

Plant-herbivore interactions and their influences on the distribution of sub-Saharan antelopes in the Ouadi-Rimé Ouadi-Achim Fauna Reserve - Chad.



First field mission summary report – Rainy season 2024

15 July – 14 August 2024

Field team members:

Caleb NGABA WAYE TAROUM

Conservation Biology Laboratory, University of Neuchâtel (Switzerland)

DJONFABE TONG-BA Bienvenu

DJASBEYE Anaclet

KADEBE Jean

Master in Animal Production, Institut des Sciences et Techniques d'Abéché (Chad)

YOUSRA Mahamat SABOUN

Master in Animal Production, Institut de Recherche en Elevage pour le Développement (Chad)

MBANGHOGUINA Clotaire

TEPMON SENNENE Dieudonné

Ecogardes, Secteur de faune Sud OROAR – Batha (Chad)

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Introduction

This summary report presents all the activities carried out from July 15 to August 14, 2024, for the collection of field data as part of the doctoral research work of student Caleb Ngaba Waye Taroum. This report sets out the purpose of the mission, a brief reminder of the methodology for collecting the different types of data sought as well as a preliminary overview of the data obtained at the end of this first field mission in the Ouadi Rime Ouadi Achim wildlife reserve. It should be noted that this mission is the first in a series of three missions, the other two of which should be carried out at the end of the rainy season (October 2024) and in the middle of the dry season (between March and May 2024). This mission was carried out with the authorization of the competent authorities of Chad (Ministry of the Environment, DFAP and IRED), under the supervision of the Conservation Biology Laboratory of the University of Neuchâtel and the Institute of Science and Technology of Abéché (INSTA). We have the administrative and logistical support of Sahara Conservation, the technical support of Katherine Mertes (SNZCBI), the Functional Biology Laboratory of the University of Neuchâtel and Stephanie Brien (University of Edinburgh). The Swiss Confederation Excellence Scholarship supports our training at the doctoral school of Life Science of the University of Neuchâtel and we benefit from the financial support of the Fondation Segré Conservation Action Fund 2024 under the aegis of the IUCN Save Our Species Secretariat.

I. Purpose of the mission

This field mission is part of the agenda of the doctoral research project entitled: "Plant-herbivore interactions and their influences on the distribution of sub-Saharan antelopes in the Ouadi Rime Ouadi Achim Wildlife Reserve in Chad". Its specific objectives were:

- To inventory and sample the woody and herbaceous flora of the reserve at the beginning of the rainy season. This is in order to study the phytosociological characteristics of the reserve's ecosystems as well as the constitution of ecological niches shared between the reintroduced antelopes (*Oryx dammah* known as "Oryx" and *Addax nasomaculatus* known as "Addax") and the four major domestic species present in the reserve (cattle, sheep, goats and camels);
- To sample the feces of the aforementioned mammalian species in order to analyze the composition of the diets of each to deduce similarities. But also to identify diseases common to the two wild mammals (Oryx and Addax) and the four domestic ones (cattle, sheep, goats and camels);
- Carry out a questionnaire with the breeders encountered in the reserve in order to establish a map of the numbers and distribution of livestock in and around the reserve.

The initial plans made for this mission were as follows:

- Make an inventory (of woody plants and grasses) on thirty (30) super-plots of 50 x 50 m distributed randomly so as to cover the distribution area of the oryx and addax for the period from June 15 to July 15, 2024;
- Sample at least 300 plants (woody plants and grasses) for metabolomic analyses on all thirty super-plots of 50 x 50 m;
- Collect 30 fecal samples for Oryx and Addax as well as 10 for each of the four targeted livestock species (cattle, sheep, goats and camels);
- Conduct 30 interviews with the breeders present in the reserve.

II. Mission details

July 15, 2024: Meeting with the administration of Sahara Conservation in N'Djamena. Presentation of the purpose of the mission and planning of the trip to Abéché with UNHAS.

July 16, 2024: Meeting with the Director of Forests and Protected Areas of Chad. Presentation of the objectives of the mission following previous email exchanges for the introduction of a research authorization in the reserve. Introduction of the authorization request to the Director General of the Ministry of the Environment for approval and final signature.

