Conducting workshops and field training to promote bird surveys and capacity-building in ornithology in the Republic of Djibouti.

PROJECT REPORT

Mathieu Mahamoud-Issa
May 2025

African Bird Club
Working for birds and conservation in Africa

DJIBOUTI
DECAN

Table of Contents

Summary

Djibouti is a small, arid nation in the Horn of Africa. Despite its modest size, Djibouti is at the heart of the Horn of Africa Biodiversity Hotspot and on a major migratory route between Africa and Eurasia. To foster interest in birds and develop local capacities in terms of naturalist expertise, the association Décan (Discover and Help Nature) has developed a collaboration with the University of Djibouti to offer Bachelor of Science (B.Sc.) in Biology students training modules on bird identification and monitoring methods. The students visited the Douda-Damerjog protected area in small groups, a natural site classified as a RAMSAR site, which includes an acacia forest and a coastal area with a mangrove. During their visits, the students learned how to observe and recognize common birds in the area and were introduced to monitoring methods as well as mobile applications such as eBird. The students were also introduced to bioacoustics tools and acoustic monitoring using autonomous recorders. In particular, they learned how to automatically detect the vocalizations of a bird species (*Corvus splendens*) using the BirdNet Analyzer software. This program gave a third-year undergraduate student the opportunity to complete an internship studying the avifauna of the Douda-Damerjog protected area. Finally, birding tours supervised by a professional ornithologist are regularly organized for visitors of the protected area.

Résumé

Djibouti, est une petite nation aride de la Corne de l'Afrique. Malgré sa taille modeste, Djibouti est au cœur du Hotspot de biodiversité de la Corne de l'Afrique et sur une route migratoire majeure entre l'Afrique et l'Eurasie. Afin de développer l'intérêt pour les oiseaux et de renforcer les capacités locales en termes d'expertise naturaliste, l'association Décan (Découvrir et Aider la Nature) a développé une collaboration avec l'Université de Djibouti, afin de proposer aux étudiants de Licence en Biologie des modules de formation à l'identification et aux méthodes de suivis des oiseaux sauvages. Les étudiants ont visité par petits groupes l'aire protégée de Douda-Damerjog, un site naturel classé site RAMSAR, englobant notamment une forêt d'acacias et une zone littorale avec une mangrove. Lors de leurs visites, les étudiants ont pu apprendre à observer et à reconnaitre les oiseaux communs de la zone et être initiés aux méthodes de suivis ainsi qu'aux applications mobiles telles que eBird. Les étudiants ont aussi été initiés aux outils de bioacoustique et le suivi acoustique avec l'utilisation d'enregistreurs autonomes. Ils ont notamment appris comment réaliser une détection automatique de vocalisations d'une espèce d'oiseau (*Corvus splendens*) avec le programme BirdNet Analyzer. Enfin, ce programme a donné l'opportunité à un étudiant de Licence de 3ème année d'effectuer un stage d'étude de l'avifaune de l'aire protégée de Douda-Damerjog. Enfin une activité de découverte des oiseaux encadrée par un ornithologue professionnel est régulièrement proposée aux visiteurs de l'aire protégée.

Introduction

Context and project justifications

Djibouti is a country in the Horn of Africa. Despite its relatively small size (23,200 km^2) and the arid environmental conditions, about 390 bird species has been listed [**1**]. The country is situated on an important migratory route between Africa and Eurasia thought the Bab al-Mandeb strait [**2**] with seven IBAs [**3,4**]. Despite the diversity of bird species, few monitoring and conservation projects targeting birds have been conducted. The main reason is the lack of trained people able to conduct research and conservation work on birds, as well as the lack of financial resources. Thus, the projects conducted on birds in the country were mostly the result of an international cooperation between experts from abroad and the local ministry of environment or local NGOs. In order to increase the number of local ornithologists and birdwatchers, the Decan association aims to develop several teaching activities and field training in collaboration with the University of Djibouti. These training will be carried out by a local scientist specialized in animal behaviour and bird communication, Dr Mathieu Mahamoud-Issa.

Aims

The project aims to organize teaching activities specifically for students at the University of Djibouti in the form of conference, workshops and field training that will impart skills in ornithology, covering bird identification, survey techniques, data reporting, and data archiving. Additionally, participants will receive training in the analysis of data obtained from passive acoustic monitoring. This initiative seeks to enhance the local community's and the youth`s practical knowledge in ornithology, potentially fostering community-driven conservation projects for birds and their habitats. These educational activities will be carried out by the Decan association and will be conducted within the Douda-Damerjog protected area in Djibouti.

Activity A: Field Ornithology in practice: Observe and identify birds, collect and analyze data, write a scientific report.

In this activity, the students learnt how to observe and identify the birds in the field and the methods to report the observations. Prior to the field training, the students attended to a conference about ornithology and the birds of Djibouti at the University, delivered by Dr Mathieu Mahamoud-Issa (Figure 1). They also received a pdf document called Module 1 which is a pedagogic document that gives the basis of bird identification and how to use a field guide (Supporting Information 1), as well as field guide of 50 bird species found in the Douda protected area, made specially for this activity (Supporting Information 2).

