Increasing capacity for conservation of threatened fish species through data mobilization and training (BID-AF 2017-0206-SMA)

Report on fish biodiversity data user needs assessment and fish biodiversity data holder mapping in Uganda

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Cover photos

Top: Research staff at the National Fisheries Resources Research Institute listen to a presentation during the launch of the NaFIRRI BID project to staff and management of the institute on 20th October 2017. *Photo by Jessy Lugya*.

Left bottom: The coordinator, NaFIRRI BID project, making his presentation during the project launch at NaFIRRI on 20th October 2017. *Photo by Jessy Lugya*

Right bottom: Stakeholders from different institutions in Uganda deliberate on the government agencies' interests in biodiversity and power for influencing decision making on biodiversity on 28th November 2017. This was during a workshop organized by a project working to mainstream biodiversity in the heart of Uganda's government decision making, which acted as a platform for biodiversity data needs assessment. *Photo by Laban Musinguzi*

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Executive summary

Despite presence of huge biodiversity data on primary species occurrence records available through the Global Biodiversity Information Facility (GBIF), more data remains inaccessible while policy formulation in some countries still does not directly benefit from mobilized data. This is because many institutions have not published their data and, in most cases, data are mobilized without a prior understanding of the needs of the users, respectively. With support from the European Union, GBIF, and the National Fisheries Resources Research Institute (NaFIRRI), NaFIRRI intends to mobilize at least 10,000 fish records and create a first—ever—comprehensive dataset of fish species occurrence in Uganda with most up—to—date information. To ensure that mobilized data directly benefits policy makers, data needs and mapping surveys were undertaken to assess the user specific needs for fish biodiversity data as well as identify data holding institutions. Data on species occurrences, especially in highly vulnerable ecosystems that are faced with multiple stressors, as well as data limited ecosystems got high ranking. Policy makers also need data presented in easily comprehensible formats, such distribution maps, checklists, graphs, and factsheets or policy briefs. Five data holding institutions and some individuals willing to share fish biodiversity data with NaFIRRI were identified. The identified data needs will guide development of user—driven data format for mobilizing and presenting fish biodiversity data in Uganda, while the data holding institutions will be engaged to ensure that their data is published.

Introduction

Biodiversity research is data intensive. This barrier has limited biodiversity conservation meta-analyses in data poor ecosystems, especially in developing countries (e.g. Wilson et al. 2016; Musinguzi et al. 2017). This barrier, however, has partly been conquered by millions of primary biodiversity records that data publishers are making publicly available through Global Biodiversity Information Facility (GBIF). Despite the accumulation of biodiversity data, there is a challenge regarding the use of biodiversity data in policy formulation where it has been found that existing data is not optimally used. The limited use of the data in policy has many barriers, but largely emanates from the fact that biodiversity data are mobilized and analyzed without a prior understanding of the needs of the users, especially those in policy and conservation planning. In the end, such scientific data, which is hugely expensive and labour intensive to produce, becomes of limited value.

With support from the European Union, GBIF, and the National Fisheries Resources Research Institute (NaFIRRI), NaFIRRI is implementing a Biodiversity Information for Development (BID) intervention (BID-AF 2017-0206-SMA) on “Increasing capacity for conservation of threatened fish species through data mobilization and training”. In this intervention, NaFIRRI is mobilizing fish biodiversity data and engaging people involved in handling fish biodiversity data as well as policy makers with a goal to increase capacity for conservation of fish biodiversity in Uganda.

This report presents the progress of the NaFIRRI BID intervention on (i) fish biodiversity data user needs and (ii) mapping of fish biodiversity data holders in Uganda. The data user needs assessment has been conducted prior to data mobilization to ensure that mobilized data directly benefits all data users, especially policy makers so that the data could be easily be mainstreamed into government decision making.

Methods

Institutions targeted

Biodiversity data in Uganda is used by government agencies and civil society organizations that either have mandate or are interested in use and conservation of biodiversity. Because not all of the institutions focus on aquatic or fish biodiversity, we selected institutions that are relevant to our project using prior knowledge on these institutions and information from their websites. This approach retrieved the following eleven institutions as targets for our data user assessment and data holder mapping. The institutions are presented with their affiliation

(government or civil society) and role to which they put the data biodiversity data (e.g. policy making, training etc.).

