WORKSHOP REPORT OF PROJECT BID-AF2017-0039-SMA:
MOBILIZATION OF BIODIVERSITY DATA RELATED TO
PROTECTED AREAS AND THREATENED SPECIES IN
WESTERN CAMEROON

(Biodiversity data capture, Cleaning and Management)

Buea, February 26-March 1, 2018
By Sainge Nsanyi Moses

This project is funded by the European Union
EXECUTIVE SUMMARY

To spread the concept of Biodiversity Informatics worldwide especially in the Congo Basin area, the Biodiversity Informatics Training Curriculum (BITC) since 2013 have collaborated with different institutions in Africa to publicize this idea through a series of in person training. The present workshop brought together 23 participants from three Universities in Cameroon, in five disciples and five trainers from Tropical Plant Exploration Group (TroPEG) Cameroon and Biodiversity Institute, University of Kansas, USA. Trainees and stakeholders had the opportunity to interact with trainers from University of Kansas, USA and the Tropical Plant Exploration Group (TroPEG) Cameroon. Trainees were trained on how to mobilized data, capture, clean and manage the data. Our mission is to disseminate this concept in the Central African sub region once funds are available.
INTRODUCTION

Biodiversity informatics is a new concept that is just closed to 20 years old and extends in many domains of studies: Biological Sciences, Geography, Geology, Mass communication, information technology, agriculture, social sciences, library (archival) studies etc.

TroPEG got involved into this since 2013 following a series of workshops delivered by the Biodiversity Informatics Training Curriculum (BITC) team in Kenya (2013), Ghana (2014), Uganda (2014), Cameroon, Buea (2015), Ethiopia (2015), Cameroon, Yaoundé (2015). Sainge N. Moses (PhD) and Mr. Ngoh Michael Lyonga benefited from this training and so far have trained four Cameroonian but we can say in concrete terms that we have actually train one Cameroonian (Mr. Sebastain Wirsiy). This is because our objective is not to train people with certificates but to impact the talent of Biodiversity informatics to people who will lead the concept to action. TroPEG goal is to disseminate this concept to Cameroonianians that will buy the vision and in the Central Africa sub region.

Biodiversity Informatics Training Curriculum (BITC) is an institution that was created and champion by scientists of the Biodiversity Institute, University of Kansas headed by Distinguished Professor A. Townsend Peterson and Kate Ingenllof. This concept was disseminated in Africa (2013-2016) through in person training: in Kenya, South Africa, Ghana, Uganda, Cameroon, and Ethiopia drawing participants from Cameroon, Ghana, Benin, Togo, Nigeria, Kenya, Burundi, Rwanda, Ethiopia, Senegal, Ivory Coast, Uganda, Tanzania, Malawi, Zimbabwe, Egypt, and South Africa.

So far closed to 39 Cameroonianians have benefited from this concept. Eight during the BITC training in Buea and Korup National Park with funds from JRS
Biodiversity Foundation organized by Prof. A. Townsend Peterson; eight at the National Herbarium of Cameroon with funds from JRS headed by Prof. Asase Alex and 23 participants in February 2018 during the Biodiversity data capture, cleaning and management workshop organized by TroPEG in Buea with funds from the European Union through BID/GBIF headed by Dr. Sainge Moses.

This project aims to (1) Mobilize TroPEG data and (2) provide detailed training in capture and improvement of biodiversity data to potential students and biodiversity data managers.

A major milestone of this project was to train at least fifteen Cameroonians, and captured ~41,000 records of TroPEG data into a database.

This joint effort stepped out from a proposal that TroPEG Cameroon represented by Dr. Sainge N. Moses and Biodiversity Institute, University of Kansas represented by Distinguished Professor A. Townsend Peterson put forward to the Biodiversity Information for Development (BID), which is a component within the Global Biodiversity Information Facility (GBIF). Funds were fully provided by European Union through BID.

To achieve our goal on capacity building, a brief training on Darwin Core was held at TroPEG office, Buea in November 2017. In January 2018 a briefing workshop on Biodiversity Informatics was carried out for Postgraduate students at the Department of Botany and Plant Physiology, University of Buea. In February 2018 a workshop titled “Biodiversity data capture, cleaning and management” was carried out at the University of Buea where 23 students were trained from Universities in Cameroon (University of Buea, Yaoundé 1) in 5 departments such as Botany, Geography, Chemistry, Environmental sciences and Computer Engineering.
Workshop Objectives

The objectives of this workshop were:

i. To provide in person training experience to potential students on the concept of Biodiversity Informatics.

ii. To encourage students to incorporate this practice in their academic work (end of term reports and thesis).

iii. To increase the number of Biodiversity Informatics trainers in the region.

iv. To bring together stakeholders who will buy this concept enabling it to be incorporated in our university curriculum and government policy.

v. To increase the visibility of BITC, TroPEG and the drill of Biodiversity Informatics.

Workshop

The workshop took place between February 26 – March 1, 2018 at the Faculty of Science, University of Buea; Southwest Region Cameroon. This four days’ workshop was composed of a series of presentations and hands on exercises from resource persons.