July 17, 2024: Meeting with the Secretary General of the National Bioethics Committee of Chad (CNBT) and at the same time Scientific Coordinator of the Livestock Research Institute for Development (IRED). A verbal agreement was granted by the Secretary General of the CNBT concerning the collection of fecal samples from reintroduced antelopes and livestock. It was agreed with IRED that a Memorandum of Understanding (MoU) be drawn up between the University of Neuchâtel, IRED and the University of Edinburgh in order to facilitate the analysis and export of samples outside Chad. The latter for adaptation submitted a draft of the MoU. It was also agreed that a Master I student at IRED could join the project in order to enable it to formulate a research theme on zoonosis common to livestock and wildlife in the reserve.

That same day, we then had a meeting with the Head of the Animal Production Master of the Institute of Sciences and Techniques of Abéché (INSTA), present at IRED, in N'Djamena that day. We discussed the involvement of the three Master II students at INSTA as well as the outlines of their research themes. Pr. Tellah (Head of the Animal Production Master) is supervising a student who should work on the dynamics and distribution of livestock in the reserve.

July 18, 2024: Arrival in Abéché in the morning, a meeting took place with Dr. Béchir Ali (PREPAS Senior Advisor) in charge of supervising two INSTA students who should work on grasses and woody plants in the reserve. Together with him and the three INSTA students, we updated the data collection protocol, reviewed the questionnaires for breeders and updated the data encoding sheets in the field. Then we updated the list of equipment needed for dendrometric and phytosociological measurements.

July 19-20, 2024: with the INSTA students, we purchased the field equipment and made the missing specific tools (sampling quadrat, graduated pole, herbarium supports, etc.). The IRED student joined us from N'Djamena on the evening of July 20, 2024.

July 21, 2024: Departure for the oryx base. We had to spend the night in Biltine, since the main dam to exit Biltine to the oryx base was destroyed by the pressure of the waters of Ouaddi and the water continued to flow with great pressure. It was on the afternoon of July 22 that we were able to reach the oryx base.

July 22, 2024: Exchange with Dr. Tim Wachter and the ecological monitoring team to explain the objectives of the mission and request the availability of certain materials necessary for the collection of fecal matter in the field. We were able to obtain the requested additive materials, namely : a GPS 276 CX for navigation, 4ml cryotubes, ethyl alcohol, gloves, pipettes and a cooler as well as ice tubes. We obtained authorization from Katherine Mertes for the use of a solar refrigerator to transport the fecal samples to the IRED Lab in N'Djamena.

July 23-30, 2024: Field collection and camping trip for floristic inventories, collection of fecal samples and interviews with the breeders encountered in our fieldwork circuit.

August 1, 2024: Meeting with the Country Director of Sahara Conservation to report on the field mission and thank for the support provided by the institution.

August 2, 2024: Meeting with the Director of Wildlife and Protected Areas to report on the mission and thank for the support provided by the State for our research work.

August 14, 2024: Receipt of samples at the Sahara Conservation office and convoy to the IRED Lab for storage at optimal temperature conditions awaiting analysis and export.

III. Methods and Main preliminary outcomes

3.1. Grass inventory

The grass inventory was done using 50 x 50 cm quadrats. In each 50 x 50 m super plot, five 50 x 50 cm quadrats were placed at 10 m equidistance along three 50 m transects. In all, 375 50 x 50 cm quadrats were inventoried for the identification of grasses.

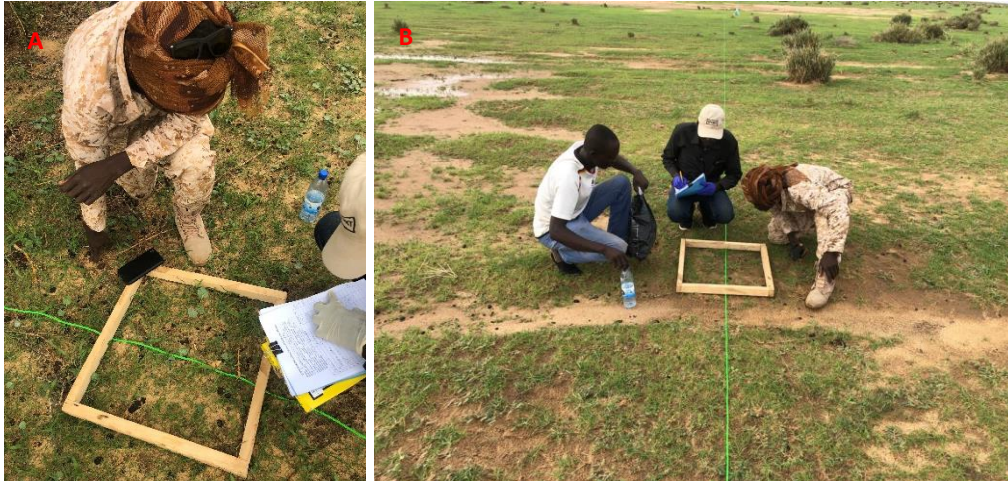


Table. 1 A) Quadrat of 50 x 50 cm ; B) Positioning of the quadrat on a 50 m transect