Table 1 Institutions targeted for user needs assessment and data holder mapping, and their corresponding affiliations and roles

Institution	Affiliation	Role (data used for)
Uganda National Council of Science and Technology	Government	
Department of Zoology, Entomology and Fisheries Sciences, College of Natural Sciences, Makerere University	Government	Research and training
National Biodiversity Data Bank in the Department of Environment Management, College of Agricultural and Environmental Sciences, Makerere University	Government	Research, archiving, and training
Directorate of Water Resources Management, Ministry of Water and Environment (DWRM)	Government	Policy making, management
Directorate of Fisheries Resources (DiFR)	Government	Policy making, management
National Environmental Management Authority (NEMA)	Government	Policy making, management
Nature Uganda	Civil society	Research, policy lobbying, public engagement
Uganda Bureau of Statistics	Government	Archiving, policy making
Uganda Wildlife Authority (UWA)	Government	Policy making, management
Wildlife Conservation Society (WCS)	Civil society	Research, Policy lobbying, Public engagement
Uganda National Museum	Government	Research, archiving

Data acquisition

Biodiversity user needs

To acquire data on the biodiversity user needs of the institutions, and information on whether they hold fish biodiversity data or not, a structured questionnaire was developed (Appendix 1). The questionnaire, which was modified from the Content Needs Assessment of GBIF data users (Ariño et al. 2013) included questions to obtain data holding status of the institutions. The questionnaire was divided into four main themes; namely,

1) Instruction of profile,
2) uses of fish biodiversity data,
3) access to fish biodiversity data, and
4) Quality and quantity requirements.

In the first theme, respondents were asked to mention briefly the business of their organizations i.e. policy institution, national agency etc. This was intended to capture sector—specific data needs.

The second theme was designed to understand the purpose for which fish biodiversity data is used by various stakeholders. Respondents were asked to choose from a list (Taxonomy, species diversity and populations, Endangered, migratory and invasive Species, Conservation Planning, Sustainable Use, Natural Resources Management, Agriculture, Fisheries, Forestry and Mining, Nursery and Pet Industry, Health and Public Safety, Border Control and Wildlife Trade, Education and Public Outreach, Ecotourism, Art and History, Recreation, Human Infrastructure Planning, Industrial Use, Environmental Impact Management, etc.) the ways in which they use fish biodiversity data and to mention any example scenario in which fish biodiversity data (occurrence or sample) has been used by the organization.

The third theme was designed to understand how users access fish biodiversity data (i.e. mechanisms employed and the frequency for accessing fish biodiversity data). Respondents were therefore asked how they access fish biodiversity data (i.e. through field works/surveys, hardcopy non-digital form, primary publications such as taxonomic monographs, maps of species observations, the NaFIRRI website (http://firi.go.ug), institutional agreements, payment basis, free and open datasets within and outside of their institution etc.), frequency of access, and data formats in which they often choose to access the fish biodiversity data.

The fourth theme was designed to understand (a) the type/nature of fish biodiversity data that the organization (as a data user) requires and (b) the quality of data that matters to the organization. Questions were tailored to types or nature of Primary Biodiversity Data Required (i.e. Taxonomic Names/Checklists, Occurrence Records (presence/absence), Population density / Dynamics data, Species Interaction Data, Species Information), the type of water environments or ecosystems they use or need more fish biodiversity data (Rivers and streams, Lakes, and Wetlands), the taxonomic resolution of fish biodiversity data they prefer (Family, Genus, Species), specific fish species or species group whose data is preferred by the

organization, the IUCN category or status of conservation the organization prefers more fish biodiversity data, and other aspects of species occurrence data that the organization prefers (i.e. accurate geo-referenced data, Metadata on uncertainty about geographical/georeferenced data, Type specimens in scientific collections, Source of information, Images, Synonyms of species name, Common name of species, Species habitat description, Threats to species etc.).

Administering the questionnaire

UNEP is implementing a project "Connect: Mainstreaming biodiversity into the heart of Government decision making" to "help achieve sustainable development by bringing biodiversity information to the heart of government decision making using actionable biodiversity information". Uganda is one of the project demonstration countries and the NEMA (one the institutions targeted for data mapping and user needs assessment) is the coordinating institution in the country. NEMA has established an expert working group (EWG) that brings together biodiversity experts representing different government agencies, civil society organizations, and indigenous people for the project. The NaFIRRI BID project is fortunate that the representative of NaFIRRI to the EWG, Laban Musinguzi, is part of the NaFIRRI BID intervention in charge of data mobilization and publishing. The project utilized this opportunity to administer the questionnaire to the representatives of the institutions present at the first workshop of the EWG that took place from 17 to 19th October 2017 at Golf View Hotel, Entebbe, Uganda. However, not all institutions selected (Table 1) were present in the workshop while representatives from some institutions felt that they were not the right persons to respond to the questionnaire due to specific focus on aquatic or fish biodiversity. Therefore, more institutions were visited from 9th to 11th January 2018 to complete the data needs assessment.