Monday 26 February 2018

The workshop started with the Head of Department of Botany and Plant Physiology, University of Buea (Prof. Afui Matthias Mih) welcoming all participants, stakeholders, and trainers. It was officially opened by the Vice Dean in charge of Research and Cooperation (Dr. Nde D. Nguti) and Vice Dean in charge of Records and Students Affairs (Prof. Achidi Eric Akum) of the faculty of Science. They both appreciated the effort of TroPEG and KU for organizing this ground breaking training on Biodiversity Informatics, bringing together students from different Universities and departments in Cameroon. They also appreciated the presence of other stakeholders: representative of the Delegate of Environment and Nature Protection (Mme Kati nee Lambi Beatrice Yenui), some board
members of TroPEG (Dr. Ekindi Moundingo and Mr. Lewis Levai), the Dean of Studies of the Pan African Institute for Development West Africa, Buea (Dr Asongwe Godswill Azinuise) and some University of Buea authorities. They plead that TroPEG and KU should continue to disseminate this concept in Cameroon. This was closely followed by a speech from the Program Coordinator/ Research Director of TroPEG (Dr. Sainge N. Moses). In his speech, he gave a short history of Biodiversity Informatics in Africa and how TroPEG got involved into biodiversity Informatics. This was closely followed by a series of power points presentation that gave the general appraisal of the workshop. General discussion was carried out between stakeholders, participants, and trainers. It was closely followed by general photography and cocktail.

The afternoon was occupied by a series of presentation on Biodiversity Informatics, data collection, data type, data processing, and management tools such as Darwin Core, Open Refine, Botanical Research And Herbarium Management Systems etc.

**February 27, 2018**

The second day was floored by inventory techniques in Plants and Birds, and hands-on on Open refine and Botanical Research And Herbarium Management Systems.

**February 28 and March 1, 2018**

These two days were set aside for ecological and species distribution models using QGIS and Maxent and PAST data analysis software.

The workshop was graced by an evaluation, appraisal from participants and award of certificates of participants.
METHODOLOGY
In a proposal to capture TroPEG data on the continental Cameroon Mountains and to train at least 15 Cameroonians on data mobilization, capture, cleaning and management, was presented to the Biodiversity Information for Development (BID) by Dr. Sainge N. Moses of TroPEG Cameroon and Prof. A. Townsend Peterson of University of Kansas, USA. This proposal was accepted with funds from European Union and co-funding from TroPEG and University of Kansas. During implementation, TroPEG collaborated with the Department of Botany and Plant Physiology, University of Buea whose contribution was the conference room. The called for application was announced via TroPEG website (http://tropegcam.org/2018/01/25/training-on-data-mobilization-and-biodiversity-informatics/). In all, 32 students applied from different disciples and Universities in Cameroon. To achieve our goal on capacity building and due to the interest in this course, the number of participants was raise from 15 to 23.

Course Content
DAY 1
- Launching of workshop
- General appraisal of workshop
- Introduction to Biodiversity Data mobilization, processing and management
- General discussion stakeholders, participants and trainers
- Introduction to Biodiversity Informatics I

What is Biodiversity Informatics?
Data collection (Different taxa have different data collection methods)

Data and data types (data from the field, checklist)
- Data processing and management (Data capture, cleaning, formatting)
- Data management tools (Darwin Core, Open Refine, BRAHMS, dnrgps, QGIS, Maxient, EstimateS, PAST etc)
DAY 2

Inventory techniques I
- Sampling methods (Plants)
- Sampling methods (Birds)

Practical on Data capture
- BRAHMS/Excel
- Geo-reference: GPS, QGIS, Google Earth
- Darwin Core, Open Refine

DAY 3 and 4
- Ecological and species distribution modelling (Maxent and QGIS)
- PAST Analysis package

General Plan of workshop
- 8.30 – arrival
- 900- 1100 lectures
- 1100-11.30 Coffee break
- 11.30-1400 lectures
- 1400-1500 Lunch
- 1500-1700 lectures
- 1700---Close for the day.

RESULTS
This workshop has as objective to train young professionals in Cameroon on Biodiversity data capture, cleaning and management using the concept of Biodiversity Informatics. In this regards, it brought together stakeholders from the government, private, University, local resource users and students.
A welcome speech was presented by the Head of Department of Botany and Plant Physiology (Prof. Afui Mathias Mih), followed by the Vice Dean of Records and Student Affairs (Prof. Achidi Eric) and the official opening of the workshop was done by the Vice Dean of Research and Cooperation (Dr. Nde Nguti). This was closely followed by a speech from TroPEG’s Program Coordinator (Dr. Sainge N. Moses). After his speech, he offered a series of presentations which was followed by general discussions between stakeholders, trainers and trainees to highlight the potential of Biodiversity Informatics in Cameroon.

Prof. Afui Matthias Mih welcoming stakeholders, trainers, and participants at the workshop
Prof. Achidi Eric addressing stakeholders, trainers and participants at the workshop

Dr. Nguti Nde addressing stakeholders, and participants during the official opening of the four days’ workshop on Biodiversity data capture, cleaning and management.
Dr. Sainge N. Moses addressing stakeholders and participants

Dr. Sainge presented on the General appraisal of the workshop, the History of Biodiversity Informatics in Africa, and TroPEG activities and achievements as highlighted below.

