# Project Report

## Avian AI - Generating acoustic training data for automated recognition of avian species found in South Africa

## The African Bioacoustics Community

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## Lay Summary

Passive acoustic monitoring (PAM) is a powerful tool for long-term, broad-scale monitoring of species presence, behaviour, distribution and habitat use, and biodiversity change. Machine learning methods are facilitating more rapid analysis of large quantities of remotely sensed data for real-time and long-term PAM. However, this requires high-quality training data for species validation, comprising various geographic areas and contexts, background noise, etc., which are currently unavailable for most African species. Increased representation of African birds in global sound libraries is required to facilitate automated, long-term PAM to effectively guide conservation management and facilitate the use of bird identification apps, like Merlin bird ID. As part of an ongoing, long-term project that aims to grow/promote bioacoustics research in Africa, the African Bioacoustics Community (ABC) is collecting and collating acoustic data to develop an acoustic library of African species, with a focus on birds, for conservation research and community-driven science.

Kruger National Park (KNP) is a prime location to record birds as it is one of South Africa's top Important Bird Areas, encompassing high species diversity. Audio/visual data were collected over 10 days in Skukuza, KNP, in July 2024 using external directional microphones connected to HD Canon XA40 video recorders (for species verification and behavioural context). Ancillary data were collected during acoustic recordings using the mobile phone app EpiCollect5, customised to facilitate necessary meta-data collection for each encounter.

A total of 1005 audio/visual recordings were made, including 348 separate encounters with 66 bird species. Data were collected from a diverse range of habitats and soundscape recordings were made in each, providing important test data for automated acoustic classifiers. Now the ABC sound library contains 353 bird species (not including encounters that still require species ID). A full day's training workshop in acoustic data collection methods for sound libraries was also held by the ABC team. This was attended by 12 local KNP students, rangers, and staff, offering important skill development in bioacoustics data collection methods required to facilitate data collection to contribute to the ABC sound library. The acoustic library developed during this project will increase the representation of African species in global sound libraries to facilitate automated real-time PAM of African birds and environmental health for more effective conservation management, and to facilitate the use of bird identification apps, like Merlin Bird ID, in Africa, for increased community science.

## Acknowledgements

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# Introduction

*Avian Ecosystem Functions and their Role as Bioindicators*

Avians are ecologically important species and excellent bioindicators for ecological health. Birds fill a vast variety of ecological niches and contribute to numerous vital ecological functions via their role as seed dispersers, pollinators, predators, scavengers, and ecosystem engineers. A significant proportion of these ecosystem functions translate to ecosystem services which benefit humans (Şekercioğlu 2010). Birds are good candidates for monitoring global environmental change as they have long been monitored worldwide (Bibby, 1999; Schmeller et al., 2012) and scientists have a sufficient understanding of the population biology, behaviour and life history of most avian species (Venier and Pearce, 2004, Gregory et al., 2005). They are also known to show predictable population-level responses to environmental change and often reflect trends in other taxa (Järvinen and Väisänen, 1979; Furness and Greenwood, 1993).

Facing numerous threats – habitat degradation, wind farms, pesticides, invasive species, climate change – South African birds are declining dramatically, with ~15% Threatened and 13 species Critically Endangered as per the IUCN Red List (BirdLife International, 2023). Understanding changes in avian populations, habitat use, dispersion, and their ecological interactions is vital to guide the conservation of avian biodiversity, having further beneficial implications on examining overall ecosystem health.

*Acoustic Monitoring and Sound Libraries*

Systematic wildlife monitoring is required for effective conservation management (Magurran et al., 2010). Data that can be used to monitor biodiversity and assess changes through space and time are essential for the evaluation of management interventions, decision-making in adaptive management strategies, reducing the risk of local and regional extinctions through timely detection using long-term trends in survey data, and evidence-based evaluation of threats to biodiversity, such as climate change, invasive species, anthropogenic disturbance, etc., (Magurran et al., 2010).

The acoustic environment (i.e., soundscape) contains a wealth of information which, when assessed within the appropriate framework, can help to address important ecological and conservation questions (Laiolo, 2010; Penar et al., 2020; Kotera and Phillott, 2022). Bioacoustics has many applications in conservation management – understanding animal behaviour, population estimates, monitoring species and individuals, detecting elusive species, and monitoring biodiversity. It also plays a role in mindfully connecting people to nature and contributes to community science apps, like Merlin Bird ID, which enhance peoples' understanding of, and appreciation for, nature.