Other data sources

Another surprising opportunity to obtain data was in the tasks of the EWG. The EWG was tasked to come up with data needs for government agencies that are key decision-making agencies, with corresponding formats for presentation of the data. Access to this information was an opportunity to learn about user needs of many more government agencies that are at the heart of policy decision making, such as the National Planning Authority (NPA). In addition, this process enabled us to obtain user needs by delineating them from biodiversity indicators of the recently completed Uganda National Biodiversity Strategy and Action Plan II 2015-25, NBSAP (NEMA, 2016). This was key because its development was a country wide

consultative process and therefore contains biodiversity user needs of institutions that this BID intervention could not be able to reach.

Biodiversity data holder mapping

For data holder mapping to identify institutions and individuals with fish biodiversity (data holders) in Uganda, the institutions (Table 1), including those that indicated that they had data during the user needs assessment were visited from 22nd to 28th November 2017, first, to ascertain the type, quality, and quantity of fish biodiversity they hold; and second, to discuss the mechanisms for sharing the data. Representatives from these institutions were asked questions related to:

1. Whether the institution actively engages in collecting field data on fish biodiversity;
2. The type of fish biodiversity data they collect or hold (i.e. Taxonomic Names / Checklists, Occurrence Records, population density / dynamics data, Species Interaction Data, Species Information (Descriptive data);
3. the type of environments or ecosystems they collect fish biodiversity data from (i.e. Rivers and streams, Lakes, Wetlands);
4. whether they have preserved fish specimens or photos of fish records; and
5. Whether they wish to collaborate with NaFIRRI and publish fish species occurrence data (by location) with GBIF.

Results

Biodiversity data user needs

Key biodiversity Information needs, together with their importance, data availability, and user expectations are summarized in Table 2. A great number of stake holders were interested in the general state of environment, critical biodiversity sites and species for conservation, and land use in key fish biodiversity hot spots. All respondents emphasized that in order to properly set up priority conservation activities, which are evidence—driven, restore degraded systems, develop mitigation and adaptation actions, ensure efficient resource allocation, and design policies to protect nursery areas, there must be data in easily comprehensible formats on species occurrence and trends, conservation value and cultural value at any scale of fish biodiversity, geographical distribution and taxonomic status, Habitat, biodiversity dynamics, ecological niche, and socio-economic importance, degradation/threat level of aquatic ecosystems, and data on the state of fish biodiversity in critical habitats such as places of major infrastructural developments. Respondents pointed out that they prefer data presented in form of distribution maps, trend graphs, checklists, fact sheets, policy briefs, reports, or infographics.

In addition, several stakeholders, especially those involved in conservation planning, were interested in data from specific ecosystems, which are either data limited, fish biodiversity hotspots, environmental change hotspots, infrastructural development hotspots, invasive species hotspots, or economic hubs for riparian communities. Table 3 shows some of the examples of aquatic ecosystems for which most respondents in conservation planning reported high interest in fish biodiversity data for policy and conservation planning. Wetlands in major urban areas, which are shrinking at a faster rate in the country, were identified as major locations for which fish biodiversity information is need to prioritize conservation actions and achieve balance between conservation and development. Aquatic systems such as Victoria Nile and those in the Albertine region were identified as hotspots for hydropower development and oil and gas exploration and development, respectively, while small ecosystems such as Lake Wamala were mentioned among the environmental change hotspots for which fish biodiversity data are urgently needed to guide planning. Data from aquatic ecosystems within the Victoria and Kyoga basins, which have suffered from the effect of introduced invasive fish species as well as invasive weeds e.g. Kariba weed invasion in Kyoga basin lakes, need to be updated, so as to ascertain threatened and resilient species. In addition, stakeholders were concerned about a number of poorly studied systems for which

biodiversity information is crucial, such as wetlands and rivers, small lakes in Western Uganda, rivers and streams in the mount Rwenzori region.

