INVENTORY OF THREATENED ODONATES IN TWO SELECTED AFROTROPICAL FORESTS IN THE ALBERTINE RIFT IN WESTERN UGANDA

By

FRANCIS SSENKUBA

Master's student (Natural Resources' Ecology, Management, and Conservation)

Mbarara University of Science and Technology (https://www.must.ac.ug/)

Email: francisssenkuba@gmail.com

PROGRESS REPORT

SUBMITTED TO RUFFORD GRANT FOUNDATION (Application ID: 40777-1)

Team members

Name	Role	University
Francis Ssenkuba	Principal Investigator	Mbarara University of Science and Technology
Julius Tumusiime	Logistics	Mbarara University of Science and Technology
Marie-Claire Dusabe	Odonata nymph Identification	Justus Liebig University Giessen, Germany
Assoc. Prof. Christian Albrecht	Supervisor	Justus Liebig University Giessen, Germany
Assoc. Prof. Grace Kagoro	Supervisor	Mbarara University of Science and Technology

February, 2024

Table of Contents

1.0 Introduction

1.1 Background

Afrotropical forests form a unique habitat site for specialist and rare odonates in Africa (Dijkstra & Clausnitzer, 2006). These forests include Afromontane forests which are key ecoregions with a high abundance of threatened odonate species (Clausnitzer et al., 2011). Bwindi Impenetrable Forest and Bugoma forest reserves are Afrotropical forests in the Albertine rift with threatened endemic odonate species (Ministry of Wildlife, Tourism and Antiquities (MTWA), 2018). These forests are under pressure from Uganda's population currently growing rate of 3.5% (Ministry of Water and Environment (MWE), 2016). This study seeks to document the conservation status of odonate assemblage in these forests with a unique focus on rediscovering *Idomacromia jillianae*, *Neodythemis munyaga*, and *Agriocnemis palaeforma* that have been reported as threatened in the IUCN Redlist of threatened species in Uganda of 2018 and recommend conservation priority sites to save these organisms from the verge of extinction.

2.0 Project activities

2.1 Odonate survey:

We conducted a 14-day fieldwork, 7 days in Bwindi Impenetrable National Park and other 7 days in Bugoma Central Forest reserve in the wet season in December. Adult odonates have been collected using an entomologist sweep net and nymphs using a scoop net from all the sampled sites. Adult odonates have been preserved using acetone to maintain the colouration while the nymphs have been preserved in 80% ethanol. A habitant integrity score has been calculated for each sampling site to assess the habitat quality requirements of the sampled odonates.

2.2 Water physicochemical parameters:

Physicochemical parameters such as pH, water temperature, Total Dissolved solids, Electrical Conductivity, Turbidity, salinity, substrate type, and Dissolved Oxygen, have been measured in situ using a HANNA handheld multiprobe meter. However, watercolour and nutrients such as phosphates, nitrates, calcium and ammonium have been measured in the laboratory using a HANNA multiparameter photometer and calorimetry kites following the manufacturer's guidelines. All the above activities were done simultaneously with the odonate survey on all the sampling sites in Bwindi Impenetrable National Park and Bugoma Central Forest Reserve.

2.3 Setting up a Citizen Scientist Network

We have managed to recruit 2 citizen scientists on the project, one in Ruhija in Bwindi Impenetrable National Park and another one in Bugoma Central Forest Reserve. Each citizen scientist was provided with an Android phone with a Kobotool box, and a survey questionnaire set and connected to a server. They were trained on how to use the app to record field data and how to upload it on our first fieldwork. Currently, our citizen scientists have managed to sample 16 sites, 10 in Bwindi Impenetrable National Park and 6 in Bugoma Central Forest Reserve. This has helped us to capture weekly data in different months of the year.

Figure 1. First day of fieldwork in Ruhija, Bwindi Impenetrable National Park. © Alex.

Figure 2. Capturing adult odonates using a sweep net at a waterfall on R. Munyaga in Bwindi Impenetrable National Park. © J. Ndimulodi.

