Detailed Final Report Project

Title: Diversity, ecology and conservation status of amphibians of the Tchabal Mbabo, a key biodiversity area in Cameroon

The following is the detailed final report project of the execution of our project conducted from March 2021 to February 2022. Four main villages (Sambolabo, Mayo Barkedje and Fungoi and Mayo Barkedje) have been identified around the study site.

After obtaining the research permit from the Ministry of Scientific Research and Innovation, we have started the work on the field.

The different objectives of this project were to: (1) study composition, distribution, and status of amphibians, (2) Understand factors (vegetation, seasonality, habitat, human activities) influencing the occurrence of the batrachofauna (3) collect GPS coordinates of breeding sites, and (4) Develop tailored conservation strategy involving awareness-raising.

Objective 1:

Study composition, distribution, and status of amphibians in our key biodiversity area (Tchabal Mbabo mountain):

a) Biological sampling method:

Based on previous field observations, transects of 1 km each were demarcated beside water bodies/puddles and preferably along an altitudinal gradient during the first field visit, then surveyed monthly. Transect design and randomized walk design were adopted for this study (following Crump and Scott 1994). This technique involves choosing random directions and walking set distances (500 m) in each direction. Habitat parameters were collected every 100 meters along the transect as well as the presence of amphibians following the methods proposed by Rödel and Ernst (2004). Visual encounter surveys: Surveys were conducted to have a holistic view of the mountains following an altitudinal gradient by four surveyors. Opportunistic visual encounter surveys (Crump and Scott, 1994) were the predominant survey method used, as well as searching for microhabitats, inspecting stems, logs, holes, cracks, slopes, and stones with a focus on habitats near water bodies including puddles. Surveys were undertaken both during the day (from 6:30 a.m. to 10:30 a.m.) and at night (from 7:30 p.m. to 11:30 p.m.) (Rödel and Ernst 2004) by walking quietly through various habitats. Logs and rocks were restored after searching to reduce habitat alteration and all materials were sterilized before each field survey to avoid the dissemination of the deadly fungus *Batrachochytrium dendrobatidis*. Frogs were captured by hand, specimens identified and photographed then released at the point of capture. The point of capture and breeding site were carefully recorded using a GPS device. Figure 1 below is an illustration.

b. Data analysis

iNEXT v2.0.20: An R package for rarefaction and extrapolation of species diversity (Hill numbers). iNEXT was used to measures of Hill numbers of order q: species richness (q=0), Shannon diversity (q=1, the exponential of Shannon entropy) and Simpson diversity (q=2, the inverse of Simpson concentration). For each diversity measure, iNEXT uses the observed sample of abundance to compute diversity estimates and the associated 95% (default) confidence intervals as well as plot the rarefaction and extrapolation (R/E) curves (Chao et al., 2014; Hsieh et al., 2016).

Figure 1*: Principal investigator in the taking of the picture, GPS coordinate and identifying the frog during the night survey in the Mayo-Kelele (Matelela river).*

b) Result and discussion of the study of composition, abundance and distribution of amphibians in our study site.

A total of 508 specimens of frogs (339 in Sambolabo, 91 in Mayo-kelele, 54 in Fongoi, 24 in Mayo-barkedje) were observed divided into 13 different species from 10 genera and 6 families in 4 sample sites.

Site 1, Fungoi: Habitat type: gallery forest. Here we had 2 transects and, we had 5 different species from 2 genera and one family (**Arthroleptidae**).

Transect 1 near Fournae Lassobiwa River: GPS coordinate: 07.25251N 012.05965E 2063 m. Here we had a total of 22 specimens of *Astylosternus rheophilus*, 6 specimens of *Astylosternus sp1*and 16 specimens of *Astylosternus sp2* and 6 specimens of *Astylosternus sp 3.*

