobilization

Data mobilization is active. Mark Olokutum, a member of our team completed the data mobilization modules of the data mobilization workshop. Mark is now actively mobilizing data and supporting others. Since inception, we have undertaken two data mobilization workshops and published four datasets on macroinvertebrates, zooplankton and fish. Our data mobilization work also involves improving quality of the datasets we have published through GBIF. In relation to this, one dataset of macroinvertebrates which previously lacked coordinates for 24 occurrences was revised and now, its dataset metrics display 100% coordinates (https://doi.org/10.15468/j8qbhw). However, most of the work on improving quality is on fish species occurrences. These datasets either lack abundance data (7214 occurrences affected) or have no coordinates (958). We completed the inventory of these datasets and assigned team members who are revising them. Abundance data has been added to the 7214 occurrences and georeferencing is underway for the occurrences lacking coordinates. These fish species occurrences form the bulk of data we are using for red list assessments. We are on course to end all data mobilization activities by the end of April 2022.

Development of freshwater biodiversity information products and tools

We are on a good progress path on development of biodiversity products and tools: national red list; fish distribution maps, including those of threatened species; index for prioritizing conservation, maps of biodiversity hotspots; water quality explorer; and checklist of macro invertebrates. We are working with two graduate students who are using our data on fish and macroinvertebrates to develop biodiversity information products.

For the national red list, we have completed assessment of 147 fish species of 284 candidate species. All the fish species in Uganda are completed apart from those under genus *Haplochromis*. These species have distribution notes, distribution maps (https://www.dropbox.com/s/n4gakw3g5dfl6ki/distribution%20maps%20of%20assessed%20fishes.zip?dl=0), distribution notes, estimates of Area of Occupancy (AOO) and Extent of Occurrence (EOO) (https://www.dropbox.com/s/88kjl6nzyis8rzs/Distribution%20of%20all%20species_including%20haplochromines.xlsx?dl=0). Our target is to complete the species assessments by the end of May 2022. This will be followed by workshops planned to obtain stakeholder views on the red list.

Each of the fish species assessed is accompanied by a distribution map that shows where the species is extant, possibly extant, presence uncertain, possibly extinct, or extinct in Uganda. This means that by the end of May, the fish distribution maps, including those of threatened species or those of conservation importance, will all be attained.

We have a working version of the index for prioritizing habitats for conservation. Please refer to the draft documentation of the index (https://www.dropbox.com/s/gfkvd7g2pg3cy8q/CPI%20report.docx?dl=0). The index for now uses global IUCN conservation status of fish species and will be updated

when conservation status of fish species at the national level becomes available (end of May). We have mapped the priority areas identified by the index (Figure 1 in the documentation). This forms our map of biodiversity hotspots. This map will also be modified to reflect conservation status of fish species at the national level.

Our checklist of macro-invertebrates of Uganda is about 90% complete (https://www.dropbox.com/s/ox21fzqdxfxfwey/checklist-general-all%20data.csv?dl=0). The checklist has been generated from all taxa occurrences available in GBIF and literature. All major lake systems in Uganda are covered. The checklist is under review and will be published by the end of April like all datasets.

The water quality explorer (map of status and changes of water quality) is still at a conceptualization state. This entails decisions on whether the explorer will provide timeseries data or averages across specified periods.

Incorporating biodiversity information products and tools into Freshwater Biodiversity Portal for Uganda (FBPU)

Development of tools to incorporate biodiversity information products into the portal is ongoing. We have transferred fish distribution maps (both shapefiles and pictures) from the national red list with the development team of Nugsoft technologies to use in prototypes to incorporate the national red list in the portal. This activity is also on course to end by 31st December 2022.