Figure 3. Jude Ndimulodi, my research assistant, a bachelor's student collecting odonate nymphs using a scoop net. © F. Ssenkuba.

Figure 4. Me and Jude Ndimulodi collecting odonate nymphs using a scoop net in Buhoma, Bwindi Impenetrable National Park. © Aventino.

Figure 3. Collecting in situ physicochemical parameters using a HANNA multiparameter probe meter. © F. Ssenkuba.

Figure 4. Measuring water chemical parameters using a HANNA multiparameter photometer and calorimeter kites in our field laboratory. © J. Tumusiime.

Figure 5. Teaching our citizen scientist in Bugoma Central Forest Reserve how to use the Kobo app to collect the field data. © J. Ndimulodi.

Figure 6. After fieldwork photo. Me in the middle, on the right side is our citizen scientist in Bwindi Impenetrable National Park and on the left side is our research assistant, a bachelor's student. © J. Tumusiime.

2.4 Sampled sites

In our first fieldwork, we surveyed 21 sites in Bwindi Impenetrable National Park, a high-altitude forest and 19 sites in Bugoma Central Forest Reserve a low-altitude forest making a total of 40 sampled sites as depicted in Figure 9 below. Currently, our citizen scientist network has managed to sample 16 sites, 10 sites in Bwindi Impenetrable National Park and 6 sites in Bugoma Central Forest Reserve making a total of **56** sampled sites so far.