- Biodiversity Informatics
- Lack of basic Biodiversity data in unknown sites
- Summary of Workshop
- Biodiversity Information Systems
- Open Platform for Publishing Data
- Publishing Papers via Biodiversity Informatics
- How stakeholders will contribute in data mobilization?
- History of current Grant
- TroPEG activities and achievements
In another present, he gave a summary of the workshop:

- Introduction to Biodiversity Informatics
- Biodiversity data mobilization, processing, management and publishing
- Data Collections and Data types in Biodiversity
- Inventory Techniques 1: Sampling methods in Plants
These series of presentations by Dr. Sainge was closely followed by general discussion, group photographs and cocktail.
General discussion between stakeholders, workshop organizers, and participants
Cocktail: Stakeholders, Participants, Trainers, and workshop organizers.

The workshop continued with presentations on data cleaning using open refine and data capture using BRAHMS. These last two presentations crown the first day of the workshop.

Data cleaning with open refine was highlighted as follows:

- File loading and project creation
- Using text facets
- Clustering text facets
- Exporting

Botanical Research And Herbarium Management Systems (BRAHMS) was presented in three phases

- Downloading and installing software
- Setting up the software
- Data collection and useful operations
Sainge N. Moses and Sabastian Wirsiy presenting to trainees
Hands-on on open Refine and BRAHMS was carried out on the second day of the workshop.
The third and fourth day of this workshop were reserved for ecological niche modeling using QGIS and Maxent. This was presented and demonstrated by Benedictus Freeman from the Biodiversity Institute, University of Kansas, USA. He started with a presentation on Biodiversity data collection: Bird survey techniques. This was followed by a series of presentations on Ecological Niche modeling and hands-on.
Evaluation and Award of certificates

At the end of the workshop, participants were evaluated secretly. This was to assess the strength of the workshop, understanding level of participants, and to look for ways to improve on future gaps and logistics.

The workshop was crown by the award of certificates to trainees and trainers by Dr. Sainge N. Moses and Prof. Afui M. Mih. During this exercise, USB drives containing all presentations of the workshop, resource materials, and necessary software’s were handed to all participants and the Head of department of Botany and Plant Physiology, University of Buea. This was closely followed by group photographs.
Annex 1. Names of Participants

<table>
<thead>
<tr>
<th>SN</th>
<th>Name</th>
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<tbody>
<tr>
<td>1</td>
<td>Harriet Arrah Ashu Enoabane</td>
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<td>Meyan-ya Daghela Gwaldys Raissa</td>
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<td>Elangwe George</td>
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<td>13</td>
<td>Tekoh Clovis Manga</td>
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<tr>
<td>14</td>
<td>Mumbang Coleen</td>
</tr>
<tr>
<td>15</td>
<td>Efuetlefac Nkongmik Flora</td>
</tr>
<tr>
<td>16</td>
<td>Enow Doris Ekayen</td>
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<td>Ndip Takou Samuel</td>
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<td>Ngu Winston Asanga</td>
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<td>Shillie Paul</td>
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<td>22</td>
<td>Ebot-Taku Ako</td>
</tr>
<tr>
<td>23</td>
<td>Sharon Njix</td>
</tr>
</tbody>
</table>
1. Adié À Mounbock Aurélien Fleury

I wish to thank TroPEG, the University of Buea, GBIF and all other parties involved in the organization of this training workshop on biodiversity informatics by getting funds from the European Union through the BID. This four-days training workshop met his objective of capacity building of the researchers involved in plant research and/or bioinformatics. At this workshop, I learnt a lot on biodiversity informatics through the detailed lectures of the trainers on the subject. I learn how to capture, clean and model biodiversity data using the following standalone and web applications: BRAHMS, Open Refine, QGIS, Maxent, Past and GBIF website. I intend to use these skills in my current research and equally share them with my peers which did not have the opportunity to attend this workshop. This training workshop met the current educational needs of researchers at the University of Buea. The program was well paced within the allotted time. The content of the workshop's program was properly disseminated by the trainers in an organized manner to the trainee trainers were good and patient communicators. To my opinion, the selection of trainees for this workshop was done on good bases, encouraging the participation of researchers from diverse fields of study. As a phytochemist and chemoinformatician, I interacted
productively throughout the workshop with all participants, but mostly with botanists and computer scientists. I would be interested in attending future advanced workshops on this same subject. I will recommend this workshop to other universities. I also recommend that in future training workshop the number of participants as well as the number of days for the workshop should be increased in order to incapacitate more researchers in the field of biodiversity informatics, which is quite a new field of research in sub-Saharan Africa.

