

## The Seventh African Higher Education Week and RUFORUM Triennial Conference 2021

**Building Capacity in Biodiversity Surveys and Data Analysis using R for Graduate Students and Early  
Career Researchers in the RUFORUM Network**

*Sentinel Pre-conference Side Event Concept Note*

**Dates: 22<sup>nd</sup> -26<sup>th</sup> November 2021**

**Venue: Zoom ([Register here](#))**

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### **Background:**

The Regional Forum for Capacity Building in Agriculture (RUFORUM) is a partner in the Social and Environmental Trade-offs in African Agriculture (Sentinel) Project<sup>1</sup>, an interdisciplinary research project seeking to address the challenge of achieving ‘zero hunger’ in sub-Saharan Africa, while at the same time reducing inequalities and conserving ecosystems. The project aims to enhance the capacity of UK and African researchers to co-develop interdisciplinary research on the impacts, risks and trade-offs within and between social, economic and environmental dimensions of different agricultural development pathways. A core component of Sentinel is to enhance the capacity of UK and African researchers and their organisations to co-develop excellent and relevant interdisciplinary research on social and environmental trade-offs in African agriculture.

The activities aimed at strengthening capacity under the Sentinel project include among others supporting a programme of collaborative research and learning, interactive training and mentoring of junior staff; engagement with senior managers in the UK and in Africa to identify and address capacity constraints. Capacity building is embedded throughout the programme as an integral part of the research agenda. Beyond the four focal countries (UK, Zambia, Ethiopia and Ghana), Sentinel partnership with RUFORUM contributes to strengthening capacity of its 129 member universities in 38 African countries to conduct relevant research at the agriculture/environment nexus and strengthen teaching. In light of the COVID-19 Pandemic and increasing demand for short skills training courses among its stakeholders, RUFORUM has been providing online skills enhancement trainings to a broad range of stakeholders such as postgraduate students, university academics and other non-university audiences beyond its target scholarship beneficiaries. These trainings are informed by capacity needs

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<sup>1</sup> [www.sentinel-gcrf.org](http://www.sentinel-gcrf.org)



assessments conducted regularly by RUFORUM to ascertain skills gaps and evolving needs of its scholarship grantees. Findings from a recent survey conducted among doctoral fellows supported by Sentinel at RUFORUM shows that students have skills capacity gaps in biodiversity surveys and analysis that are important for accomplishing their doctoral research.

Biodiversity surveys are critical in protecting and managing biodiversity through increasing our understanding of what species exist by documenting these species and their environments (Vlach, 2020). Although global biodiversity has been reported to be on the decrease, we do not yet have enough data to fully understand how different ecosystems around the world are being affected. Expertise in biodiversity surveys is also limited across various disciplines and regions especially in Africa, and with new advanced data analysis packages such as “BiodiversityR”, training more professionals and researchers to conduct biodiversity surveys and analysis is urgently required. This will strengthen the generation of standard data for cross-disciplinary syntheses and for environmental decision making by estimating biodiversity trends; comparing sites or the consequences of alternative actions of biodiversity management. It is against this background that, RUFORUM has organised a skills enhancement training on biodiversity surveys and analysis using R for graduate students and early career researchers in the RUFORUM network as a pre-conference side event of the 7<sup>th</sup> African Higher Education Week and RUFORUM Triennial conference in Benin, 2021.

### **Rational and objectives of the pre-conference side-event:**

The main aim of the Sentinel pre-conference side event is to strengthen capacity of university academics and doctoral fellows to conduct biodiversity surveys and data analysis using R and to strengthen networking among early career researchers and doctoral fellows in the RUFORUM Network. Further, this skills training contributes to increased understanding of issues around biodiversity in the three (3) Sentinel focal African countries of Ghana, Zambia and Ethiopia where Sentinel doctoral students are conducting their research. The training will provide important steps for conducting biodiversity data analysis using R statistical software building on the RUFORUM Statistical Data Management (SDM) training using R delivered on 16<sup>th</sup> -21<sup>st</sup> August 2021.

Specifically, the training has been organized to:

1. To familiarize doctoral fellows and university academics with Biodiversity survey methodologies and data analysis using R; and,
2. To foster networking and knowledge sharing among doctoral fellows and early careers in the field of biodiversity research.