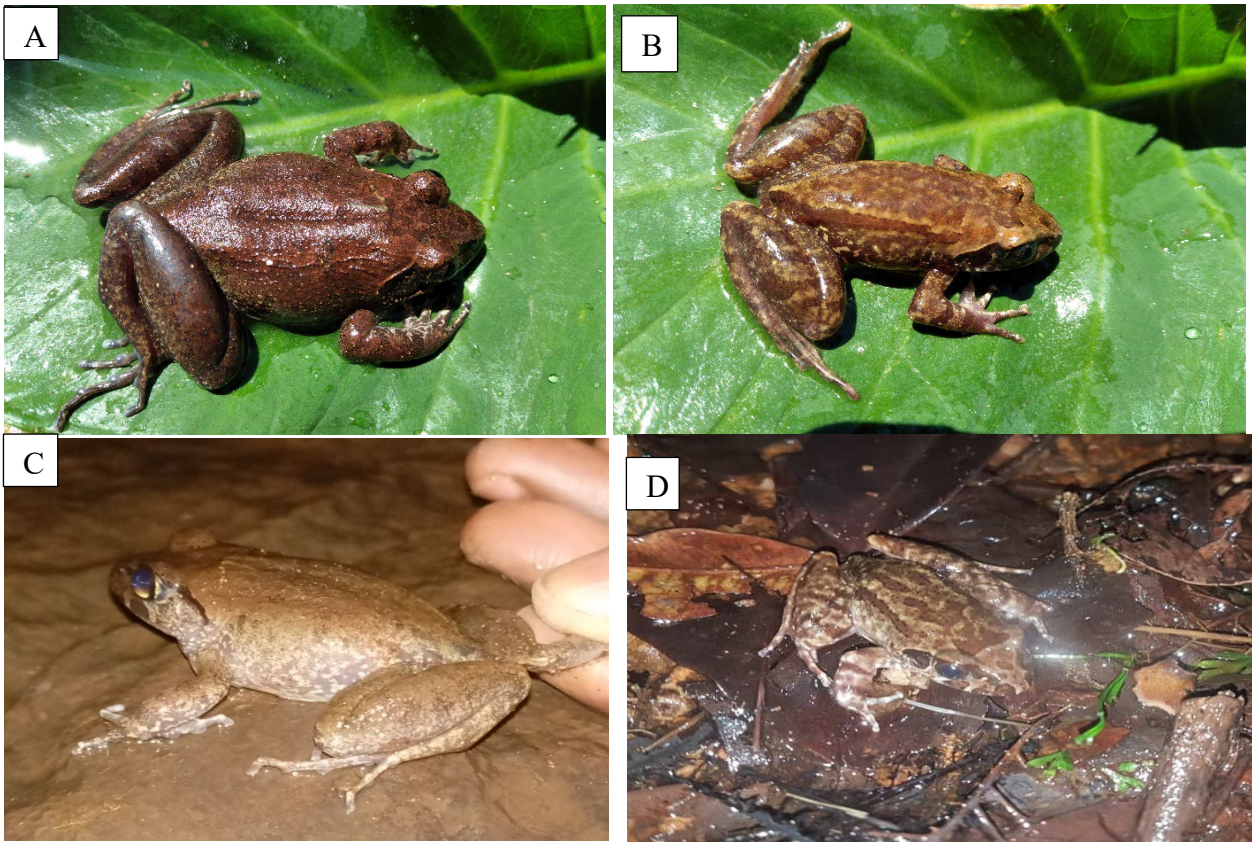

Figure 2*: A= Astylosternus rheophilus, B= Astylosternus sp1, C= Astylosternus sp2 D = Astylosternus sp3*

Transect 2 near Mayim River, GPS coordinate 07.22753N 012.03918E 1857 m.
Here, we had 4 specimens of *Arthroleptis palava* (**Arthroleptidae**).

Figure 3*: Arthroleptis palava*

Site 2, Mayo-Kelele: Here we had 3 transects, 8 different species from 6 genera and 5 families.

Transect 1: near Matelela River. GPS coordinate 07.17837N 012.02694E 1684m; Habitat type: gallery forest.
Here we had 2 specimens of *Hyperolius riggenbachi* **(Hyperoliidae)**, 10 specimens of *Hyperolius igbettensis,* 16 specimens of *Leptopelis norequatorialis* **(Arthroleptidae)** and 15 specimens of *Xenopus cf. eysoole* **(Pipidae)**.

