Final Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF format**. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please DO NOT fill in and submit this form until the project has been completed.

Complete the form in English. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Islamiat Abidemi Raji
Project Title	Transforming our future by fostering environmental awareness through student engagement: A novel community science approach to campus bird survey
Application ID	44263-1
Date of this Report	12/01/2025

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Provide baseline data on bird diversity across different campuses in Kwara State, Nigeria			■	Our study provided baseline data on bird diversity across the participating university campuses in Kwara State, where limited avian data previously existed. Importantly, through this project, we generated the first bird sound recordings from these campuses, representing the first acoustic bird database for both the city and state. This contribution is particularly significant given that Nigerian and African bird species are under-represented in global sound archives. We know how many species detection by BirdNET and still reviewing and validating the detections. BirdNET Analyzer processed 450 audio files across all three campuses, generating 15,243 total detections. When filtered to ≥0.7 confidence threshold 4,343 detections were recorded representing 120 unique species across all three campuses and a combined 248 species. Landmark University recorded the highest number of campus-exclusive species detections and the only detections of Guinea Turaco (Tauraco persa), Yellow-billed Turaco (Tauraco macrorhynchus), Little Grebe (Tachybaptus ruficollis) and Woodland Kingfisher (Halcyon senegalensis) at ≥0.7 confidence threshold (Note, these unique detections in Landmark University have been reviewed and validated to be positive detections). Total recording effort was 110 hours (Unilorin: 40 hrs; Landmark: 40 hrs; KWASU: 30

				hrs), with 480 deployments.
Understand the impact of urbanisation on bird species richness in these areas by investigating factors that predict variation in species richness				We completed the data collection last month and are currently reviewing and annotating the bird sound recordings. In collaboration with the students, we will analyze the data to investigate environmental and social factors that predict bird community variation across campuses. The findings will be published in ecological journal and shared with the universities.
Involve and engage students in data collection, training and raising future generation of biodiversity conservationists				We successfully engaged 13 undergraduate students from 3 different universities including different departments, Zoology, Plant biology, Forestry, Microbiology and Civil Engineering in hands-on data collection activities, including acoustic monitoring equipment setup, field data recording, data management, and sound annotation techniques. This direct involvement provided practical experience for the participants. Beyond technical skills, this project cultivated environmental awareness and conservation mindset among participants. Students developed deeper appreciation for urban biodiversity and understanding of their role as future conservation leaders. The project established a foundation for ongoing student-led biodiversity monitoring initiatives, creating a sustainable model for continued engagement.

2. Describe the three most important outcomes of your project.

a) First multi-campus bioacoustics monitoring in kwara state that resulted in baseline dataset

We conducted the first standardized campus bioacoustics monitoring in Kwara State, using soundscapes as ecological baselines. Our multi-campus acoustic survey in this region directly addresses a critical data gap (data deficient) that has persisted for years. This baseline dataset provides the foundation for future ecological analysis, conservation planning, and student-led research within Nigerian university spaces that have historically lacked such comprehensive data. The passive acoustic monitoring approach we employed creates lasting value, researchers can revisit and re-analyze these audio recordings for years to come, answering multiple ecological questions from a single data collection effort. We plan to make our data publicly accessible for future research.

Most importantly, the project generated bird sound recordings that will contribute to training AI-powered identification tools including Merlin Sound ID, BirdNET, and Raven Pro. Currently, fewer than 30% of African bird species have the required number of recordings to train these AI systems effectively. This significant data gap limits both scientific research capacity and accessible birding tools for millions of people across the continent. Our recordings will contribute to addressing this gap in Kwara State and Nigeria.

b) We built conservation bioacoustics capacity through hands-on student training

We trained undergraduate students across three universities while fostering genuine interest in ongoing bird acoustic monitoring programs. Our project trained undergraduate students across three campuses in bioacoustics monitoring and conservation technology. We provided the first fieldwork experience for most participants and introduced all students to bioacoustics and ornithology for the first time in this region.

The participating students, though they were studying forestry, zoology, and other biodiversity-related programs, had never received ornithology training in their curricula. None of the three universities currently offer ornithology courses or conduct bioacoustics surveys on campus. Only the University of Ilorin had previously conducted a bird survey using traditional point count methods (which I assisted with in 2018).