Data holding institutions

Among the potential data holding institutions visited to ascertain the type, quality, and quantity of fish biodiversity data, the Department of Zoology, Entomology and Fisheries Sciences (Makerere University) indicated that they had data on small crater lakes of western Uganda, whereas the National Biodiversity Data Bank in the Department of Environment Management (Makerere University) has fish occurrence records from small lakes within Lake Victoria basin as well as some aquatic ecosystems in the Albertine region. However, some fish records from Albertine region have already been published with GBIF, and these will be excluded to avoid duplication. Both departments at Makerere University obtain the data from research surveys by faculty and students. The National Biodiversity Data Bank, in addition, act as a data repository, and therefore, gets more data from other research institutions although at a low rate. More data at the two departments were indicated to be in student's theses and dissertations, which will be digitized during data mobilization. Nature Uganda, WCS, and NEMA indicated that they have a variety of biodiversity data, but there are requirements for sorting fish biodiversity information and digitizing from technical reports, which the NaFIRRI-BID mobilization team will gladly do. All these institutions obtain data through research surveys; however, NEMA, as a repository of all consultancy reports, has data in these reports ranging from the 1990's when it was created. Some individual scientists, who are actively engaged in fish biodiversity research were identified, and discussions are still ongoing whether they can publish their data with NaFIRRI. Therefore, the data available from these institutions is sample event occurrence data.

It is important to note that some institutions, such as the Uganda national Museum and the Directorate of Fisheries Resources, which are responsible for fish biodiversity management were surprisingly found to have no fish biodiversity data. This underscores the importance of mobilizing the data and depositing it where these institutions can access it. With the exception of Nature Uganda, all other data holding institutions identified are public institutions. Regarding data sharing agreements, these institutions indicated that they are required by an existing law (http://moj.gov.jm/sites/default/files/laws/The%20Access%20%20to%20Information%20Act.pdf) to freely provide access to data, in the interest and benefit of the general public, hence no need to develop additional agreements. The focal person at Nature Uganda indicated that the organization also produces data for the public benefit and for all other interested users and therefore is willing to share their data with NaFIRRI without an agreement.

Table 2 Summary of fish biodiversity information needs for policy/ decision makers

Biodiversity Information needs	Importance	Data availability	Data holder/provider	How to obtain the information	User expectations (presentation format)
Species occurrence and trends	Indicator of state of environment; critical sites & species for conservation; informing land use planning	Yes	NaFIRRI, Makerere University, NEMA, Nature Uganda, WCS	Data mining from reports and publications, un-digitised field books, excel files	Distribution maps, trend graphs, checklists, fact sheets, policy briefs,
Economic, conservation, cultural value at any scale of fish biodiversity	Setting priority activities (conservation, development)	Yes	NaFIRRI, NEMA, Nature Uganda, WCS UWA, WCS	Data mining from reports and publications	Reports, policy briefs, infographics, fact sheets
Degradation level of aquatic ecosystems	Prioritizing conservation; restoration; inform mitigation and adaptation; resource allocation	Yes, but requires regular update	NFA; MAAIF, DWRD, UWA, NEMA, Development partners e.g. USAID, FAO, World Bank	Data mining from reports and publications	Maps, trend graphs, fact sheets, policy briefs, issue papers
Disappearance of buffer zones or corridors associated with protected areas, lakes, rivers etc.	Protecting nursery areas; planning protected area systems, understand consequences of loss to livelihoods	UWA, DWRM, NEMA	UWA, NEMA	Data mining from reports and publications	Maps, trend graphs, fact sheets, policy briefs, issue papers
Critical habitats including in places of major infrastructural developments	Protection, restoration, reducing exploitation levels	Limited	NaFIRRI, UWA, NFA	Data mining from reports and publications	Maps, trend graphs, fact sheets, policy briefs, issue papers

Table 3 Examples of aquatic ecosystems for which fish biodiversity data is urgently needed for policy and conservation planning

Ecosystem characteristics	**Location(s)**	**Importance of the location**
Aquatic ecosystems threatened by infrastructural developments	Wetlands in major urban areas (e.g. Wakiso, Mukono, Kampala, Gulu, Mbarara, Jinja, Mbale)	The fastest wetland shrinking rates in the country
Aquatic systems of major economic importance	Lake Victoria and Kyoga basins, Albertine region, Edward and George system	The ecosystems are under multiple pressures from over exploitation, pollution, habitat degradation
Aquatic systems infested by invasive species	Victoria and Kyoga basin lakes	Effect of introduced invasive fish species, potential recovery of native taxa after decline of invasive species, effect of *Salvenia molesta* (Kariba weed) invasion in Kyoga basin lakes
Water resources and fisheries (Pollution, blockage of fish migratory routes, siltation, eutrophication)	Victoria Nile, Albertine region, Wamala	hotspot for hydropower development, oil and gas exploration and development, as well as environmental change hot spots
Ecosystems with limited fish biodiversity information	wetlands and rivers, small lakes in Western Uganda, rivers and streams in the mount Rwenzori region	