2. Mumbang Coleen

I will begin by thanking the Tropical Plant Exploration Group (TroPEG), GBIF, The University of Kansas, and the University of Buea for this wonderful initiative. In the course of this training, I learnt how to use several software such as BRAHMS, Maxent, QGIS, and Open Refine. I have always been motivated to build my capacity on GIS usage and so learning how to use Maxent and QGIS for Ecological Niche Modeling has enhanced my knowledge. I intend to use the knowledge I gathered during this training for my research project.
I am an MSc. student from the Department of Botany and Plant physiology, University of Buea. I wish to express my gratitude to the Tropical Plant Exploration Group (TroPEG), GBIF, The University of Kansas, and the University of Buea for putting together such a wonderful training on Biodiversity Informatics and Data Mobilization. I think it was a brilliant idea and I do applaud the initiative. I greatly enjoyed and learnt a lot during the training. Before this training, I had already developed quite an interest in biodiversity and thanks to the training, I learnt a lot which I intend to use in my subsequent research. I learnt how to collect data from the field, capture data using BRAHMS Software, cleaning the data using Darwin Core and how to publish data online. Other things that caught my attention included Ecological Niche Modeling, using the QGIS software that taught me how to draw out my own map and input different feature to handle modeling, and the PAST software, which is a great tool for comparing the diversity of different species, and for analyzing communities (animals and plants). I want to say a big thanks to the European Union for sponsoring such a great training in conjunction with TroPEG Cameroon and its partners.
I greatly appreciate the training workshop on Biodiversity Informatics brought forth by to the Tropical Plant Exploration Group (TroPEG), GBIF, The University of Kansas, in collaboration with the University of Buea. I must say the workshop was a success because I got to learn about software like BRAHMS, Open Refine and Darwin Core, which were introduced by the trainers. I was greatly moved by the fact that many of the participants had to forgo their on-going lectures to be part of the workshop. This showed the degree of importance they placed in the workshop. During the training, I got to learn a lot about birds through the concept of Ecological Niche Modelling from Mr. Benedictus Freeman’s presentations, Data Management with PAST from Mr. Ngoh Michael, and Data Capture with BRAHMS from Mr. Yunkavi Sabastian W. For a closing remark, I thank TroPEG and all the collaborators for this event; it was an amazing learning experience.
I am writing this appraisal to express my gratitude to the Tropical Plant Exploration Group (TroPEG) Cameroon and its collaborators; GBIF, The University of Kansas, and the University of Buea, for the four-day training workshop on Biodiversity Informatics under the caption “Data capture, cleaning, and management” that I was opportune to be one of the participants.

In my opinion, the training workshop has really created a great impact in the lives of the participants as far as education and professionalism is concerned. I particularly loved the fact that the concept of Biodiversity Informatics cut across lots of fields in science as this was evident with participants coming from diverse fields of studies.

The most interesting part for me was the aspect relating to technology where I was introduced to lots of software used for proficient and efficient data mobilization, collection, capturing, management, cleaning, publishing, and modeling. The software that caught my attention include BRAHMS for Data capture and management, Data formatting using the Darwin Core platform, Data cleaning using Open Refine software, and the QGIS software for mapping of Occurrence data.

I’d like to say special thank you to all the coordinators and the other participant who were great help during the training workshop. I look forward to being part of more of such workshops in the future in order to gain more experience and skills in the field of Biodiversity Informatics.
I am a B.Sc student in Botany and Plant Physiology, University of Buea. I applaud the efforts made by the Tropical Plant Exploration Group (TroPEG), GBIF, The University of Kansas, and the host, The University of Buea for making this training course possible. Indeed, the workshop was a wonderful experience because as a participant, I got to learn about data capture using BRAHMS, Data Management with PAST, QGIS and Maxent which I was unaware of before the training. I must say the timing was appropriate for the various practical sessions as it played a greater role in my understanding of the lectures and usage of the software introduced. I am happy the workshop met up with my goals and objectives. The knowledge I gathered from the course will help me in running my programs without help and it will shape my thesis in my research project. I wish to thank TroPEG and its collaborators for their commitment during the training course. I was also introduced to Rumpi Tea for my first time. Indeed, it was a wonderful experience.
I just want to express my appreciation for the amazing work done management of the Tropical Plant Exploration Group (TroPEG) under the auspices of the European Union and their collaborators; GBIF, The University of Kansas, and the University of Buea for the workshop, the endless hours that they spent in putting the workshop together, and the professionalism that they portrayed. After following each presentation, I learnt a lot on the following: Data Mobilization, Data Capture, Data Analysis, Data Cleaning, Data Publishing, and interpretation of data using software like BRAHMS, OPEN REFINE, DARWIN CORE, and PAST, just to name these few. The presentation on Ecological Niche Modeling by Benedictus (Ben) Freeman under specie distribution could be mapped using their abiotic and biotic factors within the ecosystem, gave me a wide understanding of our ecosystem. I also learnt how to clean data using MS EXCEL. The most important thing that really caught my attention was Ben’s presentation on Data Management and Capture using the QGIS Software (drawing, mapping, creating buffer, just to name a few). I am so proud to have been part of this workshop because I can now draw my own geologic map of my survey areas.
Attending the workshop was an opportunity for me to learn about the informatics related to plant science, increase my knowledge in data collection and of course learn to draw well-labeled maps. Indeed, I can say that the workshop met my expectations! I enjoyed every single method taught, from data collection to mapping, without neglecting data cleaning. Let me thank the TroPEG organizing team for their efforts and kindness; they did so well. I would like to thank GBIF, The University of Kansas, and the University of Buea as well, for hosting such an event. I am confident that this training will serve as a starting point for innovative research outcomes. Just hoping that such opportunities will spread across the whole country.
I am writing to express my warm happiness and to state that I am grateful and did not make a mistake in applying for this workshop. This training has made me understand that biodiversity composition and dissemination of results is a necessary aspect in data Mobilization. For a well-designed conservation plan to be implemented, Biodiversity data Mobilization, processing and management should follow the Biodiversity Information System. I learned that this can be achieved only by the sharing and/or exchange of data, conversion of analog data to digital format which is easily assessed at any instance using different computer base management tools such as BRAHMS, Darwin Core, Open Refine, QGIS, Maxent etc. I further learned that each of the management tools ease the use of data obtained at a given level of analysis. For example, BRAHMS and Open Refine were shown to ease the cleaning of data obtained directly from the field with messy errors. Also, I got a firsthand training on modeling entailing the use of QGIS to predict the presence/absence of
a species at a particular area and also the future conditions. This workshop made me to understand that data used by these tools can be gotten from various sources such as; herbaria sheets, preserved specimens in alcohol/formol, published scientific papers, thesis, GBIF, VERTNET, Remote Sensing etc.