### Approach:

The Sentinel skills training on biodiversity surveys and data analysis using R will be held on 22<sup>nd</sup> -26<sup>th</sup> November 2021 as a virtual ([Zoom](#)) pre-conference side event for 7<sup>th</sup> African Higher Education Week and Triennial Conference to be held in December, 2021 in Benin. The training will be delivered in an interactive manner using online presentations, group discussions, Q&A sessions, and individual assignments. Two experts in biodiversity surveys: **Prof. Dr. Ir. Romain Lucas GLELE KAKAI** and **Dr. Ir. Kolawolé V. SALAKO** from the University of Abomey- Calavi Benin will facilitate the training. Expected participants include doctoral students, academic researchers from the RUFORUM Network, among others.

### Contents:

#### 1. Introductory notes

- 1.1. *Biodiversity : definitions and key concepts*
- 1.2. *Biodiversity: patterns, drivers, and importance*
- 1.3. *Biodiversity crisis: patterns and drivers*

#### 2. Prepare your data for diversity analysis

- 2.1. *Key principles of community data preparation*
- 2.2. *Examples of community data*

#### 3. Metrics of diversity and computation in R

- 3.1. *Alpha diversity indices: concepts, interpretation, and application in R*
- 3.2. *Interpolation and extrapolation of species diversity: concepts, interpretation, and application in R*
- 3.3. *Beta diversity indices: concepts, interpretation, and application in R*

#### 4. Other manipulations of community data

- 4.1. *Calculating distance matrices,*
- 4.2. *Transformations of the species data,*
- 4.3. *Analysis of similarity*

#### 5. Multivariate analysis of communities' data in R

- 5.1. *Introductory notes*
- 5.2. *Unconstrained ordination (PCA, and NMDS): principles and applications in R*
- 5.3. *Constrained ordination (RDA, and CCA): principles and applications in R*

#### 6. Final remarks

### Expected outcomes:

- Participants become familiar with biodiversity assessment methodologies;
- Participants gain knowledge in biodiversity data analysis using R; and,
- Increased collaboration among graduate students, university academics and Sentinel researchers in the theme of biodiversity research.

### Duration and hours

- **The sessions will start everyday at 09:00 AM and close at 01:00 PM (GMT+1) i.e., 11:00 AM to 03:00 PM (East Africa Time) from Monday to Saturday.**

### Prerequisite for participants

- Participants are expected to have basic knowledge of R software, especially preparing data, and importing data in R.

### What to do before entering the first sessions

- Install R and R Studio on your personal laptop
- Install the package BiodiversityR, vegan, and ggplot2





## Training Agenda:

Time (Benin time)	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
09h00 to 11h00	<ul style="list-style-type: none"> <li>Opening Ceremony</li> <li>Objectives &amp; overview of the training</li> <li>Introductory notes</li> <li>Q &amp;A</li> </ul>	<ul style="list-style-type: none"> <li>Metrics of diversity and computation in R</li> <li>Q &amp;A</li> </ul>	<ul style="list-style-type: none"> <li>Multivariate analysis of communities' data in R: <i>Introductory notes</i></li> </ul>	<ul style="list-style-type: none"> <li>Unconstrained ordination (PCA): <i>principles and applications in R</i></li> </ul>	<ul style="list-style-type: none"> <li>Unconstrained ordination (NMDS): <i>principles and applications in R</i></li> </ul>	<ul style="list-style-type: none"> <li>Constrained ordination (RDA and CCA): <i>principles and applications in R</i></li> </ul>
<i>11h00 – 11h20 (BREAK + BREAKOUT Room for Network opportunities)</i>						
11h20 to 13h00	<ul style="list-style-type: none"> <li>Prepare your data for diversity analysis</li> <li>Metrics of diversity and computation in R</li> <li>Q &amp;A</li> </ul>	<ul style="list-style-type: none"> <li>Metrics of diversity and computation in R</li> <li>Other manipulations of community data</li> <li>Q &amp;A</li> </ul>	<ul style="list-style-type: none"> <li>Unconstrained ordination (PCA): <i>principles and applications in R</i></li> </ul>	<ul style="list-style-type: none"> <li>Unconstrained ordination (NMDS): <i>principles and applications in R</i></li> </ul>	<ul style="list-style-type: none"> <li>Constrained ordination (RDA and CCA): <i>principles and applications in R</i></li> </ul>	<ul style="list-style-type: none"> <li>Constrained ordination (RDA and CCA): <i>principles and applications in R</i></li> <li>Q&amp;A + closing remarks</li> </ul>

CO-ORGANISERS:

