DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title:	Socioecological dynamics of miombo woodlands in Southeast Angola
Travel Dates:	November 5th-November 26th, 2021
Location:	Moxico Province, Angola
Group Members:	Luisa Escobar, Chris Andrews
Aims:	To study the characteristics of anthropogenically undisturbed miombo and to understand human impacts on this vegetation type in southeast Angola

Photography consent form attached: (*please refer to your award letter)*

☒ Yes
☐ No

Background

Miombo woodlands provide many ecosystem services and products to rural livelihoods in Africa. They are also an important habitat for a high diversity of plant and animal species (including elephants, lions and wild dogs), and a diversity of birds and insects. However, due to the high reliance by humans, most miombo has been highly utilised. Southeast Angola contains the largest contiguous area of anthropogenically undisturbed miombo in Africa, which for a long time remained greatly inaccessible due to war conflicts. Because of its intactness, it provides a unique opportunity to understand the structure and diversity of miombo vegetation and the consequences of human use, which in turn could help us understand better how to protect this unique ecosystem.

Aim

The aim of my project is to gain quantitative and qualitative understanding of the ecological and social dynamics surrounding miombo woodlands in southeast Angola. Woodland composition, structure and diversity in utilised and unutilised miombo will be studied through the setting up of vegetation plots. This information can contribute to a better understanding of the baseline condition in miombo ecosystems and the consequences of different levels of human use in this ecosystem, in addition to the generation of knowledge regarding the current flora in southeast Angola. Furthermore, interactions among local communities and miombo species; including locals' understanding of the spatial distribution, their preferences and uses of woodland resources, will be explored. This could help us understand how humans have shaped the woodlands and how the composition of the woodlands has shaped human livelihoods.

Outcomes of the expedition

From November 5th to November 21st, we travelled to southeast Angola (Figure 1) where I collected information on vegetation patterns, dominant miombo species and human livelihoods. I visited 8 villages (Table 1) which resulted in the collection of baseline information about these. Meanwhile, the vegetation surrounding each one of these villages was studied, while also recording observations and collecting data of land cover types while traveling from one village to the other.

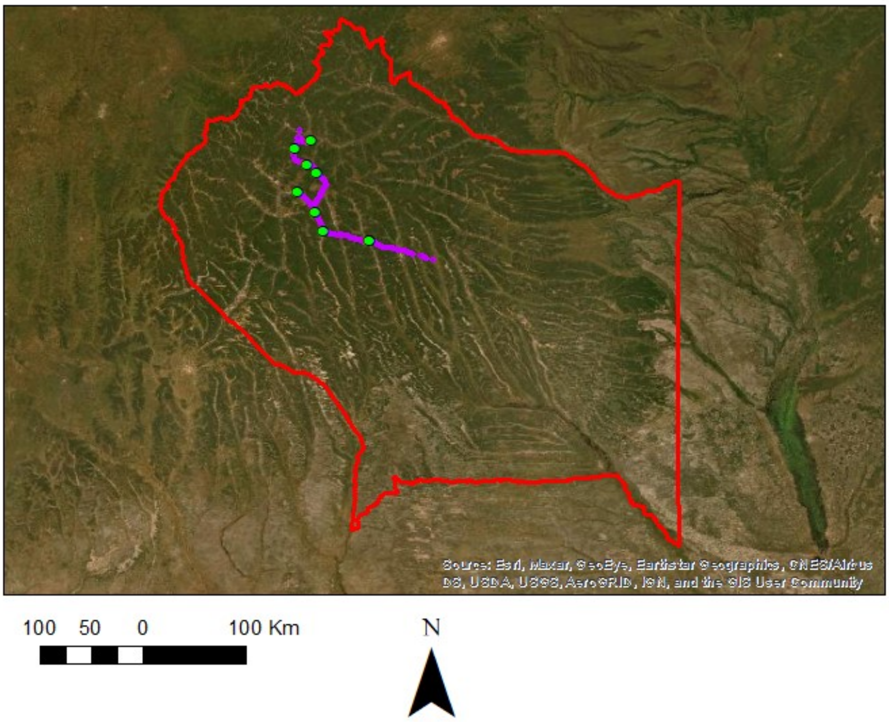

Figure 1. Track (in purple) followed from November 6th to November 20th through 8 villages (in green) in the miombo highlands of southeast Angola