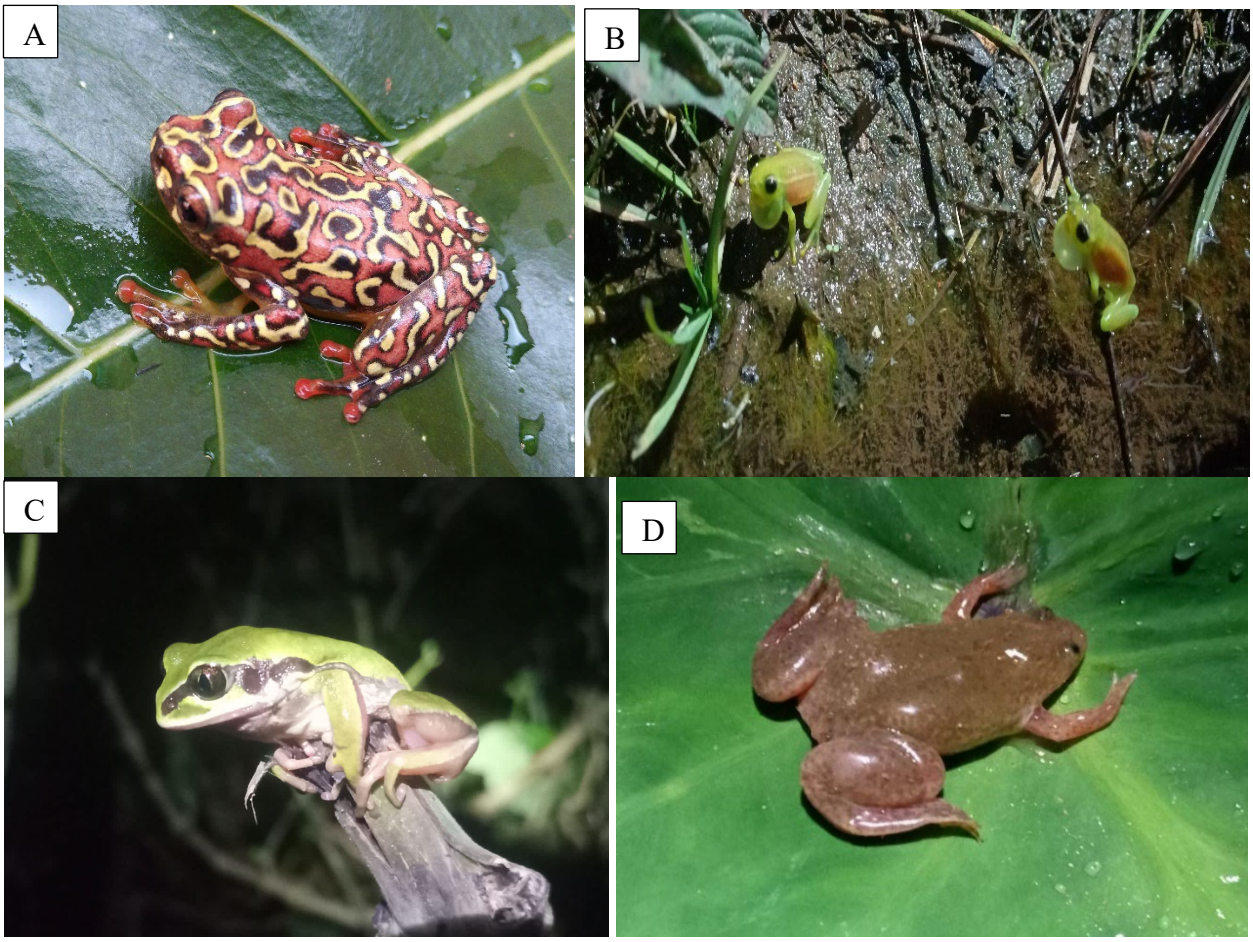

Figure 4*: A= Hyperolius riggenbachi, B= Hyperolius igbettensis. C= Leptopelis norequatorialis D= Xenopus cf. eysoole.*

Transect 2: near Moussa River. GPS coordinate 07.16856N 012.02791E 1644m. Habitat type: gallery forest.
Here we had 6 specimens of *Hyperolius igbettensis*, 17 specimens of *Leptopelis norequatorialis* and 1 specimen of *Sclerophrys cf maculata* (**Bufonidae**).