A total of 1369 grass shoots were identified, 75 of which were unknown at the end of the inventory. According to the provisional count, nine species divided into five families stand out from the entire sampled population. These are in order of importance: *Indigofera colutea*, *Cyperus amabilis*, *Urochloa trichopus*, *Citrullus colocynthis*, *Aristida mutabilis*, *Tribulus terrestris*, *Aristida funiculata*, *Seetzenia africana*, *Cenchrus biflorus*.

We are continuing the herbarium identification campaign in order to decide on unknown species and thus increase the identification rate of inventoried species. For each individual identified, a visual estimate of the species coverage was carried out in the 50 x 50 cm area. This will eventually allow us to estimate the total coverage of each species of grass for all inventoried areas.

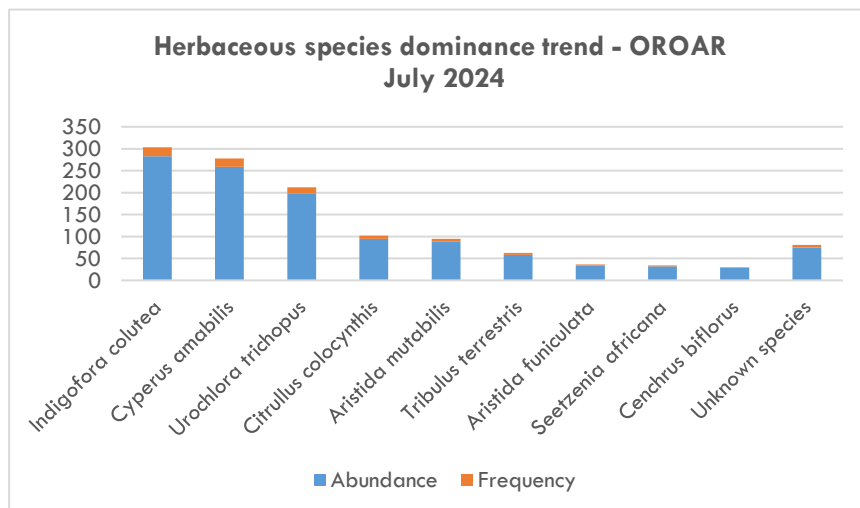


Fig 1. Trend of dominant grass species - OROAR July 2024

3.2. Tree inventory

A population of 79 individuals was inventoried for all 25 super plots of 50 x 50 m. The super plots were generated in space following the estimation of a Minimum Convex Polygon (MCP) based on the (cumulative) dispersal area of Oryx and Addax for the period from June 15 to July 15, 2024. Within each super plot, three transects 50 m long and equidistant from 10 m were used as a basis for the inventory. All individuals of height greater than or equal to 1 m identified 10 m on either side of each transect were inventoried. In order to estimate the natural regeneration rate, the shoots or living stump identified 10 m on either side of each transect were also recorded.



Table. 2 C) Height measurement using a graduated pole; D) Circumference measurement

Each tree was identify taxonomically as well as the locally known vernacular name. Then, the dendrometric parameters measured are height, circumference at breast height, coverage and number of shoots per foot. Seventy-five transects were inventoried on all 25 super plots visited. The provisional trend indicates five species divided into three families on the entire inventory population.

