



## **Center of Excellence in Biodiversity and Natural Resources Management, University of Rwanda**

### **Insect Biology, Taxonomy and Field Skills Training**

**6-9 November 2017**



## Executive Summary

Insects are the most common animal on the planet, with more than 1.5 million species identified so far. They are also understudied and underappreciated. They provide ecosystem services to humans including pollination, biological control of pests, soil fertility maintenance and decomposition. They are also sources of food for a wide range of organisms including humans and some carnivorous plants. It is in this regard that the Center of Excellence in Biodiversity and Natural Resources Management (CoEB) at the University of Rwanda, with financial support provided by the United Nations Educational, Scientific and Cultural Organization UNESCO, hosted a four-day training workshop on Insect Biology, Taxonomy, Field Sampling Techniques and Preservation held from 6-9 November 2017.

The goal of the workshop was to increase knowledge of and interest in terrestrial insects and their role in ecosystem functioning, and to encourage and build capacity for research on this understudied group of animals. Participants came from the different Nodes of the CoEB, as well as CoEB Research Associates, and affiliated researchers. A total of 16 individuals from nine institutions from around Rwanda participated in the workshop. The trainer, Venuste Nsabimana, is a University of Rwanda academic staff lecturing in College of Education and College of Science and Technology, and he is a PhD candidate carrying out his research on terrestrial insects in Rwanda in a dual doctoral program between University of Rwanda and University of Liège, Belgium.

The first day of the workshop consisted of classroom lectures about the general biology and ecology of insects and an overview of sampling methods for collecting terrestrial insects in the field. On the second day, we visited Nyungwe National Park, a tropical montane forest to practice sampling techniques used in tropical forest. The third day consisted of laboratory work where samples taken from the field at Nyungwe National Park were analyzed using microscopes located in the University of Rwanda, Huye campus laboratory in Biology Department. On the fourth and last day of the workshop, the group visited Akagera National Park in the Eastern Province of Rwanda. At Akagera National Park, field techniques for sampling terrestrial insects were demonstrated using the same three methods as practiced at Nyungwe National Park. Akagera NP afforded an opportunity to sample in savanna woodland habitat. The training was concluded in the afternoon of Thursday, 9 November 2017.

Outcomes of the workshop include knowledge and skills building in terrestrial insect sampling and taxonomy. The participants self-organized to stay connected around their mutual interests in terrestrial insects, and have created a Whatsapp group to share information related to terrestrial insects and network. One participant requested assistance to obtain alcohol and insect pinning material to use in his undergraduate course in Entomology at University of Rwanda. Overall, the workshop was a success in increasing the interest and knowledge in terrestrial insects, and creating a network of individuals interested in terrestrial insect research and conservation. Other workshops that participants requested include Insects and ecosystem functioning, Insect conservation, Insects and plant physiology, Insect voucher handling, Aerial Insects, Life cycles of insects, Insect larvae, and Insect taxonomy in greater depth. Ultimately, we would like to see an increase in terrestrial insect research in Rwanda.

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## Introduction

The goal of the Center of Excellence in Biodiversity and Natural Resources Management (CoEB) is **“to encourage, enable and support stakeholders to generate and apply knowledge on Biodiversity and Natural Resources for sustainable development.”** A specific objective of the CoEB is to enable stakeholders to generate knowledge through research and to enhance education in biodiversity and natural resource management. As a contribution to this objective, the CoEB organized a four-day workshop on terrestrial insect biology, field sampling techniques, identification and preservation.



Workshop participants hiking to sampling site in Nyungwe National Park. Photo by CoEB.

The focus of this research capacity training was terrestrial insects, chosen because they are the most common animal on the planet, including more than 1.5 million species identified to date. Insects provide ecosystem services to humans including pollination, biological control of pests, soil fertility maintenance, decomposition, and as a source of food for many other animals (and some carnivorous plants) including humans. They can also be indicator species, or vectors of disease. However, despite their abundance, diversity and importance, they are also understudied and underappreciated. New species in the Insect class have been discovered recently in Rwanda, and there are likely more to be discovered. Taxonomy is considered a priority training area in the environmental sciences with field identification and surveying methods critical to generating reliable environmental data. Information about the ecology, biology and taxonomy of insects is needed to monitor and understand insects, especially given they can serve as indicators of global environmental change.