Figure 5*: Sclerophrys cf maculata*

Transect 3: near Alim River. GPS coordinate 07.16359 N 012.02619 E 1642 m. Habitat type: Savannah.
Here we had 1 specimen of *Ptychadena mascareniensis* (**Ptychadenidae**), 6 specimens *Ptychadena cf. oxyrhynchus,* 3 specimens of *Hyperolius igbettensis* and 13 specimens of *Leptopelis norequatorialis.*

Figure 6*: A= Ptychadena mascareniensis B= Ptychadena cf. oxyrhynchus*

We also had 2 specimens of *Arthroleptis poecilonotus* (**Arthroleptidae**) around Mayo-Kelele village with GPS coordinate: 07.11246N 012.04386E 1697m. Habitat type: Savannah.

Figure 7*: Arthroleptis poecilonotus*.

Site 3, Sambolabo: here, we had 3 transects, 8 species and 6 genera from 5 families.

Transect 1 near Goumti River: GPS coordinate: 07.08722N 011.98515E 1013m. Habitat type: Savannah.

Hyperoliidae: in this family, we had 1 specimen of *Hyperolius balfouri viridistriatus;* 1 specimen of *Afrixalus cf. fulvovitatus* and 25 specimens of *Hyperolius igbettensis.* We also had 52 specimens of *Ptychadena cf. oxyrhynchus* and 36 specimens of *Ptychadena mascareniensis (***Ptychadenidae***);* 9 specimens of *Leptopelis nordequatorialis;* 1 specimen *of Leptopelis sp;* 57 specimens of *Xenopus cf. eysoole* and 11 specimens of *Sclerophrys cf maculate.*