The project therefore equipped students with essential skills including:

- Basic ornithology principles
- Acoustic recorder operation and configuration

- Field sampling design and GPS navigation using Google Maps
- Metadata recording and safe equipment deployment
- Data management workflows and research ethics

Beyond technical training, students reported increased confidence, stronger problem-solving abilities, and newfound inspiration to pursue conservation careers. Several students expressed interest in conducting further research and volunteering for conservation initiatives

c) This project Strengthened Conservation Awareness and Community Engagement Across Universities

Our project significantly raised awareness about local biodiversity and the ecological value of campus spaces. Students actively engaged their peers during fieldwork, enthusiastically explaining biodiversity conservation principles and the role of birds as environmental bioindicators when curious colleagues approached them.

We also engaged university lecturers and administrators when securing research permits and recruiting student participants, thus increasing recognition of campuses' potential role in biodiversity conservation. The project enhanced student awareness that everyday spaces (such as hostels and walkways) harbor important wildlife. Students reported increased consciousness about bird species and calls in their environment.

The project prepares participating students to champion nature conservation within their institutions and communities.

We conducted both pre- and post-participation surveys with all student participants. The pre-survey established a baseline across five areas: students' prior knowledge of birds and bioacoustics, their familiarity with how urbanisation affects biodiversity, their motivation to participate in conservation activities, their comfort with technology, and their confidence in carrying out field-based data collection. For the post-survey, we additionally asked students about skills they developed, challenges they encountered, their enjoyment and engagement with the program, and their likelihood of participating in similar projects in the future.

Students reported strong engagement and self-efficacy gains across most assessed domains (Table 2). The training and data collection process was rated highly engaging (median = 5/5, IQR = 1; 92% rated 4–5), and overall enjoyment was high (median = 4/5, IQR = 1; 83% rated 4–5). Post-survey self-rated knowledge of acoustic data collection reached the ceiling of the scale (median = 5/5, IQR = 1; 100% rated 4–5), while knowledge of urban birds and their ecology also improved substantially (median = 4/5, IQR = 0.25; 75% rated 4–5). Consistent with self-efficacy theory,

repeated successful field deployment appeared to build confidence: 92% of students rated their confidence in applying acquired skills to future data collection at 4 or 5 out of 5 (median = 5/5, IQR = 1).

Student confidence in identifying bird species by sight or sound remained low at post-survey (median = 2.5/5, IQR = 1.25; 25% rated 4–5). The post-survey was administered immediately after students completed their final round of field data collection before we introduced BirdNET and Raven Pro training for species identification as part of the program's closing analytical phase. So, at the point of measurement, students had extensive experience deploying recorders and managing acoustic data but had not yet had the opportunity to work through the species identification pipeline. The low confidence score therefore captures a moment in the students' learning trajectory rather than the endpoint of it. Following the post-survey, we took students through the full BirdNET analysis workflow. Future iterations of the program would benefit from integrating species identification training earlier, so that students develop recognition skills alongside data collection skills rather than sequentially. Conservation attitudes showed marked improvement. All 12 post-survey respondents (100%) rated their improved understanding of how urbanization affects birds at 4 or 5 out of 5 (median = 4.5/5, IQR = 1). Increased biodiversity conservation awareness was rated 4–5 by 83% (median = 4.5/5, IQR = 1), and 83% reported that participation changed their attitude toward urban biodiversity conservation (median = 4/5, IQR = 1). All 12 post-survey respondents (100%) indicated they would recommend the project to peers, and 92% reported high likelihood of participating in similar projects in the future (median = 5/5, IQR = 1).

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Shipping the equipment directly to Nigeria resulted in unexpectedly high customs duties and clearance fees, far beyond what had been budgeted. These charges delayed access to the recorders and extended the project timeline. After much discussion and deliberation, we were able to get the equipment to its destination on time for student training.

One of my proposed team members was unavoidably unavailable to be part of the project, but I was able to quickly contact another experienced colleague without any delay, and she did a perfect job with onsite coordination.

Additionally, out of six universities that we originally proposed, only three gave us permission to conduct the study on their campuses. This ended up being beneficial as it helped us build stronger relationships with the three participating campuses and concentrate on the students involved while increasing the number of sampling points in each campus for better data collection coverage.