## Workshop Activities

The workshop was conducted over four days from 6-9 November 2017. The first day consisted of classroom lectures about the general biology and ecology of insects, and an overview of methods for collecting terrestrial insects in the field. On the second day, the workshop participants traveled to Nyungwe National Park. Workshop participants collected samples both inside the park and outside the park to gain experience handling traps and samples in the field. The third day consisted of laboratory work using the laboratory at University of Rwanda Huye campus (Biotechnology Complex) where students learned how to take their insect samples (taken on the second day) and analyze using microscopes. The fourth day consisted



of visiting the Akagera National Park. At Akagera National Park, participants sampled insects using the same three methods used at Nyungwe National Park. The training concluded on the fourth day in the afternoon.



Photo: Mr. Deogratias Tuyisingize (workshop participant) preserving insects captured in the pitfall trap. Photo by CoEB

### ***Lectures on Insect Biology, Field-sampling Techniques and Preservation Methods***

General knowledge about insects including biology, characteristics, insect handling methods and different taxa which are used as indicator species were presented.



Photos: Mr. Venuste NSENGIMANA delivering a lecture on the general biology of insects. Photo by CoEB

### ***Field Visit to Nyungwe National Park***

On the second day of the workshop, we visited Nyungwe National Park to sample insects. The first sampling site was near the village of Kitabi, outside of NNP. The second sampling site was within the forest in Nyungwe National Park. At each sampling site, three sampling techniques were used. These methods included pitfall trapping, leaf litter collection for Berlese funnel insect extraction method, and the third method demonstrated was hand collection of insects. Every workshop participant collected insects at each of the sampling sites so that each would become familiar with all of the sampling techniques.



Photo: Trainees receiving instructions for collecting insects at Kitabi. *Photo by CoEB*

### ***Laboratory Work at the University of Rwanda Complex Laboratory***

On Wednesday, 8 November 2017 (the 3<sup>rd</sup> day of the training), samples taken within Nyungwe National Park and at Kitabi were identified and mounted in the laboratory. Very small insects were examined through binocular microscopes. Understory leaves collected in plastic bags were put into the Berlese funnel in order to extract insects. Lastly, each insect specimen was mounted on a polystyrene sheet using pins.