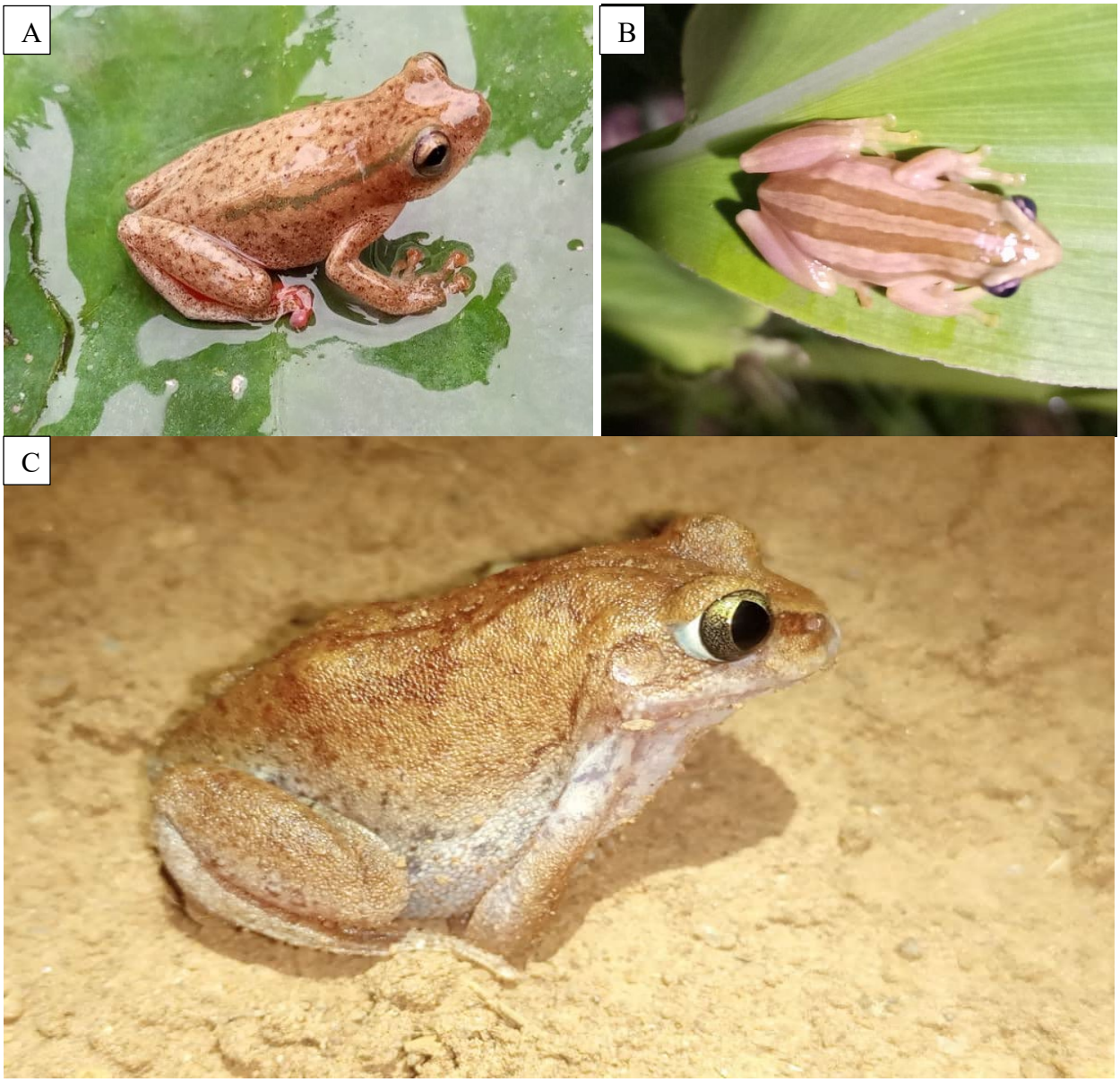

Figure 8*: A=Hyperolius balfouri viridistriatus, B=Afrixalus cf. fulvovittatus; C= Leptopelis sp.*

Transect 2 near Sarbo-Gari River: GPS coordinate: 07.09111N 011.97974E 1033m. Habitat type: Savannah
Here, we had 18 specimens of *Xenopus sp* (**Pipidae**); 105 speciemens of *Sclerophrys cf maculate* and 5 specimens of *Ptychadena mascareniensis* (**Ptychadenidae**).

***Figure 9**: Xenopus sp*

Transect 3 near Mayo-Garwoul: GPS coordinate: 07.09726N 011.94026E 1093m, Habitat type: gallery forest.
Here, we had 6 specimens of *Xenopus cf. eysoole and* 1 specimen of *Xenopus sp* (**Pipidae**), 2 specimens of *Hyperolius igbettensis,* 1 specimen of *Hyperolius balfouri viridistriatus and* 3 specimens of *Afrixalus cf. fulvovitatus* (**Hyperoliidae**), 2 specimens of *Sclerophrys cf maculata* (**Bufonidae**), 1 specimen of *Ptchychadena mascareniensis* (**Ptychadenidae**) and 2 specimens of *Phrynobatracus cf natalensis* **(Phrynobatrachidae).**

Figure 10*: Phrynobatracus cf natalensis*

Site 4, Mayo-Barkedje: GPS coordinate: 07.08956N 011.97644E 1016 m. Habitat type: gallery forest.

Here we had 3 specimens of *Afrixalus cf. fulvovitatus,* 6 specimens of *Hyperolius igbettensis* and 1 specimen of *Kasina senegalensis* (**Hyperoliidae**), and 14 specimens of *Xenopus sp* (**Pipidae**).

Figure 11*: Kasina senegalensis*

The mean of our observations was higher in Sambolabo (x=17.84 ± 31.18) and lower in Mayo barkedje (x=1.26 ± 3.43). Also, the total number of specimens found at Sambolabo (339) at an altitude of 1013m asl is much higher than that found at Fongoi (54) at an altitude of 2063m asl; this would mean that species richness decreases with altitude as also mentioned (Miraldo et al., 2016).