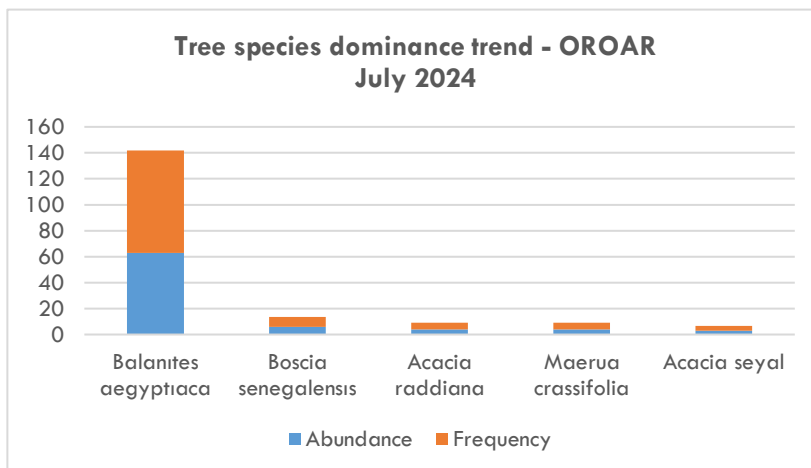


Fig 2. Trend of dominant tree species - OROAR July 2024

3.3. Plants extracts sampling

On all 25 super plots (50 x 50 m) visited, plant extracts (leaves and/or whole tuft for young grass shoots) were sampled. In the case of grasses, sampling was done by elimination from one (50 x 50 cm) plot to another. At the first plot of each super plot, a specimen of all the species identified is systematically sampled. Then, for the other 14 plots, the presence of individuals of the previously sampled species is again notified in the survey sheet, but no longer sampled. The same exercise is repeated for all 374 other 50 x 50 cm plots.

All samples were taken using gloves sterilized with ethyl alcohol to avoid any alteration of the genome of the species collected. For trees, the extracts were additionally collected using a sterilized secateur. Each of the plant extract samples was packaged in sterilized paper tea bags and then dried inside 15 ml tubes using silicate gel.



Table. 3 E) Grass sample on a tea bag with tube ID ; F) tree extract sampling with tube ID
 For trees, thirteen leaf samples were collected for the five species identified (Figure 3).

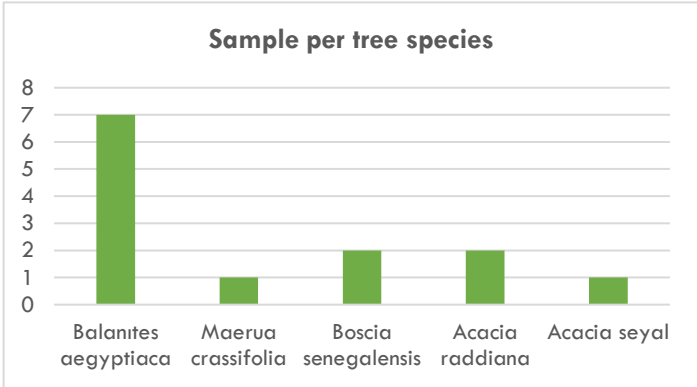


Fig 3. Number of sample per tree species - OROAR July 2024

Concerning grasses, 184 samples divided into 20 species, including 14 from unknown species, were collected (Figure 4).

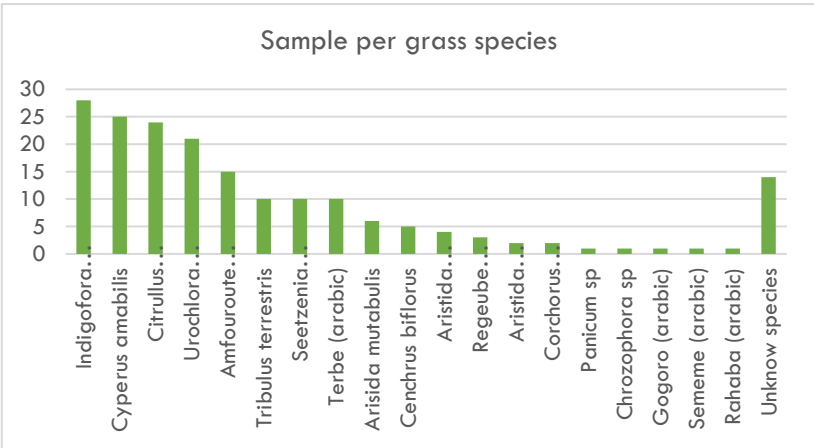


Fig 4. Number of sample per grass species - OROAR July 2024

3.4. Fecal sampling campaign and livestock breeders' interviews

At the end of this first mission, we were able to collect 83 samples of fecal matter for all six-target species. The sampling principle consists of locating a group and collecting the droppings of one individual in the group. That said, each sample corresponds to a group of at least two individuals observed for all species.