To conclude, I will like to express my greatest satisfaction by thanking the various institutions who made this great training come to realization. I will ever remain grateful to the Tropical Exploration Group (TroPEG) for standing at the forefront of this great training.
I wish to thank TroPEG and its partners for the initiative of setting up a workshop on Biodiversity Data Mobilization, Processing and Management. The 4-day workshop organized by TroPEG under the theme “Data capture, cleaning and management” which aimed at training participants on how to mobilize, clean and analyse data. In my view the workshop met its objectives as trainers gave in maximum effort to ease comprehension. I learnt about various software in data cleaning and analysis. I was also given tips on how to make use of this information in society. In fact, the workshop gave me knowledge about software like BRAHMS, Open Refine and PAST that will be of great importance to me in data collection and analysis in my field of study. I believe I can now pass on this technological knowledge to others in the field. The workshop left me with an incredible feeling, and also intensified my writing and reporting skills as a journalist because I was able to practice what I had been taught.
I am very happy for this opportunity given me to be able to express my satisfaction on the training seminar organized by TroPEG Cameroon on “DATA MOBILIZATION AND BIODIVERSITY INFORMATICS”.

I was privileged to be a part of this training seminar because through this training, I was impacted with the knowledge and skills needed to be able to develop and create data and converting all these data from analog to digital, on how to obtain data for mobilization, processing (data capturing and cleaning) and on how to refine data before storage in the data base using software like BRAHMS, DARWIN CORE AND OPEN REFINE. I was also enriched with the knowledge in Ecological Niche Modelling where species distributions could be tracked and mapped within a specific ecosystem based on ecological variables, using software like QGIS, Darwin Core and Maxent. I was very excited using MS Excel to arrange and transform data, all thanks to Trainers. In the same light, I appreciate the Tropical Plant Exploration Group (TroPEG), GBIF, The University of Kansas, and the University of Buea, for a great job during the seminar.
I write this appraisal to express my heartfelt gratitude for the opportunity I was given to be part of the 4-day Biodiversity Informatics Workshop organized by TroPEG Cameroon in collaboration with GBIF, The University of Kansas, and the University of Buea under the theme “Data capture, cleaning and management”. The workshop was enriching and brilliant with lots of interesting, enlightening, inspirational, and light bulb moments, all coupled with relevant information on data mobilization.

The topics selected covered a wide range of relevant tools to better manage and mobilize data. The aspects of the workshop that were covered were so interesting as it opened my eyes and mind to the diversity of different life forms on earth and the relationship existing between them. The training workshop also served as platform for me to interact with other areas of studies other than mine which was a pleasant experience.

In my opinion, each and every topic was covered with uttermost details as time could permit from the presenter/trainers who conveyed their knowledge with
plenty of motivation and passion and gave room to questions while clearing the trainees’ doubts and difficulties during the practical sessions. This was especially true for data processing and management since the presenters/trainers took time to ensure clear and logical delivery while keeping into account participant interaction. Through this workshop I was introduced to lots of tools used in Biodiversity Informatics such as Open Refine for Data Cleaning, Darwin Core for Data Capture and Meta Data preparation for publishing and most interesting of all was the BRAHMS software tool for data capture and management. I was unaware of all these tools before the workshop and now with the knowledge I gathered from this workshop I feel comfortable with the afore mentioned tools and look forward to begin capturing data from different sources in order to make it available to the common man in street who is in need of such data by publishing it through web portals like GBIF and VERTNET.