Table 1. Villages visited on the November 2021 field visit

Date	Village	Elevation
11/11/2021	Sayosua	1250
12/11/2021	Tempué	1378
13/11/2021	Samangongo	1394
15/11/2021	Pueia	1360
16/11/2021	Samunonga	1372
18/11/2021	Sete	1350
19/11/2021	Sachindamba	1337
20/11/2021	Sachingamba	1342

Ecological data

1. *Collection of vegetation data*

1.1. *Plant species*

As this trip is the first one of three trips in total, the collection of plant specimens in miombo vegetation was focused mainly on identifying dominant species (Figure 2). Plant specimens were identified using Coates Palgrave (2002). Different species of *Brachystegia* spp. and

Julbernardia were often found, and less frequent presence of *Pterocarpus* spp., *Guibourtia* spp., *Dialbergia* spp., and *Terminalia* spp., was found.

Figure 2. Photographs of some of the most common species on the study area in southeast Angola.

1.2. Land covers

Patches of dense forests with no understory, followed by patches of less dense forests with greater cover of understory, followed by areas of a grassy understory with low tree density occur frequently in the region (Figure 3). Soils change colour, texture and depth within small distances. The complexity of the vegetation seems to be related to the changes in elevation. The more dense forests are found in the highest areas (around 1500 masl), with almost no villages at these heights. Villages seem to develop their livelihoods around 1300 masl (Table 1), near the edge of the slope that conducts to a water body. It seems like locals have at least four different land covers that they depend on: woodlands with a medium to high tree density (depending on the level of disturbance) and with no grassy understory but a variable shrub understory; the "chana" or savannah with a grassy understory and a low tree density and size; the grasslands/peatlands in the perimeters of the rivers and lastly the rivers. These land covers provide them with different products and services necessary to develop their livelihoods such as:

-Woodlands: for the collection of bark for honey bee production (men), firewood for cooking (women), wood for construction (men), and roots for medicinal purposes. Fertile areas are also found here which are used for crop production (women), and used by men for hunting (although they report that the density of mammals has decreased, so now they have to travel further from the villages to find wild animals for bushmeat).

-"Chanas": for the collection of fruits during the wet season (in charge of the children) and for some medicinal plants.

-Grasslands: for the collection of thatch grass for roofing.

-Water bodies: to collect water for cooking and drinking (women), fish (both women, men, and children), to bathe and to wash clothes (women).

Figure 3. A) Dense forest, B) *chana* or savanna, C) grassland and river, and D) aerial pictures showing woodlands, savannahs, grasslands and rivers. Land cover in the region seems to present a complex pattern of different vegetation types within small distances.

Additionally, when walking around the villages to understand the disturbance levels on the surrounding vegetation I found that disturbance is more intense closer to the villages, however, the levels of disturbance are not uniform. Thus, the stages of forest succession are different in different directions and distances away from the village (Figure 4). This looked like a form of management (although informal); this is, the timing for the harvesting of wood differs around the woodland, and the more used areas are being left to recover. In spite of the disturbance, many areas seem to be recovering and regrowing a dense understory and a less dense tree cover. In addition, some locals report that the “chanas” (savannas) are shrinking and the forests are expanding.

Figure 4. Pictures of the different vegetation structure around one village. In some parts, there were just a few trees with a dense understory, in others there was a very dense understory but no tall trees and in others, there was a dense understory with some tall trees. The further I walked the more bigger trees I found.