Stakeholder engagement

Since inception, we have harnessed various stakeholder engagement opportunities to disseminate information about activities and all the biodiversity informatics products at NaFIRRI. Please see pictures from the engagements (https://www.dropbox.com/s/gals0hb080bw9i3/Pictures%20from%20stakeholder%20engagment%20events.docx?dl=0). We co-organised a visit of stakeholders from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), including the Minister of State for Fisheries to NaFIRRI on 12th October 2021. Events we have participated include routine dissemination events, and engagement with journalists. For details, please see the communication and visibility section.

Completed activities

Activity: Project inception

Description: Partner engagement and introduction of the project to the wider research community at NaFIRRI
Start Date - End Date: 16/8/2021 - 16/8/2021
Verification Sources: https://www.dropbox.com/s/xgrw8lnw8x5lx7e/incenception%20pictures.docx?dl=0

Report on Deliverables

Deliverables progress summary

Dataset deliverables
Data mobilization is active. Since inception, we have undertaken two data mobilization workshops and published four datasets on macroinvertebrates, zooplankton and fish. Our data mobilization work does not only involve publishing new datasets but also involves improving quality of the datasets we have made available through GBIF. In relation to this, one dataset of macroinvertebrates which previously lacked coordinates for 24 occurrences was revised and now, its dataset metrics display 100% coordinates. However, most of the work on improving quality is on occurrences we have previously published on fish. These datasets either lack abundance data (9214 occurrences affected) or have no coordinates (958). We completed the inventory of these datasets and assigned team members who are working on them. Abundance data has been added to the 9214 occurrences and georeferencing is underway for the occurrences lacking coordinates. These fish species occurrences form the bulk of data we are using for red list assessments. During the mapping, we realized some occurrences for some species do not match known distributions of the species. Therefore, we have decided to revise

all the fish occurrences to harmonise them their know distribution. We are on course to end all data mobilization activities by the end of April 2022.

National red list
For the national red list, we have completed assessment of 147 fish species of 284 candidate species. These species have distribution notes, distribution maps, assigned conservation status category and estimates of Area of Occupancy (AOO) and Extent of Occurrence (EOO). Our target is to complete the species assessments by the end of May 2022. This will be followed by workshops planned to obtain stakeholder views on the red list.

Distribution maps for threatened fish species and macro-invertebrates
Each of the fish species assessed is accompanied by a distribution map that shows where the species is extant, possibly extant, presence uncertain, possibly extinct, or extinct in Uganda. This means that by the end of May when the red list assessment is expected to end, the fish distribution maps, including those of threatened species or those of conservation importance, will all be attained. The checklist of macroinvertebrates includes IUCN conservation status of the taxa (see link to the checklist in activities above) that will be used to developed maps for threatened macroinvertebrates.

Maps of species richness and abundance of fish species and macroinvertebrates
From the datasets for fish and macro invertebrates available from GBIF and literature, maps of richness have been developed for the two taxa as part of the work of the graduate students. These are under review by the students' supervisors and proper documentation (not shared).

Index for prioritizing conservation and maps of biodiversity hotspots
We have a working version of the index for prioritizing habitats for conservation. The index for now uses global IUCN conservation status of fish species and will be updated when conservation status of fish species at the national level becomes available (by the end of May). We have mapped the priority areas identified by the index. This forms our map of biodiversity hotspots. This map will also be modified to reflect conservation status of fish species at the national level.

Freshwater biodiversity information available through the Freshwater Biodiversity portal for Uganda
Development of tools to incorporate biodiversity information products into the portal is ongoing. We have shared our fish distribution maps (both shapefiles and pictures) from the national red list with the development team of Nugsoft technologies to use in prototypes to host the national red list. This activity is also on course to end by 31st December 2022.

Data user capacity for information use
Since inception, we have engaged stakeholders through relevant events to introduce our activities and products. These include stakeholders relevant to decision making and training. Please see communication and visibility section for more information. We are on track to obtain deliverables on time which we shall use in planned communication channels to engage stakeholders and improve their capacity to use information from the project.