I loved the practicality of the workshop and how directly applicable the concepts are. I thoroughly enjoyed this workshop and I am walking away bursting with ideas and concepts to start data mobilization and why not plant sampling and bird survey. Am looking forward to putting into practice what I learnt, as this workshop has impacted me with skills that I can now deliver on Biodiversity Data Capture. I look forward to participate in more of such workshop in order to gain more skills and aptitude in Data Capture and Mobilization.
I am an M.Sc student in Botany, University of Buea. I wish to thank The Tropical Plant Exploration Group (TroPEG), GBIF, the University of Kansas, the European Union, BID, in collaboration with the University of Buea for this training course. As a young researcher, this workshop has given me an insight on BRAHMS, and Ecological Niche Modeling. I am happy I learnt about Biodiversity Informatics, which is an important tool to researchers, and I can now train myself using different software. I will apply the knowledge learnt to whatever I intend to research on in future. In addition, I thank the trainers for their dedication and help during this course.
Annex 3. Evaluation from Participants

Results BID Workshop February 2018

Core Data

Question 1:

Figure 1: Percentage of female and male and their various degrees pursue
Question 2:

**Figure 2:** Pie chart showing participants that have taken/not taken biodiversity informatics course or module.
Question 3:

Figure 3: Participants with practical experience on field course of biological science

Question 4:

Figure 4: Participants response on course relevance to their different careers
DAY ONE: Opening Ceremony and Bioinformatics Introductory Session

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

Table 1: Respondent perception pertaining to activities of day one of the workshop

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<th>Question Number</th>
<th>Items</th>
<th>Ave. score on 5</th>
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<tr>
<td>1</td>
<td>Selection process &amp; procedure</td>
<td>4.48</td>
<td>Agree</td>
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<tr>
<td>2</td>
<td>Communication parameters</td>
<td>4.23</td>
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</tr>
<tr>
<td>3</td>
<td>Publicity outlet for the workshop</td>
<td>3.48</td>
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<td>Difficult understanding the purpose of workshop</td>
<td>2.67</td>
<td>Disagree</td>
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<td>Criteria for participation was fair</td>
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<td>Venue was ok</td>
<td>4.38</td>
<td>Agree</td>
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<tr>
<td>7</td>
<td>Necessary including administration</td>
<td>4.33</td>
<td>Agree</td>
</tr>
<tr>
<td>8</td>
<td>Time allocation for workshop opening was sufficient</td>
<td>4.14</td>
<td>Agree</td>
</tr>
<tr>
<td>9</td>
<td>Topics selected were relevant for the workshop</td>
<td>4.33</td>
<td>Agree</td>
</tr>
<tr>
<td>10</td>
<td>Trainers were great in style and eloquence</td>
<td>4.19</td>
<td>Agree</td>
</tr>
<tr>
<td>11</td>
<td>Trainers were great in answering questions</td>
<td>4.10</td>
<td>Agree</td>
</tr>
<tr>
<td>12</td>
<td>There was total respect of personality through this day</td>
<td>4.43</td>
<td>Agree</td>
</tr>
<tr>
<td>13</td>
<td>Overall expectation for this day spent in workshop was met.</td>
<td>4.24</td>
<td>Agree</td>
</tr>
</tbody>
</table>
DAY TWO: Introduction to Biodiversity Informatics II

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

Table 2: Respondent perception pertaining to activities of day two of the workshop

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Items</th>
<th>Ave. score on 5</th>
<th>Overall perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topic selected this day</td>
<td>4.19</td>
<td>Agree</td>
</tr>
<tr>
<td>2</td>
<td>Topic delivery in great style and easy to understand</td>
<td>4.09</td>
<td>Agree</td>
</tr>
<tr>
<td>3</td>
<td>Software introduced this was relevant and met expectations</td>
<td>4.48</td>
<td>Agree</td>
</tr>
<tr>
<td>4</td>
<td>Hands-on sessions were very exciting and easy to understand</td>
<td>4.19</td>
<td>Agree</td>
</tr>
<tr>
<td>5</td>
<td>Trainers were very helpful and aided in the understanding of software</td>
<td>4.48</td>
<td>Agree</td>
</tr>
<tr>
<td>6</td>
<td>Time interval for each session was sufficient</td>
<td>3.52</td>
<td>Neutral</td>
</tr>
<tr>
<td>7</td>
<td>Trainers were great in time management and classroom situations</td>
<td>3.86</td>
<td>Neutral</td>
</tr>
</tbody>
</table>
Question 8

Figure 5: Recommended software to emphasize for future workshops

Figure 6:
Question 10

Figure 7: Suggested recommendation for improvement

Question 11

Most boring aspects

- Start time was not respected in the morning
- None of the aspects
- Time management during training
- More to learn short period made it boring
- The training on BRAHMS application
- Missing session made catchup very challenging
- Installing the software
<table>
<thead>
<tr>
<th>Reasons</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will your recommend these selected topics in the future?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is vital for broader understanding of the software</td>
<td>7</td>
<td>33.3%</td>
</tr>
<tr>
<td>Bioinformatics training is highly needed for every studies</td>
<td>5</td>
<td>23.8%</td>
</tr>
<tr>
<td>It incorporate all fields</td>
<td>1</td>
<td>4.8%</td>
</tr>
<tr>
<td>It is a necessary tool for biodiversity studies</td>
<td>6</td>
<td>28.6%</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>9.5%</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>No response</td>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
DAY THREE: Data Publishing on GBIF Network and Modelling with Maxent/QGIS

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

Table 3: Respondent perception pertaining to activities of day three of the workshop