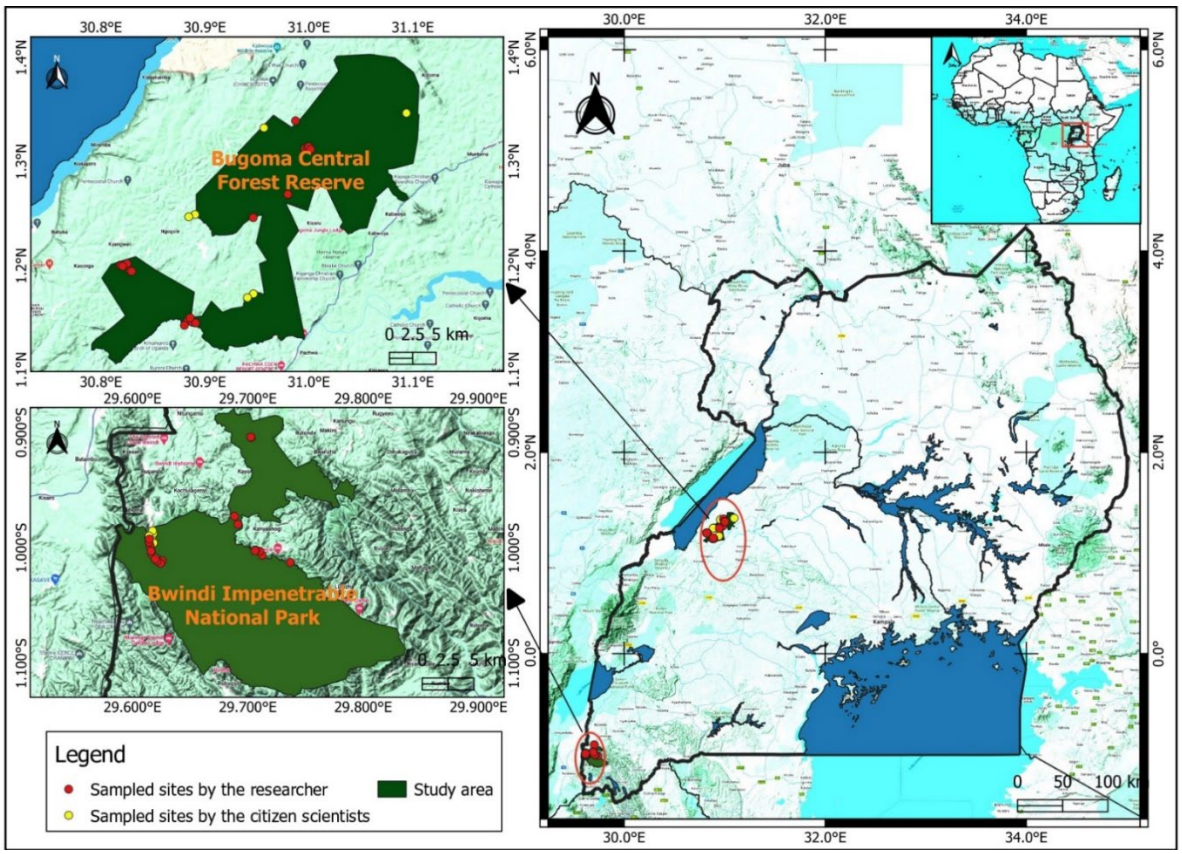


Figure 7. Map of Uganda showing the surveyed sites. Map by F. Ssenkuba.

2.5 Sampled morphotypes and their identification

In our first fieldwork, we have managed to collect **51** distinct morphotypes of adult damselflies and dragonflies which have been identified precisely to species level using morphological features and under assessment for confirmation by Dr. Perpetra Akite a senior entomologist and among the IUCN working group for the Ugandan odonates and a senior lecturer at Makerere University-Uganda in the department of Zoology. We also collected numerous odonate nymphs with the motive of identifying the important breeding areas for the species of interest. Currently, we are conducting morphological scrutiny of the nymph morphotypes to genus level with the aid of several identification keys at Justus Liebig University Giessen, Germany in the Department of Biodiversity and Zoology.

Figure 8: Pictorial presentation of sample morphotypes. Compiled by F. Ssenkuba

Figure 9. I am identifying odonate nymphs in Justus Liebig Giessen University laboratory, Department of Biodiversity and Zoology. © M. Rwibutso.

Figure 10. I and Marie-Claire Dusabe a PhD student at Justus Liebig University Giessen, and a team member identifying odonate nymphes. © M. Rwibutso.