Figure 1 - Conference organized at the University of Djibouti to introduce students to Ornithology and the birds of Djibouti, on the 28 November 2024.

Methods

During February 2025, students from the 2nd year of Licence in Biology from the University of Djibouti came every Monday and Wednesday per group of about 20 students at Decan Wildlife shelter, for a total of about 100 students. After a brief presentation of the Douda protected area which encompasses three distinct habitat types (coastal acacias woodland, invasive *prosopis* forest and mangrove), students received binoculars, field guides and a sheet of paper to note the number of species observed. The group of students walked from the Decan wildlife shelter to the coastline with a trained ornithologist, and reported the different bird species observed. Two monocular scopes were also provided so that students could learnt how to use it (Figure 2). The field class focused mainly on identifying the common species, and to learn about their diet, reproduction, general behaviour. At the end of the class, students were asked to selected among the list of species observed, two species and write a detailed description of the aspect, and the ecology of the birds using information gathered from books and websites.

Figure 2 - Pictures of the field training with different groups of students that were organized during February 2025 at the Douda-Damerjog protected area.

Outputs

- Students got the opportunity to discover the protected area.
- They learnt how to observe birds and recognize common.
- They developed their interested toward birds and learnt how studying birds can positively impact the conservation efforts of the environment.
- They received information about the career possibilities if they wish to become a professional ornithologist.

Internship Opportunity

In March - Mai 2025, a student of 3nd year Licence of Djibouti University did an internship at the Decan association to participate to the monitoring of bird diversity at the Douda protected area (Figure 3, Supporting Information 3). The aims of the internship were:

- Learn how to observe and identify the different species.
- Learn to make eBirds lists while doing birding sessions.
- Analyze eBirds data from 2024-2025 using Rstudio to obtain species accumulation curve and calculate some diversity indices such as Shannon diversity index.
- Participate in the monitoring of the bird migration, learning how to remove birds from mistnets, ring and take few measurements.

Figure 3 - *Left*: The internship student counting the number of birds at the Douda mangrove in March 2025. *Right*: The internship student learning how to handle and perform measurements on birds with a Black-scrub robin (*Cercotrichas podobe*) at the Decan Wildlife shelter in March 2025.

Activity B: Listening to Nature: The use of Bioacoustics to study bird behaviour and a tool in conservation.

Passive acoustic monitoring (PAM) using autonomous recording units (ARUs) has become a popular technology used for diverse purposes such as: to report on species activity patterns, habitat use, survey and species assessment [**5**]. The decrease of the costs and the increase of efficiency make these ARUs more and more accessible and easy to use for a large panel of institutions (research institutes, universities, NGOs). However, the lack of good training to learn how to deploy such technology, and how to handle and analyze the amount of audio data generated might discourage local institutions and NGOs to use it in developing countries. The aim of this activity was to initiate university students to use such technology with a practical example: *Detecting the presence of an invasive bird species, the House crow (corvus splendens) in three protected areas in Djibouti* (Figure 4).

Figure 4 - A class at the University of Djibouti during which, students learnt how to analyze an audio recording, and to use BirdNet analyzer to automatically detect vocalization of a target species (in this case the House crow) in March 2025.

Methods

1- *Field deployment of ARUs*.

Song Meter Micro were deployed during few days within Assamo protected area (south of the country), Dittilou in Goda Mountains (north), and in Douda-Damerjog mangroves near

Djibouti city. The ARUs recorded in the morning the acoustic activity from 6:00 a.m. to 10:00 a.m. Then, one recorder was deployed within the city to record vocalizations of House crow, because the species colonized entirely urbanized area.

2- *Sound selection and automatic detection of House crow's vocalizations*.

In class, the students learnt how to manually select vocalizations within an audio recording using Raven Lite software and how to run an R script that read a selection table from Raven Lite, extract and save the vocalizations as individual audio file. Such procedure was applied to create a folder of 100 vocalizations of House crow and a second folder "Background" with 90 environmental noise extract of 3 sec each. The two folders were then used to train a custom classifier using BirdNet Analyzer. Then, the custom classifier was used to conduct an automatic detection of House crow's vocalizations within the recordings from the different protected area.

An alternative R script was presented to the students to automatically select and download recordings from xeno-canto website, choosing the species, the location, and the quality. Thus, they could use such audio files to train BirdNet Analyzer.

Outputs

- Students were introduced to bioacoustics (Supplementary Information 4).
- The House crow was detected only within the protected area of Douda-Damerjog. This is explained by its proximity to Djibouti city.
- The students learnt that passive acoustic monitoring could be used to detected invasive species within a protected area using free access software (Raven Lite, BirdNet analyzer, R Studio with bioacoustics packages such as *warbleR* and *seewave*).