Instead of surveying 20 points on each campus as originally planned, we surveyed 40 points per campus (maintaining our total of 120 points as planned). This provided opportunities to focus on each student individually, answering questions and helping them troubleshoot, creating excellent opportunities for continuous mentorship. We plan to expand the project in the future to other campuses and have the trained students pay it forward by being part of the project to train new students

4. Describe the involvement of local communities and how they have benefitted from the project.

The project directly involved the university communities across all three participating campuses, where students are involved as active researchers rather than passive recipients. Students from diverse academic backgrounds (Microbiology, Forestry and Wildlife, Civil Engineering, Zoology, Plant biology) participated in field training and data collection, and were introduced to bioacoustics monitoring protocols, creating a cross-disciplinary learning environment that strengthened campus community bonds around environmental stewardship.

We also involve the university staff and faculty members; they help with approval and support the students in locating their sampling points (specifically Landmark University).

We plan to share the data with the universities and hope the academic staff can integrate project findings into their coursework, extending the educational impact beyond the immediate participants.

5. Are there any plans to continue this work?

Yes, there are plans to continue this work. More than half of the world's population lives in cities, and rapid urbanization is driving biodiversity decline. There are more than 26,000 universities worldwide, most of which are located in urban areas with remnant green spaces that house biodiversity.

To conserve biodiversity in urban ecosystems, it is important to understand what species exist in these spaces, what drives their persistence, how humans engage with these environments, and the bidirectional impacts of these interactions. This information is particularly lacking in the Global South.

Therefore, we plan to explore the impact of human engagement with nature on mental health and wellbeing in the three universities. Our established acoustic monitoring network across the three university campuses provides an ideal foundation for expanding into human-nature interaction research. We aim to investigate how

campus biodiversity affects student wellbeing while simultaneously studying how human activities influence bird communities and acoustic environments.

Future research will integrate our acoustic biodiversity data with surveys measuring student stress levels, academic performance, and mental health indicators in relation to their exposure to campus green spaces and bird sounds. This interdisciplinary approach will provide evidence for the therapeutic value of campus biodiversity while informing conservation strategies that benefit both wildlife and human communities.

Additionally, we plan to expand our monitoring network to other universities, neighbouring urban areas and urban green spaces

6. How do you plan to share the results of your work with others?

The universities are excited and eager to learn about the bird species on their campuses, as this is the first and a baseline bird survey on two of the campuses and the first bioacoustics surveys across all campuses. This is also the first-time students will be involved in such a comprehensive capacity-building project.

We plan to publish in peer-reviewed journals: one in Environmental Education Research journal and another in an ecological journal. We have already prepared a manuscript for Environmental Education Research journal and will prepare an ecological manuscript investigating the ecological, social, and management impacts on bird diversity across campuses. We will also publish in newsletter detailing our novel approach to this project.

We will continue working closely with participating students at each university and guide them on how to analyze their campus data and explore scientific questions of particular interest. We aim to support them in publishing their findings in reputable journals (local or internation journal), a first-time experience for all participants. Additionally, we will apply for funding to enable students attend conferences and present their findings, which is a rare opportunity for undergraduate students in our study region. Students will also be encouraged to present findings at departmental talks. I have already presented the preliminary results of this project at my lab meeting at Cornell Lab of Ornithology.

We will make the data accessible through open access for each university and contribute to local and global data archives for future research. Several excited students have offered to create short videos documenting their experiences, which will be compiled into a documentary to share with the universities and the public.

7. Looking ahead, what do you feel are the important next steps?

The important next step is to analyze the data to understand the impact of urbanization on bird species richness in these areas while actively involving our trained students in this analytical phase. Unlike many community conservation projects that end with data collection or awareness activities, we plan to build a future where students develop comprehensive conservation and ecological research skills.

We will engage the trained undergraduates and student coordinator in acoustic data processing using software like BirdNET, Raven Pro, and R programming for species identification. This hands-on training in data analysis will guide them through scientific writing and publication processes, with students serving as co-authors on resulting papers. We also plan to mentor students to develop their own research questions from our dataset, supporting independent projects and creating research presentation opportunities at conferences.

This approach builds local expertise that can continue monitoring independently while developing mentor networks connecting students with established researchers globally. We will also upload our processed data to public platforms to help train AI-powered identification tools like BirdNET, Raven Pro, and the Merlin App.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, The Rufford Foundation logo was used in project materials, including training slides and presentation slides relating to the project. The Foundation received publicity throughout the project duration. University staff became aware of Rufford through our interactions, from the initial permission-seeking phase through project execution, I always made it clear that the project was funded by the Rufford Foundation. Rufford will continue to receive recognition through acknowledgments in publications and conference presentations stemming from this work.