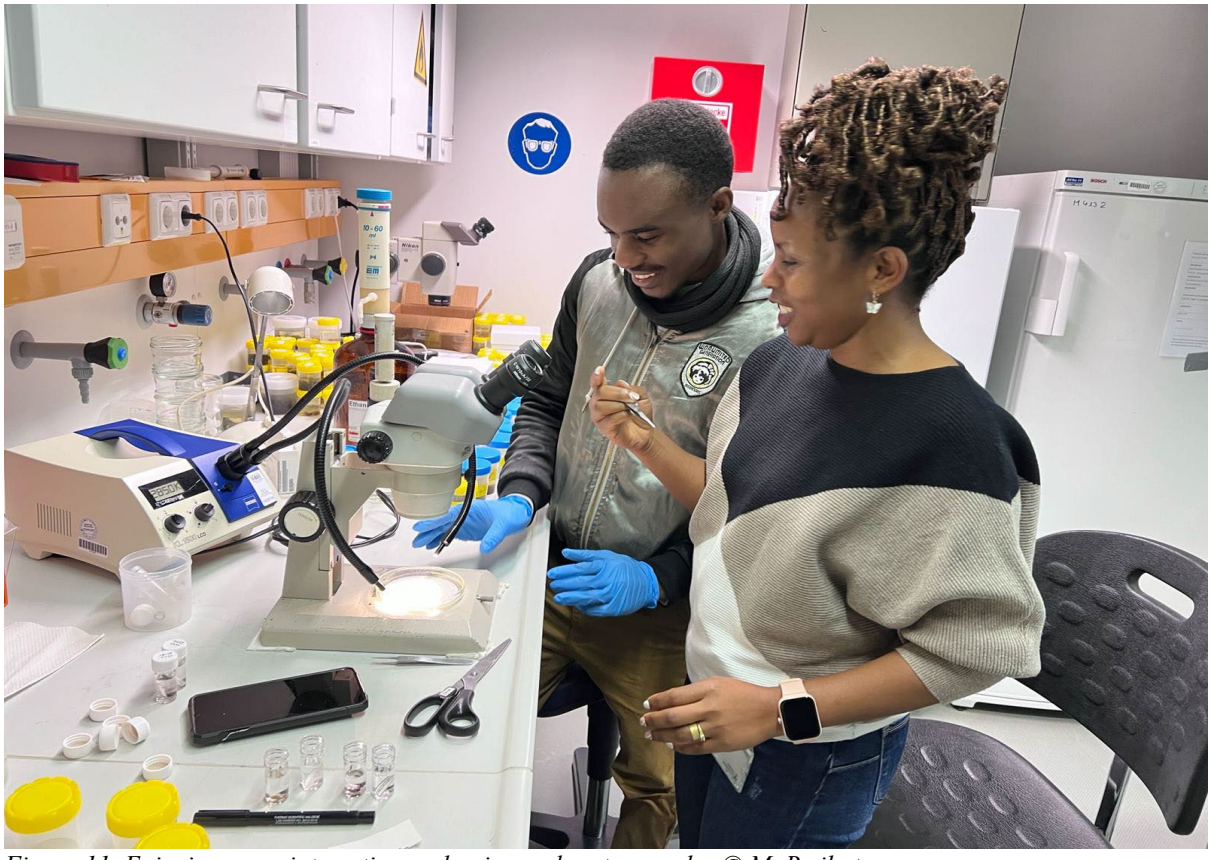


Figure 11. Enjoying some interesting and unique odonate nymphs. © M. Rwibutso.

Figure 12. Enjoying some interesting and unique odonate nymphs. Photo by M. Rwibutso

3.0 Recorded Success

We have managed to collect a species listed on a red list among the endangered dragonflies at a global level and as critically endangered at a national level. *Neodythemis munyaga* (fig. 15) is endemic to Bwindi Impenetrable National Park with a restricted range. We have also managed to collect two threatened Albertine endemics yet to be confirmed; *Stenocypha molindica* (fig.16) nearly threatened at a global level and endangered at the national level and *Stenocypha jacksoni (fig. 17)* a nearly threatened species at the global level and vulnerable at the National level. We have also collected a globally endangered dragonfly *Neodythemis nyungwe* (yet to be confirmed) from one locality in our first field survey in Bwindi Impenetrable National Park.

Figure 13. Neodythemis munyaga (not confirmed). © F. Ssenkuba.

Figure 14. Stenocypha molindica (not confirmed). © F. Ssenkuba.

Figure 15. Stenocypha jacksoni (not confirmed). © F. Ssenkuba.

We also managed to train two citizen scientists one from each forest who are currently providing us weekly data mainly on the adult odonates. Currently, 16 sites have been sampled by the citizen scientists and five non-captured species in our first fieldwork have been captured. On this project we have recruited one bachelor's student, inspiring him in odonata conservation research and building his capacity in this field. He has managed to acquire the necessary skills

in Odonata sampling, and identification. He has also acquired enough data for his research report and currently is writing his research project report.

4.0 Identified conservation threats

We have managed to identify several threats to the conservation of the sampled odonates and their habitat at large. The threats are mainly anthropogenic with charcoal burning, firewood collection, illegal lumbering and agriculture leading due to the fact that the local communities living close to these forests are poor with no alternative energy sources and hence entirely depend on the forest resources for energy. We also identified one natural threat explicitly the parasitic red mites (fig. 28). In general, we found out that the situation in Bugoma Central Forest Reserve is enigmatically alarming with most of the forest patches degraded. It's on this note we plan to conduct our Odonate conservation campaign in a primary school close to the Bugoma Central Forest Reserve to inculcate a conservation attitude in the young generation close to this disappearing resource. Bwindi Impenetrable National Park is relatively pristine with few conservation threats due to the strict managerial strategies of the Uganda Wildlife Authority.