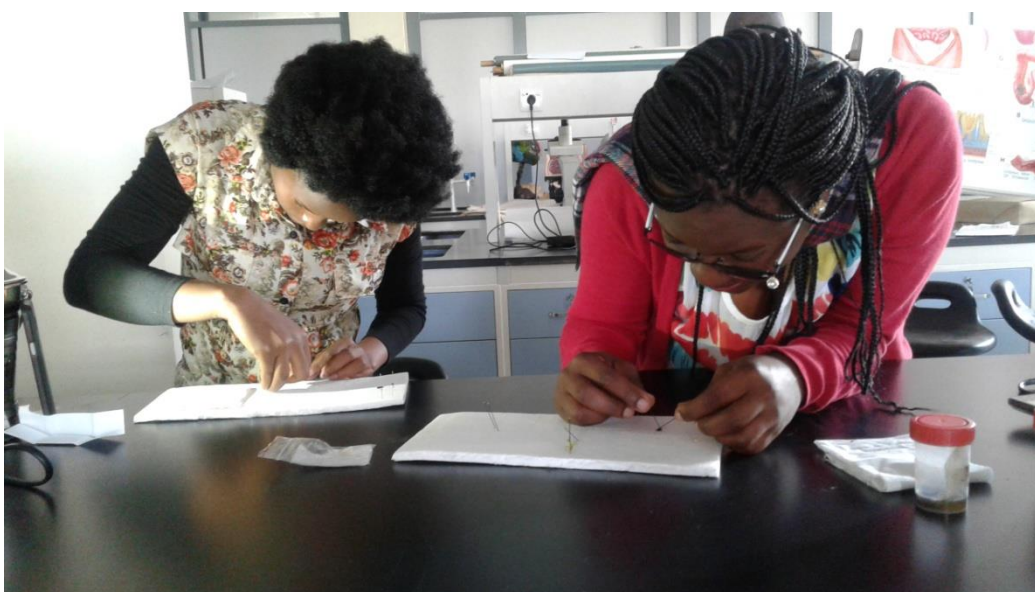


Photo: Insect mounting in the laboratory

*Photo by CoEB*



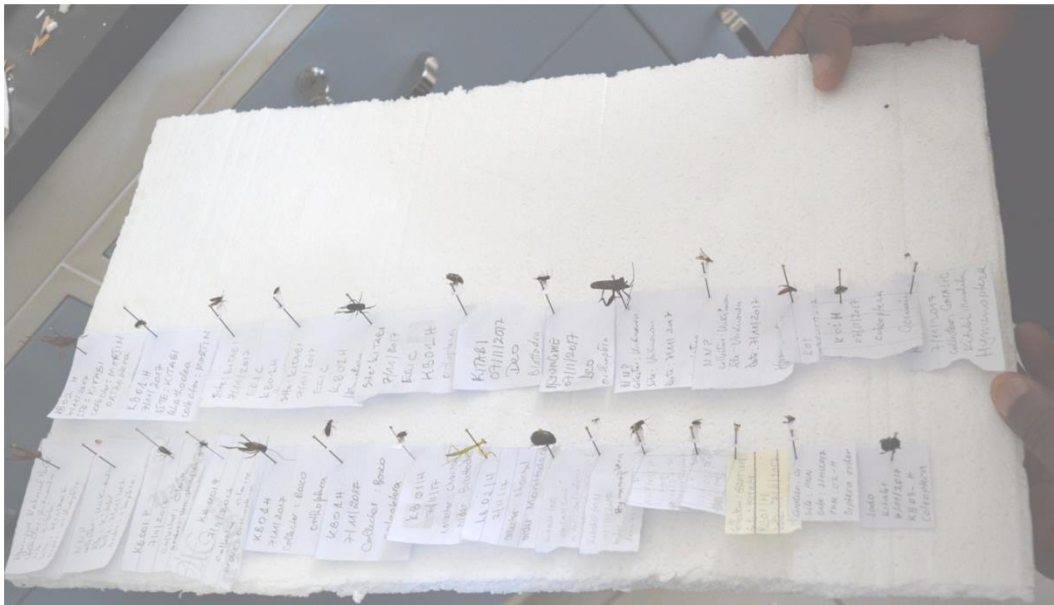


Photo: Completed specimen mounts. *Photo by CoEB*

### ***Field Visit to Akagera National Park***

On Thursday morning, participants drove to Akagera National Park to collect insects, using the same three collection methods as were taught and tested at the Nyungwe National Park sampling site. Only one site was sampled at Akagera National Park, within a savanna woodland ecosystem, in order to provide opportunity to compare results from two different ecosystems.



Photos: Setting pitfall traps at Akagera National Park.

*Photos by CoEB*



Photos: Setting pitfall traps at Akagera National Park.

Photos by CoEB

## Workshop Evaluation

### Pre-workshop Survey

Prior to the start of the workshop, when participants were assembled in the classroom, they were given a survey to assess their opinions and knowledge. Most participants said they are not familiar with terrestrial insect sampling techniques (Table 1). Participants were asked to identify topics they would like to have addressed during the workshop. Most participants wanted to cover topics related to insect research (33%) including taxonomy, field sampling techniques and preservation methods. Some participants also wanted to know the importance of insects (26%), especially their ecological importance. When asked about the knowledge they should have had before they attended the workshop, participants identified the need for some knowledge related to insect ecology and taxonomy (33%).

**Table 1: Responses from the closed questions on the pre-workshop survey.**

<i>Closed Questions</i>	<i>Responses</i>		
	<i>Answer</i>	<i>#</i>	<i>%</i>
I'm familiar with terrestrial insects sampling techniques.	Yes	4	26.3%
	No	11	73.7%
Will you apply the knowledge gained in this workshop?	Yes	15	100%
	No	0	0%
	Yes	15	100%