Species richness (q=0), Shannon diversity (q=1) and Simpson diversity (q=2) were highest at the Sambolabo site in contrast to the Fongoi and Mayo-barkedje sites where they were very low as shown in Figure 12 below.

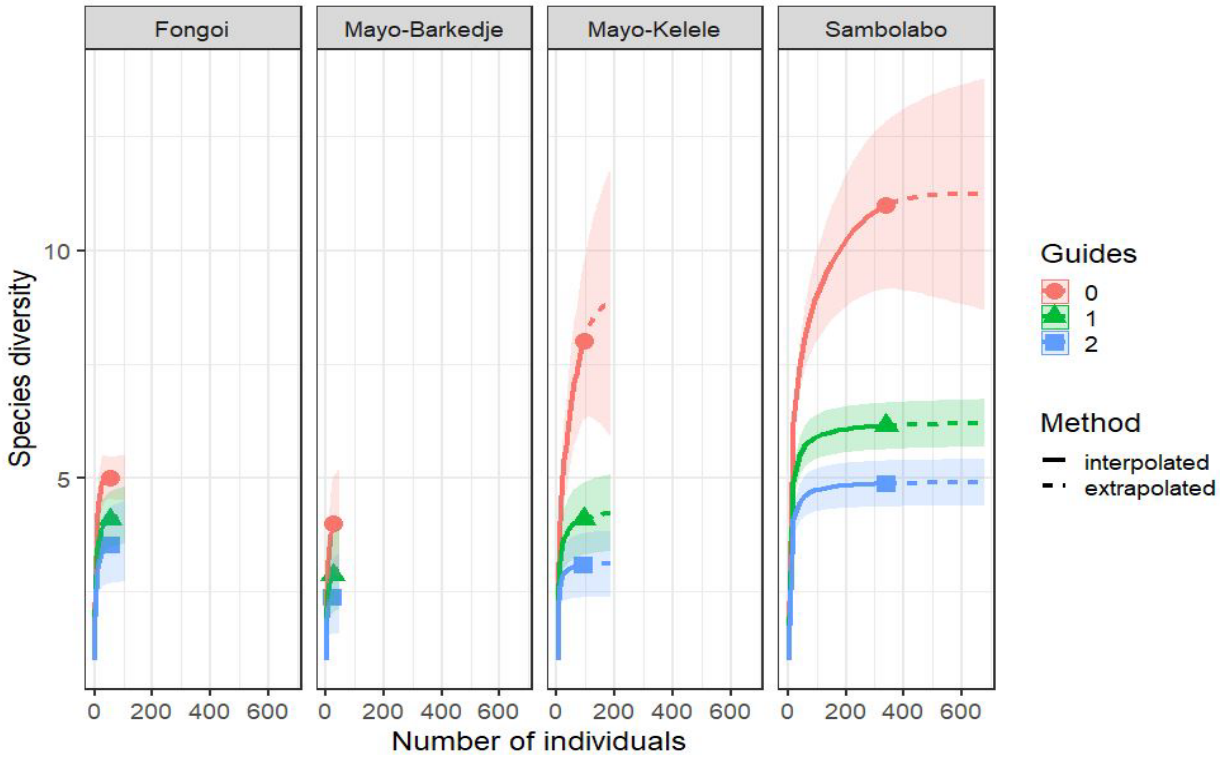

***Figure 12**: the sample-size-based rarefied and extrapolated sampling curves*

Objective 2: Understand factors (vegetation, seasonality, habitat, human activities) influencing the occurrence of the batrachofauna.

a. Method

Habitat parameters were collected every 100 meters along the transect as well as the presence of amphibians following the methods proposed by Rödel and Ernst (2004).

b. Result and discussion:

During all the period of surveys in our study site, we have noted that there are several threats that can influence the occurrence of the batrachofauna.

During the raining season, the main issue that destroy habitat was overgrazing carry out by local populations around the mountain due to the fact that cattle rearing constitutes their main economic activity. We also have the practice of intensive agriculture.