Passive acoustic monitoring (PAM) is a powerful tool for long-term, broad-scale monitoring of species presence, distribution, habitat use, and behaviour. PAM offers a fresh perspective towards fundamental ecological questions, revealing important information to guide conservation management strategies (Browning et al., 2017; Ross et al., 2023). Biodiversity and environmental change can also be effectively monitored through the assessment of soundscapes from long-term acoustic deployments, again, helping to guide conservation management (Jo and Jeon, 2021; Xiang et al., 2023). Acoustic indices provide a quantitative metric to assess biodiversity and ecosystem health over time and space, along with anthropogenic influences, like increased vehicle traffic or invasive species presence. PAM has proven very useful in monitoring rare/endangered bird species, e.g., Elfin Woods warblers (Campos-Cerqueira and Aide, 2016), white-bellied herons (Dema et al., 2017), Northern spotted owls (Duchac et al., 2020), as automated acoustic classification enables both real-time and long-term monitoring.

As acoustic recording equipment becomes cheaper, and more data can be collected, machine learning (ML) methods are increasingly being used to process big datasets, for more efficient and feasible PAM. Automated acoustic classification enables both real-time and long-term monitoring of species from large acoustic databases created over time. However, this requires high-quality training data with species validation (collected across different geographic areas and contexts, background noise, etc) which are currently unavailable for most African bird species. There is a clear pattern of low effort, regional and species bias, and a lack of local capacity in bioacoustics within Africa (Becker et al., 2022) and this low representation within global sound libraries hinders the development and application of automated species recognition for long-term PAM in conservation management. It also hinders the use of existing bird identification apps, which facilitate affordable / free public involvement, citizen science data collection, and promote increased appreciation nature. The Merlin Bird ID app requires at least 150 good quality recordings per species to train and function, but these data are currently only available for ~12 % of African species (Macaulay Library, Cornell Lab of Ornithology). Increased representation of African avian species in global sound libraries is, therefore, of paramount importance for long-term, effective PAM of species, monitoring biodiversity over space and time, and to promote community science by facilitating the use of internationally used bird ID apps.

### *Building an African Avian Sound Library in the Kruger National Park*

Kruger National Park (KNP) is South Africa's premier wildlife destination and an Important Bird Area (IBA), supporting over 500 bird species, half of which are resident. This is roughly 55% of species within the southern African Sub-region (BirdLife International, 2023). This abundance is owed to the diversity of habitats within KNP – wetlands, mixed woodlands, open savannah grassland, thornveld, mountain bushveld, wooded savannah and sandveld etc. (Lerm et al., 2023). Many of the species which are doing well in KNP have suffered in non-protected areas, including vultures, southern ground-hornbills, bateleurs, secretary birds, along with biome-restricted species like Burchell's starlings, white-bellied sunbirds and brown-headed parrots – all considered IBA trigger species (BirdLife International, 2023).

Bioacoustics methods have already played an important role in research and conservation in the park, such as helping us understand how climatic conditions affect reproductive and territorial behaviour in Southern ground hornbills (Middleton et al., 2023). Audio playback of bird song/calls is a powerful tool in the conservation of highly endangered species as it can be used to attract birds to novel or previously known breeding or nesting sites; an approach like this could be valuable for supporting the growing breeding population of yellow-billed oxpeckers, which were once thought to be extinct (Whyte et al., 1987).

KNP is a prime location to begin building acoustic archives of African birds due to the high species diversity, protected area status, ease of access to a wide range of habitats and naturally quieter background noise. The generated sound library will provide valuable training data for automated species classifiers, which will then facilitate the use of acoustic tools for research and species monitoring by park rangers, and the development of community science birding apps, for conservation purposes.

In the future, we anticipate that this acoustic library will offer a wealth of data that will help us better understand the diversity, behaviour, evolution, distribution, habitat use and conservation status of African bird species – all of which is fundamental for guiding conservation efforts/management. The development of apps like Merlin Bird ID for use in South Africa will likely broaden the number of people interested in birding through increased accessibility and ease of identifying species and ultimately improve community science data collection and bird conservation.