Figure 16. Maize plantation in front and a sugarcane plantation in the background in the Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 17. A cleared site for agriculture in Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 18. Charcoal kiln in Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 19. Illegal tree cutting. © F. Ssenkuba.

Figure 20. A debarked tree in Bugoma Central Forest Reserve for medicinal purposes. © F. Ssenkuba.

Figure 21. Collected logs for charcoal burning Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 22.Tree burning in Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 23. An active charcoal burning site in Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 24. A cleared forest into grazing land in Bugoma Forest Reserve. © F. Ssenkuba.

Figure 25. Animal grazing in Bugoma Central Forest Reserve. © F. Ssenkuba.

Figure 26. Parasitic red mites on Orthetrum dragonfly. © F. Ssenkuba.

References

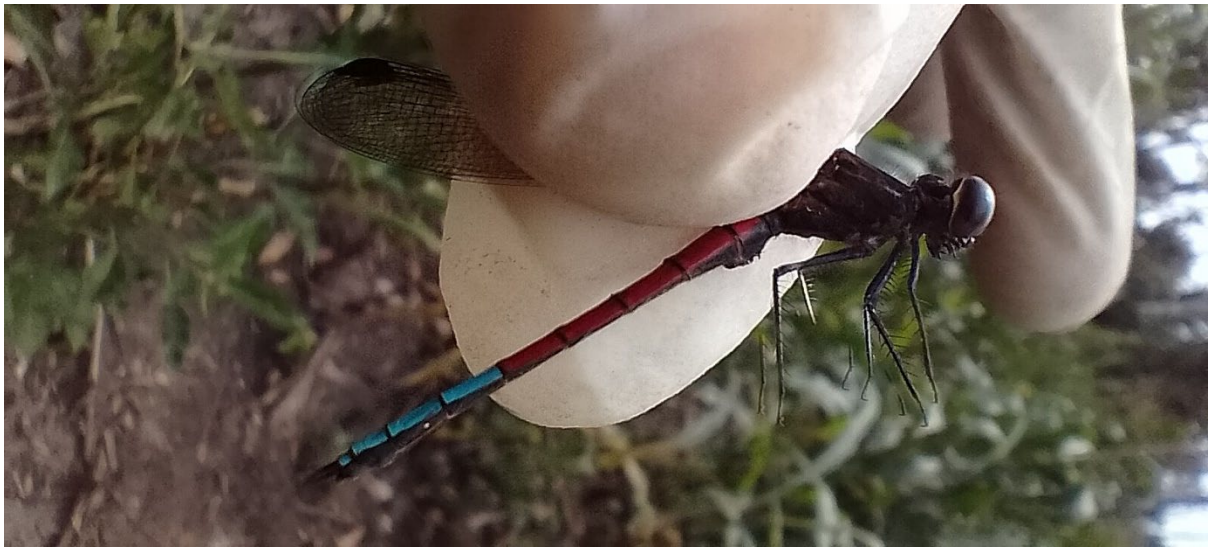
Dijkstra, K.-D. B., & Clausnitzer, V. (2006). Thoughts from Africa: how can forest influence species composition, diversity and speciation in tropical Odonata. Forest and Dragonflies. Pensoft Publishers, Sofia, 127–151

Dijkstra, K.-D. B., & Vick, G. S. (2006). Inflation by venation and the bankruptcy of traditional genera: the case of *Neodythemis* and *Micromacromia*, with keys to the continental African

MTWA. (2018). Red list of threatened species in Uganda 2018. 10.

Appendices: Interesting, collected specimens

Appendix 1. Platycypha sp. © F. Ssenkuba.



Appendix 2. Chlorocypha curta. © F. Ssenkuba.

Appendix 3. Agriocnemis sp. © F. Ssenkuba.

Appendix 4. Trithemis sp. © F. Ssenkuba.

Appendix 5.Neodythemis sp. © F. Ssenkuba.