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Items</th>
<th>Ave. score on 5</th>
<th>Overall perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topics selected for this day were very exciting and met expectations</td>
<td>4.50</td>
<td>Agree</td>
</tr>
<tr>
<td>2</td>
<td>Topics were delivered in great style and easy to understand.</td>
<td>4.20</td>
<td>Agree</td>
</tr>
<tr>
<td>3</td>
<td>Software introduced on this day were relevant and met expectations</td>
<td>4.20</td>
<td>Agree</td>
</tr>
<tr>
<td>4</td>
<td>Hand-on sessions with different software were most exciting and easy to understand.</td>
<td>3.95</td>
<td>Neutral</td>
</tr>
<tr>
<td>5</td>
<td>Trainers were very helpful and aided understanding of software packages</td>
<td>4.30</td>
<td>Agree</td>
</tr>
<tr>
<td>6</td>
<td>Time intervals allocated for each working session with selected software were sufficient.</td>
<td>3.80</td>
<td>Neutral</td>
</tr>
<tr>
<td>7</td>
<td>Trainers were great in managing time and classroom conditions</td>
<td>3.95</td>
<td>Neutral</td>
</tr>
</tbody>
</table>
DAY FOUR: Continuation of Modelling with Maxent/QGIS

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

Table 4: Respondent perception pertaining to activities of day four of the workshop

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Items</th>
<th>Ave. score on 5</th>
<th>Overall perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topics selected for this day were very exciting and met expectations</td>
<td>4.29</td>
<td>Agree</td>
</tr>
<tr>
<td>2</td>
<td>Topics were delivered in great style and easy to understand.</td>
<td>3.91</td>
<td>Neutral</td>
</tr>
<tr>
<td>3</td>
<td>Software introduced on this day were relevant and met expectations</td>
<td>4.15</td>
<td>Agree</td>
</tr>
<tr>
<td>4</td>
<td>Hand-on sessions with different software were most exciting and easy to understand.</td>
<td>4.14</td>
<td>Agree</td>
</tr>
<tr>
<td>5</td>
<td>Trainers were very helpful and aided understanding of software packages</td>
<td>4.19</td>
<td>Agree</td>
</tr>
<tr>
<td>6</td>
<td>Time intervals allocated for each working session with selected software were sufficient.</td>
<td>3.86</td>
<td>Neutral</td>
</tr>
<tr>
<td>7</td>
<td>Trainers were great in managing time and classroom conditions</td>
<td>4.19</td>
<td>Agree</td>
</tr>
</tbody>
</table>
DAY FIVE: General Appraisal of workshop

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

**Table 5:** Respondent perception pertaining to activities of day four of the workshop

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Items</th>
<th>Ave. score on 5</th>
<th>Overall perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food served during the workshop was great.</td>
<td>4.62</td>
<td>Agree</td>
</tr>
<tr>
<td>2</td>
<td>Time intervals between activities were ok.</td>
<td>3.91</td>
<td>Neutral</td>
</tr>
<tr>
<td>3</td>
<td>Catering services were great</td>
<td>4.05</td>
<td>Agree</td>
</tr>
<tr>
<td>4</td>
<td>The trainers had the capacity and were able to deliver messages in clear and concise manner.</td>
<td>4.33</td>
<td>Agree</td>
</tr>
<tr>
<td>5</td>
<td>Trainee was able to gain sufficient capacities during training within the time allocated for this workshop.</td>
<td>3.91</td>
<td>Neutral</td>
</tr>
<tr>
<td>6</td>
<td>The time allocated for this workshop was sufficient.</td>
<td>3.24</td>
<td>Neutral</td>
</tr>
<tr>
<td>7</td>
<td>The impact of this workshop is that student will now consider bioinformatics as a possible career option in the future.</td>
<td>4.48</td>
<td>Agree</td>
</tr>
<tr>
<td></td>
<td>The impact of this workshop is that participant will disseminate knowledge for developmental in their different area of influence.</td>
<td>4.67</td>
<td>Agree</td>
</tr>
<tr>
<td></td>
<td>The numbers of participants for this workshop were just sufficient.</td>
<td>3.95</td>
<td>Neutral</td>
</tr>
</tbody>
</table>
Annex 4. Secret Survey Questionnaire

**Biodiversity Information for Development Workshop Survey Questionnaire**

Please, we will like you take some few minutes of your valuable time to answer these questions. Your response is vital as it will help the organisers of this workshop improve in the future.

**Core Data**

Female □ Male □

What is the title of your degree? ______________________

Have you been in a similar course/module before? Yes □ No □

Have you taken field course or practical work on botany, tropical ecology or biodiversity conservation before? Yes □ No □

After taking this course can you give us the relevance and the career you will like to follow?

____________________________________________________________________________________
______________________________________________________________________________

**DAY ONE: Opening Ceremony and Bioinformatics Introductory Session**

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent *strongly disagree* and 5 represent *strongly agree* on the scale.