For each sampling, we took care to observe and record the relative health of the individual sampled based on its body condition. This is how we were able to collect two dead Oryx in the rectum (Figure 5). A count of the size of the groups encountered and sampled allowed us to observe a predominance of camels followed by sheep, overall six-target mammal species (Figure 6).

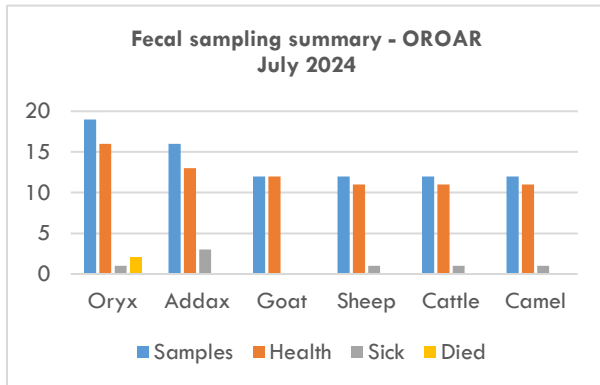


Fig 5. Fecal sampling campaign summary per species

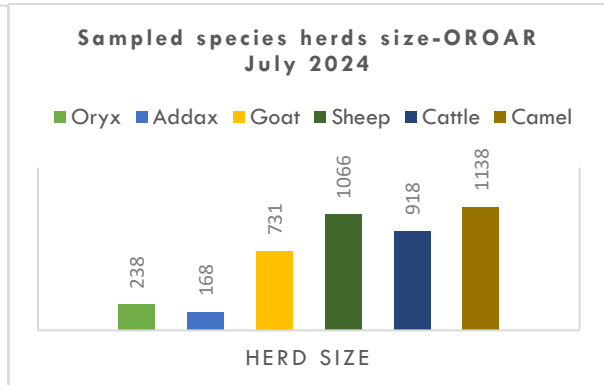


Fig 6. Observed and sampled herd size per species

The interviews were conducted mostly with the owners and/or keepers of the herds encountered. This allowed some samples of fecal matter to be located in the same place as some interviews. A majority of the interviewees are natives of Arada, while some of the 25 interviewees come from the surroundings of Haraz-Djambo and Mielé. The analysis of the questionnaires in progress will allow us to have information on: places of origin, species raised, method of acquisition of livestock (purchases, inheritance, gifts or bequests), transhumance routes and periods, estimation of the size of livestock owned and the perception of the cohabitation of wildlife with livestock. Some questions were also asked about their knowledge of animal health and common diet for livestock and antelopes reintroduced into the reserve.

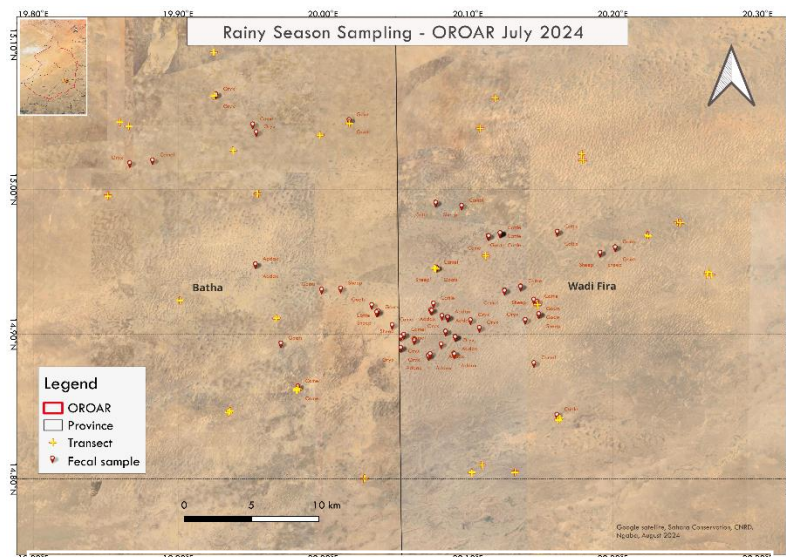


Fig 6. Rainy season sampling representation (OROAR, July 2024)

Perspectives

- Continue data grooming in preparation for biostatistical analyses with R and analysis of GPS collar movement data.
- Conduct second field mission between 05 to 30 October 2024 to send faecal samples to Edinburgh for analysis, before December 2024.
- Investigate the possibility of doing only two data collection missions instead of three, given time and insufficient funding to analyse more samples.