Conclusions

Data needs and mapping surveys were undertaken to assess the user—specific needs for fish biodiversity data as well as identify data holding institutions. The goal of the data needs survey was to ensure that the mobilized data directly influences policy. Data on species occurrences, especially in highly vulnerable ecosystems that are faced with multiple stressors, as well as data limited ecosystems, got higher ranking. Policy makers also need data presented in easily comprehensible formats, such as distribution maps, checklists, and factsheets or policy briefs. The identified data needs will be used to guide development of user—driven biodiversity data and presented in the indicated formats that are preferred by users. Therefore, during the development of tools to engage policy makers, the fish occurrence data will be synthesized to, for example, indicate fish species occurrence and trends in vulnerable ecosystems, environmental hotspots, areas of high infrastructure development, and areas infested by invasive species.

The data holders mapping exercise identified five institutions and individuals willing to contribute fish biodiversity data. These will vehemently be engaged during data mobilization to obtain data. However, due to budget constraints, the data mapping exercise could not consider all potential data holders, especially universities located in up country places.

Acknowledgment

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Appendix one: **Questionnaire used for biodiversity data user needs assessment and data mapping**

National Fisheries Resources Research Institute (NaFIRRI), P.O. Box, 343, Jinja, Uganda

Data Mapping and Needs Assessment Survey

NaFIRRI is a public research institute mandated to conduct fisheries research in Uganda. With support from the European Union, through the Global Biodiversity Information Facility (GBIF), NaFIRRI is mobilizing fish biodiversity and engaging people involved handling data and policy making to increase capacity for conservation. The GBIF is a partnership of countries and international organizations working to share biodiversity data openly and freely. Uganda is part of the 50 countries that are members of GBIF.

The objective of this survey is to assess the user needs for fish biodiversity data as well as identify data holding institutions to guide efforts to mobilize data and make it publicly accessible. We would like to get information on your organization's specific or preferred needs in line with fish biodiversity data. Your input will provide guidance for NaFIRRI to provide data that meets the needs of data users.

1. USER PROFILE

NOTE: Your information will be kept confidential. This information will help us to contact you in case we need further inputs on the survey through phone interviews.

Details of the person undertaking this survey

Name	
Organization/Institution affiliated with	
P.O. Box	
City	
Phone/Mobile	
Email	

Description of your organization (please tick one or several options)

Academic / Educational institution	
Research Institution	
Policy making institution	
National Agency	
Non-Governmental Organization (NGO)	
Intergovernmental Organization (IGO) OR Multilateral Convention	
Private Company	
Individual Researcher or Naturalist (e.g. citizen scientists)	
Others (please specify)	

Main interest/business of your organization (please tick one or several options)

Conservation	
Policy	
Bio productivity / Bioprospecting (Agriculture, Fisheries, Forestry, etc.)	

Biodiversity	
Biotechnology	
Biosecurity	
Natural Resources Management	
Industrial / Commercial Use of Natural Resources	
Exhibition / Educational / Academic	
Others (please specify)	

2. USES OF FISH BIODIVERSITY DATA

This section of the survey is designed to understand the purpose for which fish biodiversity data is used by various stakeholders. Two categories of data i.e. **occurrence data and sample data are considered**. Occurrence data is defined as the record of where a fish lives (locality). Sample data is information on for example fish abundance, composition, catches, size, etc.

The uses of the data can be wide and varied, and encompass virtually every aspect of human endeavor – food, shelter, health, recreation, art and history, society, science and politics, etc. Furthermore, such data is essential for predicting the sustainable future of our planet, and therefore of all living beings.

Ways in which you use fish biodiversity data (please choose one or several options)

Taxonomy	
Biogeographic studies	
Species diversity and populations	
Life histories and phonologies	
Endangered, migratory and invasive Species	
Impact of Climate Change	
Ecology, Evolution and Genetics	
Environmental regionalization	
Conservation Planning	
Sustainable Use	
Natural Resources Management	
Agriculture, Fisheries, Forestry and Mining	
Nursery and Pet Industry	
Health and Public Safety	
Bioprospecting	
Forensics	
Border Control and Wildlife Trade	
Education and Public Outreach	
Ecotourism	
Art and History	
Society and Politics	
Recreation	
Human Infrastructure Planning	
Industrial Use	
Environmental Impact Management	
Others (please specify)	

Mention any example scenario in which fish biodiversity data (occurrence or sample) has been used by you/your organization.