A checklist of macro invertebrates in Uganda
Our checklist of macro-invertebrates of Uganda is about 90% complete. The checklist has been generated from all occurrences available occurrences that cover all major lake systems in Uganda. The checklist is under review and will be published by the end of May like all datasets.

Map of water quality status and changes
The water quality explorer (map of status and changes of water quality) is still at a conceptualization state. This entails decisions on whether the explorer will provide time series data or averages across specified periods.

Progress towards deliverables

Deliverables - Project planning phase

Deliverables - Project data mobilization phase

Occurrence Records for Uganda Mobilized from Observation Archives
Dataset type: Occurrences
Dataset scope: Data set covers fishes of Uganda. Years in the data are 1996 to 2013
Number of records: 7,214
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 90%
Status update: Abundance data provided for 90% of the occurrences. Taxonomy and presence of taxa under review. Referencing for missing coordinates ongoing
DOI:
Expected date of publication: 2022-04-30

Additional fish species occurrence records for Uganda
Dataset type: Occurrences
Dataset scope: Dataset covers fishes of Uganda from numerous water bodies for years 1971-2015
Number of records: 507
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 90%
Status update: Geo referencing ongoing for the coordinates lacking coordinates. Presence of the taxa in the data under review
DOI:
Expected date of publication: 2022-04-30

Fish species occurrence and composition in selected Ugandan water bodies, 2001-2003
Dataset type: Occurrences
Dataset scope: Dataset covers fishes of Uganda from various water bodies, 2001-2003
Number of records: 431
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 90%
Status update: Presence for the taxa under review
DOI:
Expected date of publication: 2022-04-30

Diversity, distribution and abundance of macro-invertebrates in areas with different pollution levels in Lake Victoria
Dataset type: Occurrences
Dataset scope: Macroinvertebrates of Lake Victoria (2011-2013)
Number of records: 24
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: Occurrences Geo-referenced and published
DOI: https://doi.org/10.15468/j8qbhw
Expected date of publication:

Fish species occurrences in Lake Nyaguo
Dataset type: Occurrences
Dataset scope: Fish species of Lake Nyaguo
Number of records: 88
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: The mobilization of the dataset is complete. The PI of the hosting/source project has so declined to approval publication
DOI:
Expected date of publication:

Fish species occurrences in River Kagera
Dataset type: Occurrences
Dataset scope: Fish species occurrences from River Kagera
Number of records: 60
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: Published
DOI: https://doi.org/10.15468/wsxmk6
Expected date of publication:

Taxa occurrences and composition of benthic macroinvertebrates in Lake Edward system, Uganda
Dataset type: Occurrences
Dataset scope: Aquatic macroinvertebrates in Lake Edward system, Uganda
Number of records: 280
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: Published
DOI: https://doi.org/10.15468/puth4m

Expected date of publication:

Zooplankton occurrences and abundance in the Lake Kyoga system, Uganda
Dataset type: Occurrences
Dataset scope: Zooplankton of Lake Kyoga system, Uganda
Number of records: 3,488
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: Published
DOI: https://doi.org/10.15468/kc6dy5
Expected date of publication:

Fish Biodiversity Assessments for Conservation and Hydropower Developments
Dataset type: Occurrences
Dataset scope: Occurrences of fish
Number of records: 87
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 100%
Status update: Published
DOI: https://doi.org/10.15468/js65th
Expected date of publication:

A checklist for macro-invertebrates in Uganda
Dataset type: Checklist
Dataset scope: A checklist for macro-invertebrates in Uganda showing the taxa extant in water bodies
Number of records: 306
Data holder: NaFIRRI
Data host institution: GBIF France
% complete: 90%
Status update: Our checklist of macro-invertebrates of Uganda is about 90% complete. The checklist has been generated from all occurrences available occurrences that cover all major lake systems in Uganda. The checklist is under review and will be published by the end of May like all datasets.
DOI:
Expected date of publication: 2022-04-30