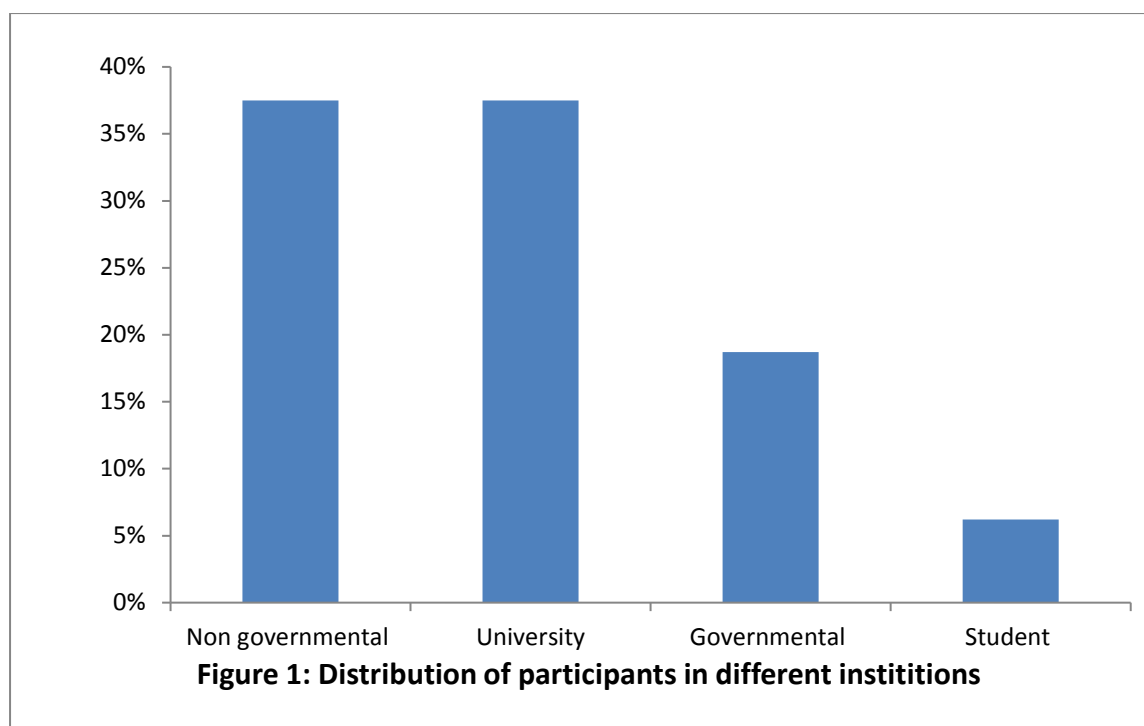


Did you receive all the information you needed to attend the workshop?	No	0	0%
Do you think a follow-up to this training skills will be useful?	Yes	15	100%
	No	0	0%
Are there other workshops you would like to see the CoEB facilitate?	Yes	15	100%
	No	0	0%
Do think you will develop a research project related to the topic of this training?	Yes	14	93.3%
	Unlikely	1	6.7%
How much knowledge do you have about terrestrial insects?	A lot	3	20%
	Very little	4	26.6%
	Some	8	53.4%

As part of the survey, other topics participants suggested be covered in future CoEB workshops included:

- Importance of insects in agriculture
- Impacts of chemicals used in agriculture on insects
- Use of insects for biological control
- Integrating insect ecology and conservation into development plans
- Insect behavior
- Ecological role of insects
- Climate change impacts on insects
- Ecology and conservation of small mammals, amphibians, reptiles, invertebrates and birds
- Small mammal identification, classification and nomenclature
- Agro biodiversity
- Medicinal plants
- Soil ecology
- Ecosystem-based adaptations to climate change
- Grant proposal writing and the publication process
- Statistical analysis, using Program R and use of GIS in biological studies

Among participants of the training, approximately 47% were assigned to attend the training while the remaining 53% volunteered to attend as a result of their interest in insect research. Lastly, participants of the training came from different institutions in Rwanda ranging from governmental, nongovernmental, and university; there were also students not affiliated with any particular institution at the time of the training (recent graduates of the university) (Figure 1).



**Figure 1. Institutions represented at the terrestrial insect training workshop**

### Post-workshop Evaluation

Post-workshop evaluations were done by participants so that the effectiveness of the workshop could be assessed. In general, participants were very positive about their evaluation of the workshop (Table 2). The evaluation statements were from the stated objectives of the workshop that were provided to potential participants. Most participants (92%) strongly agreed that they gained an understanding and skills in field sampling techniques for terrestrial insects. Most participants (83%) somewhat agreed that they gained understanding and skills in 1) insect taxonomic classification, use of identification guides and dichotomous keys and 2) in morphological separation of the insect orders and key selected insect families. Most participants (83%) expressed a need for the workshop to be longer so that the objectives could more fully be met. All participants agreed the field site visits were useful.