Example 1	
Example 2	
Example 3	
Example 3	

3. ACCESS TO FISH BIODIVERSITY DATA

In this section, we would like to learn how users access fish biodiversity data (please choose one or several options). The objective is to understand the mechanisms employed and the frequency for accessing fish biodiversity data.

How do you access fish biodiversity data? (please choose one or several options)

Through field works/surveys	
Through hardcopy, literature survey (non-digital form)	
Through primary publications (e.g. taxonomic monographs, maps of species observations):	
Through access to offline digital data sets (CDROM/DVD/Tapes etc.)	
Through the NaFIRRI website (http://firi.go.ug)	
Through other web based data portals (**please specify**)	
Through File Transfer Protocol (FTP) sites (please specify)	
Through institutional agreements	
Through payment basis	
Through free and open datasets within and outside of your institution	
Through reciprocal agreements with other groups/individuals	
Others (please specify)	

Frequency of access

Daily basis	
Once a month	
Once a quarter	
Bi-annual	
Cannot determine (on Need Basis)	
Others (please specify)	

Select the data formats in which you often choose to access the fish biodiversity data.

MySql (dump)	
Excel values	
Tab delimited	
Comma separated values	
XML	
Maps as images	
Keyhole Markup language (Kml)	
Others (Please specify)	

4. QUALITY AND QUANTITY REQUIREMENTS

The intention of this section is to understand: (a) what type/nature of fish biodiversity data that your organization as a data user requires? and (b) how much the quality of data matters?

Types or Nature of Primary Biodiversity Data Required? (please choose one or several options)

Taxonomic Names / Checklists	
Occurrence Records (presence only)	
Occurrence Records (including absence records)	
Population density / Dynamics data	
Species Interaction Data	
Species Information (Descriptive data)	
Others (Please specify)	

For which type of water environments or ecosystems do you use/need more fish biodiversity data? (please choose one or several options)

Rivers and streams	
Lakes	
Wetlands	
Other (please specify)	

At what taxonomic resolution of fish biodiversity data do you prefer? (Please tick preferred resolution)

Family	
Genus	
Species	

Do you have any fish species or species group whose data is preferred by your organization? (Please list the preferred fish species or fish species group)

Fish species or species group 1	
Fish species or species group 2	
Fish species or species group 3	
Fish species or species group 4	

For which IUCN category or status of conservation do you use/need more fish biodiversity data?

Not evaluated	
Data deficient	
Least concern	
Near threatened	
Vulnerable	
Endangered	
Critically endangered	
Extinct in the wild	

For which category of uses of fish do you use/need more fish biodiversity data?

Food	
Animal Feed	
Medicinal	
Aquarium/recreation	
Commercial	
Non-commercial	
Conservation importance	

What are the most important characteristics that you generally want for species occurrence data?

Precise/accurate geo-referenced data	
Metadata on uncertainty about geographical/georeferenced data	
Pre- 1990 data	
Post-1990 data	
Type specimens in scientific collections	
Source of information	
Images	
Synonyms of species name	
Common name of species	
Species habitat description	
Threats to species	
Others please specify	

5. DATA MAPPING

This section is intended to identify fish biodiversity data holding/providing individuals and institutions

Do you/your institution actively engage in collecting field data on fish biodiversity?

Yes	
No	

If Yes, what type of fish biodiversity data do you collect or hold (please choose one or several options)

Taxonomic Names / Checklists	
Occurrence Records (presence only)	
Occurrence Records (including absence records)	
Population density / Dynamics data	
Species Interaction Data	
Species Information (Descriptive data)	
Others (Please specify)	

From which type of environments or ecosystems do collect fish biodiversity data? (please choose one or several options)

Rivers and streams	
Lakes	
Wetlands	
Other (please specify)	

Do you wish to share with NaFIRRI or publish (under your institution name) fish species occurrence data (location) with GBIF? NaFIRRI can collaborate with you to publish data with GBIF

Yes	
No	

Do you have preserved fish specimens, photos of fish records, and observational records of fish (published or unpublished) that you would wish to share with NaFIRRI? NaFIRRI can contact you through appointment

Yes	
No	

Thank you for taking the time to complete this survey - your help is much appreciated.
If you have any other feedback to this survey, NaFIRRI will be glad to hear from you.
NB: If you have any comments not covered by the survey, feel free to enter them here.