Deliverables - Project evaluation phase

A national red list for selected fish species
Description: Conservation status of selected fish species at the national revel. Developed by applying the IUCN redlist criteria to fish species occurrences
% complete: 60%
Status update: Assessments completed for 147 of 284 candidate species. Unassessed species belong to only one genus, Haplochromis
Sources of verification: Link to species distribution maps: https://www.dropbox.com/s/n4gakw3g5dfl6ki/distribution%20maps%20of%20assessed%20fishes.zip?dl=0 Link to distribution nodes: https://www.dropbox.com/s/88kjl6nzyis8rzs/Distribution%20of%20all%20species_including%20haplochromines.xlsx?dl=0

Distribution maps for threatened fish species and macro-invertebrates
Description: Maps of vulnerable, Endangered and Critically Endangered species fish and macro-invertebrates. Integrating occurrences with the conversation status
% complete: 60%
Status update: Each of the fish species assessed is accompanied by a distribution map that shows where the species is extant, possibly extant, presence uncertain, possibly extinct, or extinct in Uganda. This means that by the end of May when the red list assessment is expected to end, the fish distribution maps, including those of threatened species or those of conservation importance, will all be attained. The checklist of macroinvertebrates includes IUCN conservation status of the taxa (see link to the checklist in activities above) that will be used to developed maps for threatened macroinvertebrates.
Sources of verification: See link to fish species distribution maps above.

Maps of species richness and abundance of fish species and macroinvertebrates
Description: Mapping number of species extant in Uganda water bodies and by major lake basins
% complete: 70%
Status update: From the datasets for fish and macro invertebrates available from GBIF and literature, maps of richness have been developed for the two taxa as part of the work of the graduate students.

These are under review by the students' supervisors and proper documentation (not shared).
Sources of verification: The maps are under review in theses of the graduate students by the students' supervisors (not shared).

An index for prioritizing habitats for conservation
Description: A tool for highlighting habitats of priority areas for conservation based on richness of threatened species, rear species and habitat surface area
% complete: 80%
Status update: We have a working version of the index for prioritizing habitats for conservation. The index for now uses global IUCN conservation status of fish species and will be updated when conservation status of fish species at the national level becomes available (by the end of May). We have mapped the priority areas identified by the index. This forms our map of biodiversity hotspots. This map will also be modified to reflect conservation status of fish species at the national level.
Sources of verification: Link to documentation of the index: https://www.dropbox.com/s/gfkvd7g2pg3cy8q/CPI%20report.docx?dl=0

Freshwater biodiversity information available through the Freshwater Biodiversity portal for Uganda
Description: Developed information products will be incorporated into the Freshwater Biodiversity Portal for Uganda
% complete: 30%
Status update: Development of tools to incorporate biodiversity information products into the portal is ongoing. We have shared our fish distribution maps (both shapefiles and pictures) from the national red list with the development team of Nugsoft technologies to use in prototypes to host the national red list. This activity is also on course to end by 31st December 2022.
Sources of verification: N/A

Data user capacity for information use
Description: Data users have capacity to use the information developed through engagements and communication
% complete: 10%
Status update: Since inception, we have engaged stakeholders through relevant events to introduce our activities and products. These include stakeholders relevant to decision making and training. Please see communication and visibility section for more information. We are on track to obtain deliverables on time which we shall use in planned communication channels to engage stakeholders and improve their capacity to use information from the project.
Sources of verification: Please see pictures from the engagements (https://www.dropbox.com/s/gals0hb080bw9i3/Pictures%20from%20stakeholder%20engagment%20events.docx?dl=0)

Map of water quality status and changes
Description: A map showing the status and changes in water quality at multiple sampling sites. Product proposed during the planning phase
% complete: 10%
Status update: The water quality explorer (map of status and changes of water quality) is still at a conceptualization state. This entails decisions on whether the explorer will provide time series data or averages across specified periods.
Sources of verification: N/A