### *Purpose and Relevance to Conservation*

This project forms part of a larger long-term initiative led by the African Bioacoustics Community (ABC). This aims to grow/promote bioacoustics research in Africa through increasing networking between African and international scientists/students, hosting our biennial conference, providing accessible education opportunities via free workshops and online materials, collecting and collating acoustic data for research and community science (see: https://www.africanbioacoustics.org/).

The acoustic library developed during this project will facilitate the real-time, automated, acoustic monitoring of threatened species and environmental health. Sound files provide archived records of the 'soundscape' state, which is indicative of habitat quality, for studying long-term environmental change. This acoustic archive will help conservation surveys including environmental impact assessments for the energy industry. Data will also be useful for academic studies, such as acoustic playbacks to attract birds for behavioural studies or to encourage species re-introduction/introduction to important nesting sites, ultimately proving a powerful tool for the study and conservation of birds.

### *Aims and Objectives of the Field Expedition*

1. Data collection for sound library

Collect high-quality acoustic data from vocalising birds encountered in the KNP, supported by video recordings and photographs, first focusing on non-discriminate focal species, moving to a more targeted approach as the library is built. This data will be internally archived and then shared to regional and global sound libraries.

2. Sound Library Workshop

Conduct a full day's workshop with local students, rangers and other staff members at the Skukuza Scientific Leadership Initiative (SSLI) campus to provide training in acoustic data collection to contribute to the ABC sound library. This bioacoustics training will facilitate ongoing data collection in KNP by students and staff. This increased data collection efforts across the year will also enable different migratory species, that are only present in the park at certain times of year, to be captured and archived in the ABC acoustic library.

# Methods

### *Sound Library Data collection*

Fieldwork was conducted over 10 days in July 2024, in and around Skukuza, with a dedicated day of field work in and around Lower-Sabie, KNP. Data were collected between 05:00 – 19:00, with collection efforts focusing on the morning chorus and late afternoon/early evening when the temperature is cooler, and birds are more active. Data collection routes were planned by a local researcher (Donovan Tye) at the SSLI, including numerous 'no public access' roads that were much quieter for acoustic data collection. Data were collected by four dedicated observers in a range of locations (see Figure 1) from 4x4 vehicles (with the engines turned off) and on foot in locations where people are allowed around, including the

Skukuza Village, Skukuza Nursery, Lake Panic, Skukuza Rest Camp and airport. Data were also collected on foot in publicly inaccessible areas of the park on guided walks accompanied by a local ranger.