9. Provide a full list of all the members of your team and their role in the project.

Islamiat Abidemi Raji: (the principal investigator) coordinated the entire project. Recruit students, train students, answer questions, design study design and sampling, design survey protocols, training materials, for data collection and data management, train the students and local coordinator on bioacoustics survey and dissemination of results, reporting, mentorship

Olayemi Omolara Esther: She coordinated distribution of the equipment and project materials to the campuses, scheduling for training, onsite troubleshooting, Onsite training, troubleshooting, equipment distribution, data management oversight.

Thirteen undergraduate students from the University of Ilorin, Kwara State University, and Landmark University served as community scientist after their training. They:

- Navigate assigned sampling points
- Deployed and retrieved acoustic recorders
- Recorded metadata (time, location, habitat details)
- Supported peer troubleshooting and communication during the survey

The students are mentioned here as their roles became important to successful the project after their trainings

10. Any other comments?

We are grateful for The Rufford Foundation's financial support. Many thanks to the RF team for investing in early-career researchers and students (tomorrow's conservation and environmental leaders). Without this backing, we could not have achieved these meaningful results. We would also like to thank Jane Raymond for all her administrative support.

This project creates sustainable outcomes extending far beyond the grant period. The baseline data generated, ecological knowledge gaps bridged, hands-on training we provided to participating students, and campus-wide awareness raised are important building blocks for creating a world where people and nature thrive together.

We are currently reviewing and annotating the bird sound recordings in collaboration with students who will analyze the data to investigate environmental and social-economic factors that predict bird community variation across campuses. This collaborative approach builds local research capacity while generating publishable scientific findings. The results will be submitted to peer-reviewed scientific journals, contributing new knowledge about urban bird ecology in Nigeria. Additionally, students will explore the dataset for independent research projects and skill development in bioacoustics analysis. This hands-on training in acoustic monitoring techniques and data analysis creates a foundation for the next generation of Nigerian researchers to continue this important conservation work.

This work demonstrated the potential for low-cost biodiversity initiatives in resource-limited settings with data deficiencies.

Again, many thanks to The Rufford Foundation for the support. We are confident this work will contribute to urban ecology research, institutional planning, inspire future leaders, and create a lasting model for integrating research, education, and environmental action.