However, during the dry season, in addition to overgrazing, we noted bushfires (Figure 13 B) almost everywhere around the mountain and the herders explained that they do this so that the younger grasses/plants can grow back and have food for their cattle (Figure 12 A and B).

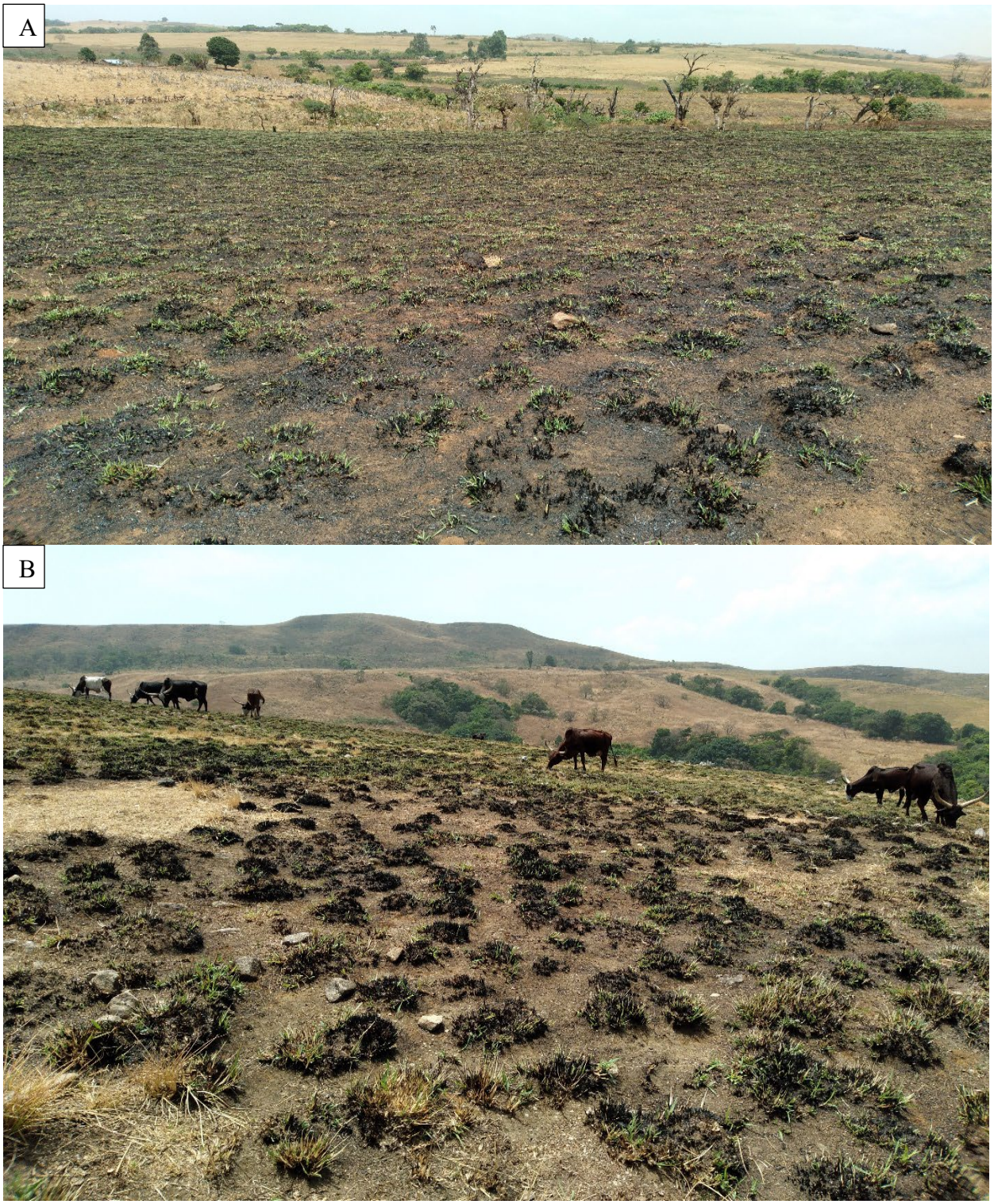

***Figure 13**: Bushfires in the savannah around Fungoi village.*

Figure below is showing how bushfire can impact and destroy the structure of the habitat of some animals.