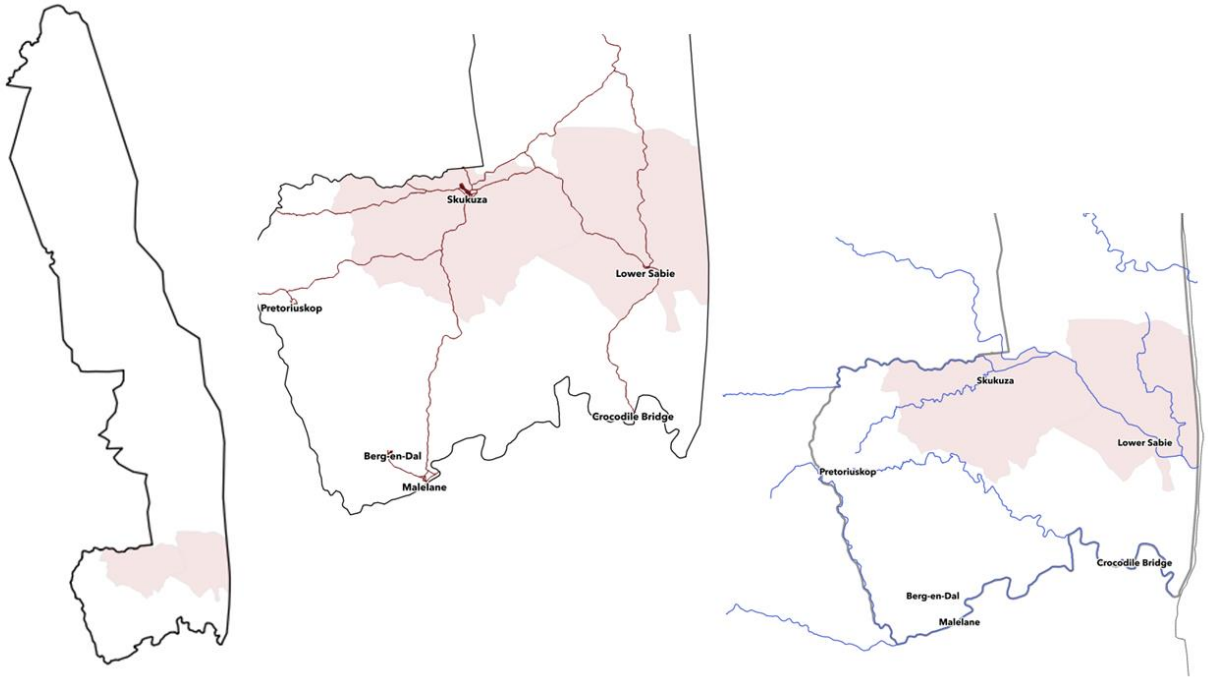


**Figure 1:** Three maps displaying the areas (shaded red) of Kruger National Park in which data were collected during this field expedition. The map on the left displays the area in relation to the whole park. The brown lines on the map in the middle represent roads and the blue lines on the map on the right represent rivers.

High-quality acoustic data from avian species encountered in KNP, supported by video recordings and photographs, were collected during this study. Although as many high-quality acoustic recordings of non-discriminate focal species were taken, a more targeted approach was taken if rarer species were present to increase the coverage of rare species which are harder the locate. Acoustic recordings were made using external directional microphones, with a 150 Hz high pass filter, connected to HD Canon XA40 video recorders (for species verification and behavioural context). Directional microphones limit background noise and non-target species vocalisations, producing high-quality recordings of species-specific calls, required for sound libraries. Recordings included single and multiple focal species to be used for training data and soundscape acoustic recordings to be used for test data.

Species ID was verified during, or after,, the encounter from the video footage with the assistance of bird identification books, apps, and local knowledge. Ancillary data were collected during acoustic recordings using the mobile phone app EpiCollect5, customised to facilitate meta-data collection for each encounter. This includes the time and date of recording, single/multi-focal species' ID, geographic location, recording equipment information, weather conditions, behaviour, group size, age/sex (if known), meters from observer, as well as any notes on the recording context or unusual observations. Information on the quality of the video recording was determined using the following categories:

0 - Video only. Recorded interesting behaviour but the bird didn't vocalise.

1 – Audio only. Acoustic vocalization recorded but focal species not seen or recorded.

2 – Audio only with visual confirmation. Only acoustic data, no video footage, was recorded from the focal species but the person recording saw and identified the species.

3 – Basics. Audio and video footage of the focal species were captured, but the video footage is poor quality / short.

4 – Good audio and video footage of the focal species.

5 – Excellent video footage of the focal species.

*Sound library data storage and processing*

Hotter midday hours, when birds are generally less active, were dedicated to data downloading and processing. Acoustic data were archived in a standardized manner with associated metadata and stored on hard drives, in duplicate, held by the ABC. For each day of encounters a folder was created with the following information: Date (year/month/day)_Location code_Observer. Within this folder, a folder for each encounter during that day was created, with the encounter number, E001/E002/E002_, and so on, followed by the species names. Each encounter folder holds all the video files from each encountered, which were renamed as: Date (year/month/day)_Location_Observer_Unique file code. Data collected via EpiCollect5 were uploaded to the main online database in which holds all the sound library metadata for each recording encounter.

This acoustic data will be institutionally archived and then submitted to regional and global free sound repositories as training data for species classifiers. Processed data will be submitted annually to SANParks as part of the research agreement. Data will be submitted to the Cornell McCauley Sound Library (https://www.macaulaylibrary.org/) as training data for the Merlin Bird ID app.