ANNEX – Financial Report

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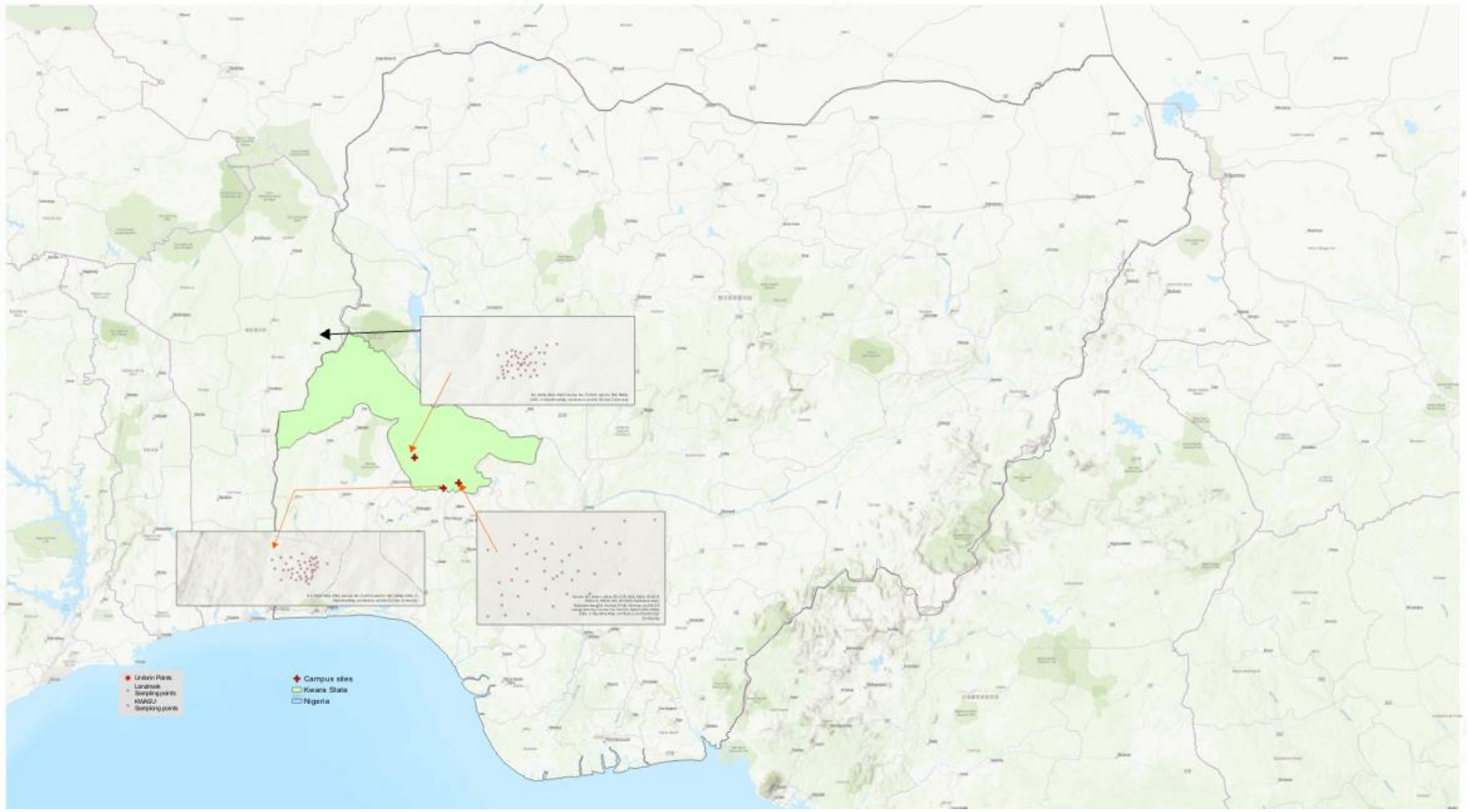
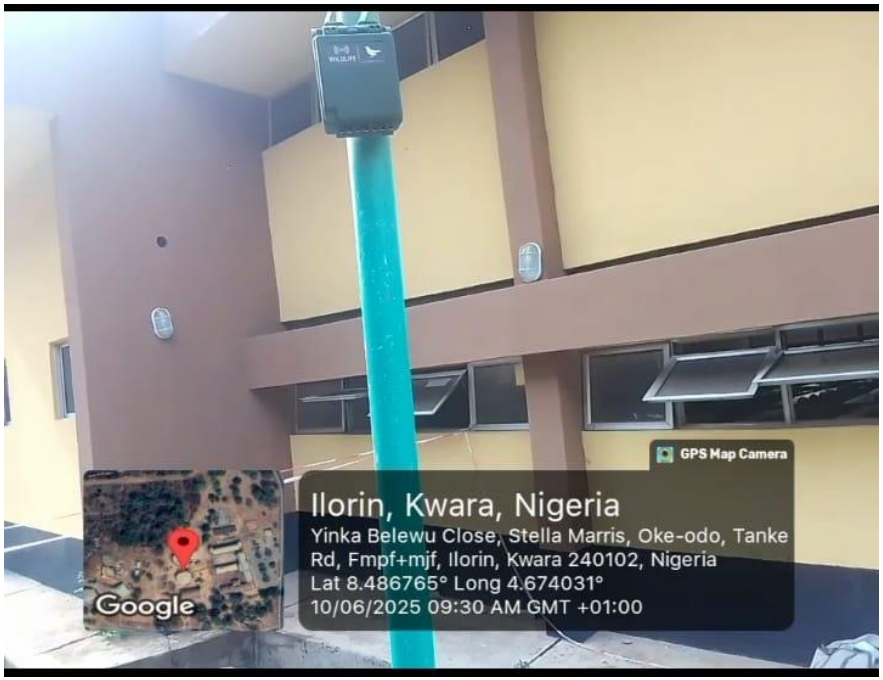


Map showing the three study sites in Kwara State, Nigeria: University of Ilorin, Kwara State University, and Landmark University, with 40 acoustic sampling points surveyed across each campus (120 total points)



Wildlife Acoustics Song Meter Micro 2 recorders deployed at sampling points within the University of Ilorin campus

Wildlife Acoustics Song Meter Micro 2 recorders deployed at sampling points within Landmark University Campus

Wildlife Acoustics Song Meter Micro 2 recorders deployed at sampling points within Kwara State University Campus