Furthermore, in most villages locals have different names for the woodlands surrounding their village (in Pueia there were up to 6 different names for them, with these located in different directions). According to them, the names relate to the river that delimits that forest, but it would be interesting to see if they also name them differently because these different parts have dissimilar characteristic and thus, provide diverse services/goods.

2. *Collection of data regarding human interactions with woodland resources*

Different methods were used to understand the relationship that humans have with woodland resources, these included:

-Household surveys

-Community profiles

-Focus group discussions

From these, the main observations were:

The main activities on the villages are:

- Honey bee production (to sell)
- Hunting (mostly for selling, although some for self-sustenance)
- Crop production (mostly for self-sustenance, some for selling)

The activities that are most important to locals seem to be household-dependent. Some houses reported to make more money from selling bushmeat while others from selling honey. Thus, in terms of cash income, the experience and ability of the producer/hunter might determine which activity is the most important for that household.

Locals seem to be nearly 100% dependant on the natural resources that surround them

The low quality of the roads keeps the local inhabitants' possibilities of connecting to markets very low (which somehow has protected these natural places), which leads them to develop their livelihoods from natural resources around them. When asking them about the importance of the different land covers that they have access to, most people responded that forests and rivers are the most important ones for their livelihoods. When asking them to pick the most important between those two, most people chose the woodlands (mainly because they obtain a lot more products from the woodlands than from the river, especially products that contribute to their cash income). In addition, the activities surrounding woodland products seem to be gender specific. The goods they obtain from the miombo are (Figure 5):

-**Firewood**: collected by women and children on a daily basis

-**Construction**: to build houses (door, structure, ceiling), kitchens (which are an independent building from the house), toilets, churches and shops (*cantina*, in very few villages)

-**Honey production**: Use of the bark of around 4 different tree species to create beehives. Use seems to be of low intensity

-**Wood products for the house**: chairs, grinder to make cassava flour (*pilão*), spoons. Making these products seems to be differentiated by gender, i.e., the *pilão* (tool to grind the cassava) is made by women

-**Tools for hunting and fishing:** fishnets, arrows, bows (made by men).

-**Fences**: for livestock and to protect some crops grown in the village

Figure 5. House, kitchen, toilet, fenced crops, utensil to transport wood, poles to hang clothes, chicken house and beehive.

Conclusions

-Miombo woodlands in southeast Angola seem to be dominated by *Brachystegia spp.,* and *Julbernardia spp.*
-Vegetation patterns seem to be complex and diverse, with tree density being highly variable.
-Disturbance levels in woodlands around villages differ from one place to another.
-Locals' seem to be highly dependent on their natural resources, extracting most products of their lives from the woodland.

Future work

In order to obtain data on the species diversity, floral composition and stand structure of the miombo woodlands in the region, vegetation plots will be set up. The Socio-Ecological

Observatory for Southern African Woodlands (SEOSAW, https://seosaw.github.io/) methods will be used for this work, and will include five 1 ha permanent plots in "undisturbed" miombo vegetation (> 5 km away from the villages) and 15 50 x 50 m plots around three villages (< 5 km away from the villages). Villages will be chosen based on their ease of access, safety and level of woodland coverage

Additionally, the method 'participatory mapping' will be implemented, which consists of creating maps with the knowledge of locals to identify different land cover types and location of different resources. These will be used to establish the locations of the vegetation plots around the villages. Furthermore, interviews and focus discussion groups will be implemented to understand which tree resources locals are using, for what purposes and the amounts used. Ideally, integrating the ecological and social data will give us an understanding of the underlying reasons for the changes in miombo vegetation and will help us understand the impact of humans on this type of vegetation.

Lastly and hopefully, this work will contribute to the creation of effective conservation planning, with a clear component of being inclusive with local livelihoods and traditional knowledge. This type of interdisciplinary work could also encourage us to safeguard customary knowledge and translate it into scientific language, so that the wider scientific community can learn from traditional ways of managing and preserving natural resources.