*Training in Acoustic Data Collection and Archiving for the African Bioacoustics Community Sound library*

We conducted a full day's workshop at the SSLI campus, Skukuza, to provide theoretical and practical training in acoustic data collection and storage to local staff and students. The first half of the workshop introduced the basic theories of bioacoustics, passive acoustic and soundscape monitoring during a series of lectures. This was followed by an introduction to different types of acoustic recording equipment, ranging in price and quality, from basic/affordable to more high-quality expensive equipment. Participants were also taught about the acoustic recording equipment you can use for soundscape recording vs recording focal animals, for example AudioMoths vs directional Shotgun microphones. Participants then gained experience using the different types of equipment during a dedicated recording session around the SSLI campus. Before this session, participants downloaded the EpiCollect5 app and were taught how to use it for metadata collection.

# Results and Outcomes

*ABC Sound Library Data Collection and Archiving*

In July 2024, 1005 audio/visual recordings were made across 10 days in the south of the KNP. This included 348 separate encounters with single- / multi-focal species, during which 66 avian species were recorded (see Table 1 in the appendix for the list of species encountered). Data were collected from a range of habitats, including bushveld, wetlands, mixed woodland and thorn thicket, open savannah and grassland. Within these different habitats, 50 soundscape recordings were made during dedicated data collection, and 20 recordings of the soundscape were made with two AudioMoths, set to record at dusk

and dawn throughout the field trip. This will offer important test data for the development of species classifiers.

The most commonly recorded species included Dark-capped Bulbul, Scarlet-chested Sunbird, Grey go-away-bird, Fork-tailed Drongo, Cape Glossy Starling, and African fish Eagle (see Figure 2). While some of the least commonly recorded species (being recorded only once) included, Arrow-marked Babbler, Brubru, Purple-crested Turaco, Brown Snake eagle, and Gorgeous Bushshrike (see Figure 3). The data offers a diverse representation of the different avian taxonomic groups within KNP, with 15 different orders and 39 different families recorded.






**Figure 2:** The most commonly recorded species during this field expedition, including: a) Dark-capped Bulbul, b) Scarlet-chested Sunbird, c) Grey Go-away-bird, d) Fork-tailed Drongo, e) Cape Glossy Starling, and d) African Fish Eagle.


a)
African Bioacoustics Community. TGridley


b)
African Bioacoustics Community. CNadin


c)
African Bioacoustics Community. RProbert


d)
African Bioacoustics Community. RProbert


**Figure 3**: The least commonly recorded species (recorded only once) during this field expedition, including: a) Arrow-marked Babbler, b) Brubru, c) Purple-crested Turaco, d) Brown Snake Eagle, e) Gorgeous Bushshrike.

The quality of audio/video recordings ranged from 0 – 5 (see methods for descriptions of quality ratings). Over half of the recordings (60.1 %) were rated 2 and above for data quality, with 29.5% of recordings being rated 4 (good audio/visual data) and 14.2% being rated 5 (excellent audio/visual data). These recordings will provide valuable acoustic data to the ABC and global sound libraries.

*Training workshop and Data Archiving for the ABC Sound library*

Training took place on Monday the 15th of July 2024 during a free full day's workshop, from 8am to 4pm at the SSLI campus in Skukuza, KNP. A total of 16 participants attended the workshop, including both students, rangers, and other staff members working and residing in KNP. The training was led by the ABC and a collaborative researcher from the OTS. The morning's theory session started with an interactive game of "guess the animal sound" where participants were played numerous calls produced by various animals and asked to guess what animal they thought was vocalizing. This grabbed the attention of the audience and helped to decrease the formality of the workshop, encouraging interaction and questions from participants throughout. A series of lectures were then presented on the following topics: animal sound production and perception (including source-path-receiver models), sound propagation, choosing equipment for animal bioacoustics research, and analysis of soundscapes as an ecological tool. The importance of bioacoustics and sound libraries for species and biodiversity monitoring in guiding conservation management was clearly conveyed and participants discussed this importance, contributing their own ideas.

The second part of the workshop was dedicated to acoustic data collection training. Participants were introduced to various types of equipment for recording focal species, from the free Wildlife Acoustics mobile phone app, Song Meter Touch, with/without a small external microphone, to using the more expensive, high-quality Canon, HD video recorder setup. Participants were also introduced to AudioMoths, Song Meter acoustic recorders, and camera traps for more long-term recordings and soundscape monitoring.