***Figure 14**: A= structure of habitat before bushfire and B= structure of habitat after bushfire around the Sambolabo village.*

Another problem was that in the Sambolabo village, local populations excessively used water in some streams for making mud bricks (Figure 14 A et B). This caused the degradation of the habitat of certain species of frogs such as *Xenopus cf eysoole*.

***Figure 15**: A= degradation of the habitat of certain species of frogs by local populations for making mud bricks (B).*

Other human activities are shown in the following figure 15 A, B and C.


A
B

Figure 16*: human activities around the village:* ***A****= destruction of trees around Sambolabo village causing habitat degradation;* ***B****= fencing for agriculture in streams that support certain frogs such as Ptychadena mascareniensis around Sambolabo village;* ***C****= watercourse harboring frogs used by local populations to wash clothes causing habitat degradation of frogs around the village Mayo-Kelele.*

All these anthropic activities can be the reason why still now; we have not yet found some of our flagship species such as *Cardioglossa alsco* or *Astylosternus rheophilus tchabalensis* among other. Seasonality has also influenced the occurrence of the batrachofauna because some species found in the rainy season such as *Afrixalus cf. fulvovittatus* were not found in the dry season.
Similarly, some species such as *Hyperolius riggenbachi* found during the dry season were not found during the rainy season.

Objective 3: Collect GPS coordinates of breeding sites

a. Method:
The point of capture and breeding site were carefully recorded using a GPS device.

b. Result and discussion:
During our survey, we have recorded the breeding sites in all our site. One in Fongoi, with GPS coordinate 07.25251N 012.05965E 2063m, where we found a breeding site of *Astylosternus sp*

(Figure 16 A). Another one of the *Hyperolius igbettensis* in Mayo-Kelele near Matelela river with GPS coordinate 07.17825N 012.02704E 1691m. In Sambolabo, we had one in Sarbo-gari river with GPS coordinate 07.09132N 011.97952E 1038m where we found the breeding site of *Sclerophrys cf maculata* (figure 16 B). The last one of *Kasina senegalensis* was found in Mayo-barkedje with GPS coordinates 07.08687N 011.98413E 1020m.

Figure 17*: A= breeding site of Astylosternus sp in Fournae lassobiwa river in Fungoi village. B= breeding site of Sclerophrys cf maculata in Sarbo-gari river in Sambolabo village.*

Objective 4: Develop tailored conservation strategy involving awareness-raising.

a. Method:

Awareness-raising campaign: Based on the information recorded during fieldwork, we have developed a tailored awareness-raising campaign to inform various stakeholders on the conservation needs of the species. We have developed a tailored awareness-raising strategy with well-targeted messages during awareness and education sessions. A kick-off workshop was organized before the start of fieldwork to inform on the presence of threatened amphibians around and involve stakeholders (local authorities and populations). A closing workshop after fieldwork was also organized to present our findings during the community outreach. Specific gadget bearing the Rufford logo and endangered species photo with a sensitizing message was distributed during the campaign to increase awareness of stakeholders.

b. Result and discussion:

The awareness campaign was carried out in several village and public schools in our different study sites, such as the public school in Mayo-kelele (figure 17 A and B); village Fungoi (figure 18 A, B, C and D). We have also put posters on the walls for a potential impact over time (Figure 19).

A

***Figure 18**: Awareness campaign of pupils at the public school in Mayo-kelele.*

B

C


Protégeons les amphibiens
Du Mont Tchabal-Mbabo
Importance:
Menaces

***Figure 19**: Awareness campaign at the village Fungoi chiefdom.*

***Figure 20**: Posters on the walls for a potential impact over time.*

References:

Chao, A., Gotelli, N. J., Hsieh, T., Sander, E. L., Ma, K., Colwell, R. K., & Ellison, A. M. (2014). Rarefaction and extrapolation with Hill numbers: A framework for sampling and estimation in species diversity studies. *Ecological Monographs*, *84*(1), 45–67.

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