Table 2. Results of the post workshop evaluation.

Evaluation Statements	Responses		
	Disagree	Somewhat Agree	Strongly Agree
Gained understanding and skills in insect taxonomic classification, identification guides and dichotomous keys.	0(0%)	10(83%)	2(17%)
Gained understanding and skills in long term preservation and storage of voucher specimens	0(0%)	6(50%)	6(50%)

Gained understanding and skills in the kinds of research questions involving insects relevant for Rwanda.	1(8%)	7(58%)	4(33%)
Gained understanding and skills in value of insects in research and value of museum collections.	0(0%)	3(25%)	9(75%)
Gained understanding and skills in field sampling techniques for terrestrial insects.	0(0%)	1(8%)	11(92%)
Gained understanding and skills in morphological separation of the insect orders and key selected families.	0(0%)	10(83%)	2(17%)
Gained understanding and skills in terrestrial insect research needs leading to more research projects launched.	1(8%)	7(58%)	4(33%)
Following this training I feel more confident and likely to initiate a research project involving insects	0(0%)	7(58%)	5(42%)
Do you think a follow-up workshop to this workshop on insect taxonomy and field sampling skills will be useful	No – 1(8%)		Yes – 11(92%)
Were the field trips useful?	No – 0(0%)		Yes – 12(100%)
Should the workshop be shorter? Longer?	Shorter – 2(78%)		Longer – 10(83%)

The post-workshop evaluation also asked participants to provide comments on what other topics they would like to have been covered during the workshop. The responses included the following topics:

- Insects and ecosystem functioning
- Insect conservation
- Insects and plant physiology
- Insect voucher handling
- Aerial Insects
- Life cycles of insects
- Work on insect larvae
- Insect taxonomy

Seven participants commented the need for improvement in the organization and logistics of the workshop. The particular issues mentioned that needed improved organization were the need for better time management during the workshop and improvement in the processing and receiving of travel allowances for participants through the University of Rwanda financial office.

## 2. Conclusions

The workshop was an opportunity for participants to gain knowledge in terrestrial insect ecology, identification skills, field collection skills, and preservation methods. From these new skills, it is hoped that participants will conduct research and conservation efforts involving terrestrial insects. Participants have already started discussions on social media to look for ways that what they learned can be leveraged for future projects. University of Rwanda faculty



have also requested to borrow the field sampling equipment used in the workshop to be used for student trainings.

### **3. Acknowledgements**

We would like to express sincere gratitude to the United Nations Educational, Scientific and Cultural Organization (UNESCO) for funding this workshop, which made all activities possible. Without their support, this training would not be possible. We also thank all the participants of this workshop for their active and interactive learning during the whole period of the training. Their enthusiasm will yield tremendous benefits in the future. We are grateful to the Rwanda Development Board and the Akagera National Park for access to the two parks visited during this workshop.

**Appendix 1.** List of workshop participants, their affiliations and position titles.

N°	Participants	Affiliation	Position
1	NKIMA Germain	RAB	Scientist
2	NDAGIJIMANA Isidore	KCCEM	Lecturer
3	MURERITESI J.Bosco	WCS	Researcher
4	GATORANO Gratien	WCS	Field Team Leader
5	NSENGIMANA Theophile	UR-CE	Assistant Lecturer
6	IRADUKUNDA S. Christelle	CoEB	Researcher
7	UMUHOZA Chantal	INMR	Curator
8	KATUGA N.Joelle	RAB	Researcher
9	TUYISINGIZE Deogratia	DFGF/KRC	Manager/Biodiversity
10	Dr. UKOZEHASI Celestin	UR/CAEVM	Deputy Dean
11	SINDIKUBWABO Martin	ARCOS	Biodiversity Monitoring Officer
12	DUSABE M.Claire	MUST	Research Assistant
13	GATALI Callixte	UR/CAEVM	Lecturer
14	UWIZEYIMANA J. de Dieu	UR/CST	Assistant Lecturer
15	NSENGIMANA Venuste	UR/CE	Assistant Lecturer of Biology
16	NZIBAZA Venant	UR-CoEB	Project Coordinator
17	Yvette UMURUNGI	UR-CoEB	Bioinformatics Department Coordinator
18	Prof. Beth KAPLIN	UR-CoEB	Director of the CoEB