Workshop participants then conducted two hours of acoustic data collection from birds around the SSLI campus, using all the different types of equipment previously demonstrated. Beforehand, participants

downloaded and were taught how to use the EpiCollect5 app to collect important metadata during acoustic data collection for the sound library.


After the practical session, participants regrouped and were taught how to rename and file their data in the appropriate format to contribute to the sound library. Participants were then shown the basics of using acoustic analysis software Raven, which is free for students and researchers in Africa. The different acoustic analysis tools available in Raven were covered, in relation to the type of questions that might be studied. The workshop ended with a fruitful discussion about how participants can continue to contribute

to the ABC sound library and people who were keen to be involved provided the team with their contact details. A link to a Google Drive was emailed to these participants to upload their contributed data.

# Discussion and Future Direction

*ABC Sound Library Data Collection and Archiving*

Valuable acoustic data were collected during this field expedition, adding to the continuously growing ABC acoustic archive, offering both important training and testing data for automated classification methods. The ABC sound library now contains a minimum total of 305 avian species (not including encounters that still require species ID). Since June 2021 to the present date, acoustic data have been collected by 17 different observers, during both opportunistic and dedicated data collection periods, in 28 locations across South Africa, with dedicated data collection focused in the KNP, Western Cape, and Northern Cape.

Data collected during this trip greatly increased the number of individuals in the ABC sound library and the representation of both rarer and more common species. Collecting data in KNP enabled the team to record resident birds that are not found anywhere else in South Africa, such as Mosque Swallows, Brown-headed Parrots, and Southern Ground Hornbills. Also, species such as Verreaux's eagle-owls, Crested Barbets, Broad-billed Rollers, Crowned Lapwings, that are very rarely documented in places other than KNP, were recorded and added to the sound library. This increased the representation of rarer South African species in the ABC sound library and global sound libraries. Seasonal residents were also captured for the first time in KNP, for example, the Scarlet-breasted Sunbird, which were abundant in numbers, with males regularly performing vocal territorial displays.

Data collected during dedicated field expeditions in IBAs such as KNP will greatly contribute to the facilitation of effective passive acoustic monitoring of rare/endangered species within South Africa's national parks. Audio/visual recordings made during this field trip will, later down the line, contribute valuable data that will help us better understand the diversity, behaviour, distribution, habitat use, and conservation status of African bird species – all of which is fundamental for guiding conservation efforts/management. In the near future, data collected during this trip will be offered to African students for research projects, promoting higher education opportunities in African bird bioacoustics and conservation, and increasing avian conservation research outputs in this. Acoustic data collected during this trip has been institutionally archived, and in the process of being submitted to regional and global sound repositories as training data for species classifiers. This will facilitate the use of bird ID apps, such as Merlin Bird ID, and inspire and promote bird conservation activities.

*Training Workshop in Acoustic Data Collection and Data Archiving for the ABC Sound library*

The training workshop was deemed a great success by all who attended. Participants successfully learnt the fundamentals of bioacoustics research and how to collect acoustic data to contribute to sound libraries. This increased the skills set of African students and rangers, as well as increasing the number of observers contributing to the ABC sound library. We received very encouraging feedback from attendees about how much they learnt and how excited they were to begin contributing to the ABC sound library. Phumlile Mnguni, a local Masters student working in the park, provided us with the following feedback:

"I want to extensively express my gratitude for the amazingly wonderful experience and training I received from the ABC team. It was so informative and eye-opening for me. For example, I didn't know sounds can be used to monitor biodiversity. Also, I didn't know about Song Meter Touch app that I can download to my phone and start recording different sounds anywhere. I love birdwatching and I only

visually and listen to identify them, I have never thought of recording them. But now, I have started recording using the Song Meter Touch app, and all I can say is it's wonderful, I have started to notice different calls of each species are linked to different behaviors and trust me, I'm learning a lot of the finer details with different birds sounds." She continued to say, "I am also super excited to do more, like put out sound detectors and explore other species at different times of the day, and different seasons, also to learn more about the cryptic and nocturnal species, and I love this technique because you don't interfere with the species, you just set you detectors and leave them out to do the job."