1) The selection process and procedure for this training workshop was objective and fair.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

2) Communication parameters used during preparation for workshop was ok
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

3) The publicity outlet used for this workshop was sufficient
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

4) It was difficult understanding the purpose of the workshop from the publicity theme
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

5) The requirements/criteria to participate in this training workshop was fair
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

6) The venue selected for this training workshop was ok
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

7) It was necessary including administrative procedure and protocol services in the opening of this workshop.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree
8) The time allocated for the opening of the workshop was sufficient and logical.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

9) The topics selected for day one was relevant for the workshop.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

10) The trainers were great in style and eloquence.
    □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

11) The trainers were great in answering questions from participants.
    □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

12) There was total respect for opinion, level and personality throughout this day on both parties (trainer and participants).
    □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

13) The overall expectations for this day spent in the workshop was met
    □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

14) What particular aspect(s) of this day makes you regret your participation in the workshop?
    ______________________________________________________________________

15) What particular aspect(s) of this day interest most?
    ______________________________________________________________________

DAY TWO: Introduction to Biodiversity Informatics II

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent **strongly disagree** and 5 represent **strongly agree** on the scale.

1) Topics selected for this day were very exciting and met expectations.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

2) Topics were delivered in great style and easy to understand.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

3) Software introduced in this day were relevant and met expectations
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

4) Hands-on sessions with different software were most exciting and easy to understand.
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

5) Trainers were very helpful and aided understanding of software packages
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

6) Time intervals allocated for each working session with selected software were sufficient
   □ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

7) Trainers were great in managing time and classroom conditions
8) Which software would you recommend to emphasize if another workshops were to be organised?
________________________________________________________________

9) Referring to your response in the question (8) above, how much time would you recommend for the training of this software? ____________________________________________

10) How do you think we can improve on the training of the selected software? ________________
___________________________________________________________________________

11) What particular aspect(s) of this day bore the most? ________________________________
___________________________________________________________________________

12) What particular aspect(s) of this day excite you the most? __________________________
___________________________________________________________________________

13) Will you recommend training on these selected topics and software in the future? Yes ☐; No ☐

14) If yes, why? ___________________________________________________________________

15) If no, why not? __________________________________________________________________

16) What aspects of the training would you preferred but were neglected this day?
___________________________________________________________________________

DAY THREE: Data Publishing on GBIF Network and Modelling with Maxent/QGIS

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

1) Topics selected for this day were very exciting and met expectations.
   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

2) Topics were delivered in great style and easy to understand.
   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

3) Software introduced in this day were relevant and met expectations
   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

4) Hand-on sessions with different software were most exciting and easy to understand.
   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

5) Trainers were very helpful and aided understanding of software packages
   ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree
6) Time intervals allocated for each working session with selected software were sufficient

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree

7) Trainers were great in managing time and classroom conditions

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree

8) Which software would you recommend to emphasize if another workshops were to be organised?

_______________________________________________

9) Referring to your response in the question (8) above, how much time would you recommend for the training of this software?

_______________________________________________

10) How do you think we can improve on the training of the selected software?

_______________________________________________

11) What particular aspect(s) of this day bore the most?

_______________________________________________

12) What particular aspect(s) of this day excite you the most?

_______________________________________________

13) Will you recommend training on these selected topics and software in the future? Yes ☐; No ☐

14) If yes, why?

_______________________________________________

15) If no, why not?

_______________________________________________

16) What aspects of the training would you preferred but were neglected this day?

_______________________________________________

DAY FOUR: Continuation of Modelling with Maxent/QGIS

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

1) Topics selected for this day were very exciting and met expectations.

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree

2) Topics were delivered in great style and easy to understand.

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree

3) Software introduced in this day were relevant and met expectations

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree

4) Hand-on sessions with different software were most exciting and easy to understand.

☐ Strongly disagree   ☐ Disagree   ☐ Neutral   ☐ Agree   ☐ Strongly Agree
5) Trainers were very helpful and aided understanding of software packages
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree

6) Time intervals allocated for each working session with selected software were sufficient
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree

7) Trainers were great in managing time and classroom conditions
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree

8) Which software would you recommend to emphasize if another workshops were to be organised?

9) Referring to your response in the question (8) above, how much time would you recommend for the training of this software?

10) How do you think we can improve on the training of the selected software?

11) What particular aspect(s) of this day bore the most?

12) What particular aspect(s) of this day excite you the most?

13) Will you recommend training on these selected topics and software in the future? Yes ☐; No ☐

14) If yes, why?

15) If no, why not?

16) What aspects of the training would you preferred but were neglected this day?

---

**DAY FIVE: General Appraisal of workshop**

Provide logical and unbiased response to the following questions by selecting from the scale 1 to 5; 1 represent strongly disagree and 5 represent strongly agree on the scale.

1) Food served during the workshop was great.
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree

2) Time intervals between activities were ok.
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree

3) Catering services were great
- Strongly disagree  - Disagree  - Neutral  - Agree  - Strongly Agree
4) The trainers in this workshop had the capacity and were able to deliver messages in clear and concise manner.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

5) Trainee was able to gain sufficient capacities during training within the time allocated for this workshop.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

6) The time allocated for this workshop was sufficient.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

7) The impact of this workshop is that student will now consider Bioinformatics as a possible career option in the future.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

8) The impact of this workshop is that participant will disseminate knowledge for development in their different area of influence.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

9) The number of participants for this workshop was just sufficient.
□ Strongly disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

THANK FOR YOUR PRECIOUS TIME
Annex 5. Some Presentations Preview

All presentations for this workshop can be found by accessing the link below:

http://tropegcam.org/featured-presentations/