Activity C: Become a birdwatcher: Bird watching, bird survey and citizen science

This activity was dedicated to a large public who wished to learn more about birds and would like to gain skills in observing and identifying local bird species. On several occasions, usually during the weekend, I organized a birding tour within the Douda-Damerjog protected area. An advertisement about the upcoming activity was broadcasted trough the social medias and people could book a place for the activity. The maximum number of people per session was limited

to 15 persons to facilitate the observation of birds. A field guide of 50 common local species (the same provided to students) was given with binoculars. A smartphone mounted on a scope was used to get a nice image of birds detected, which helped people to spot the birds, but also to look at it without the need of their binoculars. General information about the bird diversity of Djibouti and how to use application such as such as iNaturalist, eBird and African Bird Club where provided. The birding tour always started at the Decan wildlife shelter and ended at the Douda mangrove (Figure 5). It allowed people to see many species from two different habitat: acacias woodland and coastal mangrove.

Figure 5 - *Left:* Mathieu Mahamoud-Issa with the printed field guide of local common birds during a birding session with visitors at the Decan wildlife shelter. *Right*: Visitors watching birds at the Douda mangrove.

Total project budget

The funds were spent according to the initial budget of the project (Table 1). One adjustment has been made. I did not buy the book "*Guide d'identification des oiseaux en main*" because it was out of print at the moment. Also, I bought 2 instead of 3 field guides because the association managed the get one from someone. Moreover, the price of the Jumelles BUSHNELL Prime 10x42 was cheaper than expected. Also, the prices for the Song Meter decreased. Thus, I decided to buy two more binoculars to have a total of 8 binoculars. This will reduce the need of group of people to share the binoculars during the futures birding activities (Table 1). I also bought Sd cards for the Song Meters recorders.

Overall, I spent about 1891.6 GBP which was 21.6 GBP higher that the initial budget. This amount was covered by the Decan association.

Type of materials	Model	Quantity	Price (Unit)	Total (GBP)
automatic recording unit	Song Meter Micro Wildlife Acoustics	3	215	645
binocular	Jumelles BUSHNELL Prime 10x42	6	180	1080
book, field guide	Princeton Field Guides: Birds of the Horn of Africa	3	35	105
book	Guide d'identification des oiseaux en main	1	40	40
	Grand Total			1870

Table 1: Initial budget

Type of materials	Model	Quantity	Price (Unit, GBP)	Total (GBP)	Price (Unit, EUR)	Total (EUR)	Price (Unit, FDJ)	Total (FDJ)
automatic recording unit	Song Meter Micro Wildlife Acoustics	3	153.72	461.16	183	549	36417	109251
SD cards for recording unit	SD card MSD ULTRA+	2	33.58	67.17	39.98	79.96	7956	15912
SD cards for recording unit	SD card MSD ULTRA+	1	25.18	25.18	29.98	29.98	5966	5966
binocular	BUSHNELL Prime 10x42	6	150.97	905.84	179.73	1078.38	35766	214598
binocular	BUSHNELL Legend E-SERIE BLACK 10x 42mm	2	167.96	335.92	199.95	399.9	39790	79580
book, field guide	Princeton Field Guides: Birds of the Horn of Africa	2	48.17	96.34	57.345	114.69	11412	22823
	Grand Total			**1891.60**		**2251.91**		**448130**
	Funds			**1870**		**2226.19**		**443011.9**
	Balance			-21.60		-25.72		-5118
	budget update 18/05/2025							

Table 2: Budget spent for the project

References

1- Lepage, D., 2024. Checklist of the birds of Djibouti. Avibase, the world bird database

2- McGrady, M. J., Rayaleh, H. A., Dara, A. M., Abdillahib, E. (2013) Migration of raptors across the Bab el Mandeb Strait, Djibouti, March 2013. *Bull ABC*, Vol 21 No 1, p64-71.

3- Georgina Magin. Important Bird Areas in Africa and associated islands – Djibouti. https://datazone.birdlife.org/userfiles/file/IBAs/AfricaCntryPDFs/Djibouti.pdf

4- Fishpool, L. D. C. and Evans, M. I., eds 2001. Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation. Pisces Publications; Cambridge: Birdlife International, 2001.

5- Sugai, L.S.M., Silva, T.S.F., Ribeiro, J.W., Jr, Lusia, D., 2019. Terrestrial Passive Acoustic Monitoring: Review and Perspectives. BioScience 69, 15–25. https://doi.org/10.1093/biosci/biy147

Supplementary information

All supplementary information can be downloaded with the following links:

Supplementary information 1: https://drive.google.com/file/d/1-cpNyJM4i11l16eC0XxH3NaGZZ4eDEAf/view?usp=sharing

Supplementary information 2: https://drive.google.com/file/d/1BbOBAdOwB0fnA77OoSPIiSz_973hEF6Y/view?usp=sharing

Supplementary information 3: https://drive.google.com/file/d/1TOGQzvlw3kX2J36VPKcUGVUPKfJdLh61/view?usp=sharing

Supplementary information 4: https://drive.google.com/file/d/1fwlazcbxMYFuL-00TG2dyCApLzoU2TTF/view?usp=sharing