It was extremely encouraging to receive such positive feedback and collaborations with SSLI researchers were strengthened. The ABC team have now set up a course in bioacoustics that will be run yearly at the SSLI campus in collaboration with the OTS, with the first course starting in March and July, 2025. This will offer students an in-depth training in bioacoustics theory and practice, increasing bioacoustics research capacity in Africa, which will also help to guide passive monitoring methods that will effectively guide avian conservation managements.

## Conclusion

The African Bird Club Conservation Award enabled the ABC team to successfully collect important audio/visual data from bird species in the top IBA in South Africa, contributing fundamental data to the ABC sound library. This data will increase the representation of African bird species in global sound libraries. It also allowed us to successfully conduct and full day's training workshop, with practical experience, in acoustic data collection and archiving for sound libraries. This has resulted in ongoing data collection in KNP by local students and staff. Collaborations were strengthened and future field work opportunities were discussed for 2025.

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# Appendix

**Table 1:** All the avian species recorded during this field expedition to Skukuza, Kruger National Park with the number of encounters. The most frequently encountered species are in bold.

| Species common name | Scientific name | Order | Family | Number of encounters |
|---|---|---|---|---|
| African firefinch | *Lagonosticta rubricata* | Passeriformes | Estrildidae | 1 |
| **African fish eagle** | ***Icthyophaga vocifer*** | **Accipitrifores** | **Accipitridae** | **10** |

| | | | | |
|---|---|---|---|---|
| African jacana | *Actophilornis africanus* | Charadriiformes | Jacanidae | 3 |
| **Arrow-marked babbler** | ***Turdoides jardineii*** | **Passeriformes** | **Leiothrichidae** | **12** |
| Barn swallow | *Hirundo rustica* | Passeriformes | Hirundinidae | 5 |
| **Bearded woodpecker** | ***Chloropicus namaquus*** | **Picidae** | **Picidae** | **10** |
| Black crake | *Zapornia flavirostra* | Gruiformes | Rallidae | 2 |
| **Black-backed puffback** | ***Dryoscopus cubla*** | **Passeriformes** | **Malaconotide** | **18** |
| Black-collard barbet | *Lybius torquatus* | Piciformes | Lybiidae | 1 |
| Black-headed oriole | *Oriolus larvatus* | Passeriformes | Oriolidae | 1 |
| Blacksmith lapwing | *Vanellus armatus* | Charadriiformes | Charadriidae | 1 |
| Blue waxbill | *Uraeginthus angolensis* | Passeriformes | Estrildidae | 1 |
| Brown snake eagle | *Circaetus cinereus* | Accipitriformes | Accipitridae | 2 |
| Brown-hooded kingfisher | *Halcyon albiventris* | Coraciiformes | Alcedinidae | 2 |
| Brubru | *Nilaus afer* | Passeriformes | Malaconotidae | 6 |
| Burchell's starling | *Lamprotornis australis* | Passeriformes | Sturnidae | 1 |
| Cape glossy starling | *Lamprotornis nitens* | Passeriformes | Sturnidae | 2 |
| Cardinal woodpecker | *Dendropicos fuscescens* | Piciformes | Picidae | 2 |
| Chinspot batis | *Batis molitor* | Passeriformes | Platysteiridae | 1 |
| Collared sunbird | *Hedydipna collaris* | Passeriformes | Nectariniidae | 1 |
| Common waxbill | *Estrilda astrild* | Passeriformes | Estrildidae | 5 |
| Crested barbet | *Trachyphonus vaillantii* | Piciformes | Lybiidae | 1 |
| Crested francolin | *Ortygornis sephaena* | Galliformes | Sturnidae | 1 |