Events

Project inception

Dates: 2021-08-16 - 2021-08-16
Organizing institution: NaFIRRI
Country: Uganda
Number of participants: 20
Comments: Pictures at the inception event are shared
Website or sources of verification:
https://www.dropbox.com/s/xgrw8lnw8x5lx7e/incenception%20pictures.docx?dl=0

Events

Data mobilization workshop

Dates: 2021-08-20 - 2022-08-25
Organizing institution: NaFIRRI

Country: Uganda
Number of participants: 13
Comments:
Website or sources of verification:

Events

Data mobilization workshop

Dates: 2021-11-22 - 2021-11-25
Organizing institution: NaFIRRI
Country: Uganda
Number of participants: 15
Comments:
Website or sources of verification:

Events

Visit of stakeholders from the Ministry of Agriculture, Animal Industry and Fisheries, including the Minister of State for Fisheries

Dates: 2021-10-12 - 2021-11-12
Organizing institution: NaFIRRI
Country: Uganda
Number of participants: 80
Comments: All research staff of NaFIRRI participated. Media was present
Website or sources of verification:

Communications and visibility

Since inception, we have harnessed engagement events for dissemination. We co-organized a visit of stakeholders from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), including the Minister of State for Fisheries, to NaFIRRI on 12th October 2021. We participated in the Jinja fish festival on 15th November 2021, and the World Fisheries Day on 22nd November 2021. At these events, biodiversity information was exhibited or featured in presentations. On 23rd October 2021, we engaged journalists from Water Journalists Africa/InfoNile on how the freshwater biodiversity portal and our data can be used to report on biodiversity. We demonstrated the utility of our work to students from Makerere University. We are engaging the GBIF community by publishing our data. We provided for stakeholder engagement workshops to further engagement. We shall use the workshops to obtain views on the national red list and introduce developed products to stakeholders. For this, we provided for non-expert communication tools including radio talk shows. We shall engage NEMA to mainstream our work into reporting on biodiversity through the national state of environment report in the short term, and Uganda's next report to the CBD in the long run. We are working to incorporate all data and biodiversity information developed into the Freshwater Biodiversity Portal for Uganda to sustain availability on the web. To engage the research community, we envisage two peer reviewed papers.

Monitoring and evaluation

Monitoring and evaluation findings

Progress of the project can be evaluated basing on whether required midterm milestones are met, activities are within timelines, and there are short-term results e.g., published datasets. The project was represented in the data mobilization and data use workshops and has published 4 datasets. Milestones are met, and short-term results are available. The project is on track to deliver all dataset deliverables within time and is likely to deliver early on most of the biodiversity information products including the national red list. Given that the team is also harnessing opportunities for stakeholder engagements, the project is on course to deliver. During inception, partners discussed the proposed information products. Owing to different perceptions towards invasive species, and the fact that most fish species defined as invasive are of immense economic importance, we agreed to eliminate the proposed map of invasive fish species because it would not have practical conservation importance. All our activities are within proposed timelines. We are obtaining this efficiency from data mobilization workshops which motivate our team and working with two graduate students. The students are incorporating data on fish and macro invertebrates in their research to develop information products, thus accelerating our progress. We intend not to slow down so that we obtain ample time to engage stakeholders, a task we think is more challenging. We are grateful for the engagement with the BID regional support contractor in review of datasets. Our national red list assessments involve estimating

global EOO and AOO for each species. Currently, our approach is inefficient. We have contacted the contractor for a possibility of obtaining a more efficient approach from the GBIF community.

Impact of COVID-19 pandemic on project implementation

Two members of our data mobilization team became sick of Covid-19 and many others had close family members who became sick. This halted progress for these individuals for two to four weeks. Despite this, no major changes took place, and none are proposed. All activities to attain deliverables are within planned timelines.

GBIF leads the Biodiversity Information for Development (BID), a programme funded by the European Union. The programme provides supplementary support for activities addressing the needs of regional researchers and policymakers through mobilization and use of biodiversity data.