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|---|---|---|---|---|
| Crombec | (species to be confirm) | Passeriformes | Macrosphenie | 5 |
| Crowned lapwing | *Vanellus coronatu* | Charadriiformes | Charadriidae | 1 |
| Dark-capped bulbul | *Pycnonotus tricolor* | Passeriformes | Pycnonotidae | 2 |
| Egyptian goose | *Alopochen aegyptiaca* | Anseriformes | Anatidae | 3 |
| Fork-tailed drongo | *Dicrurus adsimilis* | Passeriformes | Turdidae | 2 |
| Golden-tailed woodpecker | *Campethera abingoni* | Piciformes | Picidae | 2 |
| Gorgeous bush shrike | *Telophorus viridis* | Passeriformes | Malaconotidae | 2 |
| Great egret | *Ardea alba* | Pelecaniformes | Ardeidae | 1 |
| Green wood hoopoe | *Phoeniculus purpureus* | Bucerotiformes | Phoeniculidae | 1 |
| Green-backed camaroptera | *Camaroptera brachyura* | Passeriformes | Cisticolidae | 2 |
| Grey go-away bird | *Crinifer concolor* | Musophagiformes | Musophagidae | 4 |
| Grey-backed camaroptera | *Camaroptera brevicaudata* | Passeriformes | Cisticolidae | 1 |
| Hadeda ibis | *Bostrychia hagedash* | Pelecaniformes | Threskiornithidae | 2 |
| Hamerkop | *Scopus umbretta* | Pelecaniformes | Scopidae | 1 |
| Kurrichane thrush | *Turdus libonyana* | Passeriformes | Turdidae | 2 |
| Lilac-breasted roller | *Coracias caudatus* | Coraciidae | Coraciidae | 1 |
| Little bee-eater | *Merops pusillus* | Coraciiformes | Meropidae | 1 |
| Little sparrowhawk | *Tachyspiza minulla* | Accipitriformes | Accipitridae | 5 |
| Magpie shrike | *Lanius melanoleucus* | Passeriformes | Laniidae | 4 |
| **Mosque swallow** | ***Cecropis senegalensis*** | **Passeriformes** | **Hirundinidae** | **14** |
| Natal spurfowl | *Pternistis natalensis* | Galliformes | Phasianidae | 1 |

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|---|---|---|---|---|
| Purple-banded sunbird | *Cinnyris bifasciatus* | Passeriformes | Nectariniidae | 2 |
| Purple-crested turaco | *Gallirex porphyreolophus* | Musophagifomes | Musophagidae | 2 |
| Red-billed buffalo weaver | *Bubalornis niger* | Passeriformes | Ploceidae | 2 |
| Red-billed oxpecker | *Buphagus erythrorynchus* | Passeriformes | Buphagidae | 5 |
| Red-capped robin chat | *Cossypha natalensis* | Passeriformes | Muscicapidae | 2 |
| Red-faced mousebird | *Urocolius indicus* | Coliiformes | Coliidae | 3 |
| Scarlet-chested sunbird | *Chalcomitra senegalensis* | Passeriformes | Nectariniidae | 1 |
| Sombre greenbul | *Andropadus importunus* | Passeriformes | Pycnonotidae | 6 |
| Southern black tit | *Melaniparus niger* | Passeriformes | Paridae | 2 |
| Southern ground hornbill | *Bucorvus leadbeateri* | Bucerotiformes | Bucorvidae | 1 |
| Southern red-billed hornbill | *Tockus rufirostris* | Bucerotiformes | Bucerotidae | 1 |
| Southern yellow-billed hornbill | *Tockus leucomelas* | Bucerotiformes | Bucerotidae | 2 |
| Speckled mousebird | *Colius striatus* | Coliiformes | Coliidae | 1 |
| Spectacled weaver | *Ploceus ocularis* | Passeriformes | Ploceidae | 2 |
| **Square-tailed drongo** | ***Dicrurus ludwigii*** | **Passeriformes** | **Dicruridae** | **36** |
| Tawny-flanked prinia | *Prinia subflava* | Passeriformes | Cisticolidae | 3 |
| Treecreeper | Species to be confirmed | Passeriformes | Certhiidae | 1 |
| | *Ketupa lactea* | Strigiformes | Strigidae | 3 |

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| Verreaux's eagle owl | | | | |
| White-bellied sunbird | *Cinnyris talatala* | Passeriformes | Nectariniidae | 2 |
| White-browed robin-chat | *Cossypha heuglini* | Passeriformes | Muscicapidae | 3 |
| White-browed scrub robin | *Cercotrichas leucophrys* | Passeriformes | Muscicapidae | 1 |
| **White-fronted bee-eater** | ***Merops bullockoides*** | **Coraciiformes** | **Meropidae** | **13** |
| | | | Total Number of Encounters | 240 |