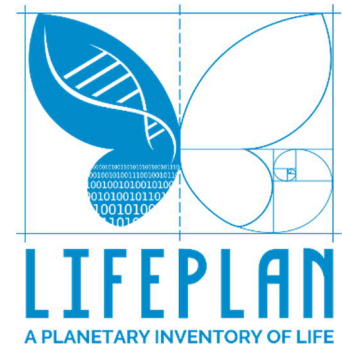# LIFEPLAN Newsletter January 2023

What's going on with Lifeplan?

Starting in 2023, we are <u>reducing the soil sampling protocol from eight times a year to four times a year</u>. This is due to the rising costs of DNA sequencing. The aim is to collect no more samples than we will actually be able to analyse. Reducing to four samplings a year will still give us temporal resolution, without sacrificing comparability between years.

The analysis of camera trapping data has now moved into the annotation phase. We have started the first set of six teams annotating on Zooniverse in December, and will be adding more teams as the first ones finish their annotation. Your team coordinator will receive a message from us when their dataset is ready for annotation. The order in which teams are added is based initially on how much filtering of human and empty images there is to do: we are starting with the easy ones first.

For the Malaise samples, we have now been able to make more detailed decisions on the analyses. We will take a spread out bulk image of every fourth sample, and from some of those samples some individual arthropods will be barcoded and photographed separately to develop barcode libraries. We will prioritise developing countries and areas with less existing barcode library coverage.

We are now sending out monthly summaries to teams, with lists of what has been sampled or not sampled. In December we also sent out the Plot information collecting form, to check the exact positions of your traps in 2022 and get some background plot information like altitude and habitat.

At the New Year, it was once again time for the global teams to switch between urban and natural locations. If you are a global team that was sampling in 2021, you should have received a letter from us with trap code stickers for 2023, as well as a map and coordinates of your trap locations in 2021, to help you place your traps for 2023 in the same way as they were in 2021.

Please note that due to the holiday period, Lifeplan coordination will be partly closed down between December 22nd 2022 and January 6 2023, so there will be a break in responding to messages and no shipments during that time. The receiving of Malaise samples in Canada will also be closed down between December 23 and January 2, so please do not send Malaise sample shipments during that time.

New publication

Our BAYESiAn Nonparametric Taxonomic classifier (BayesANT) was recently published in Methods in Ecology and Evolution (Early view). BayesANT is a supervised method that classifies DNA barcodes into a taxonomic tree. Such classification is a complex task since many species are still unknown to science or do not have a reference barcode. To cope with these issues, BayesANT relies on Bayesian Nonparametric tools to assign the sequence to a "new" taxon if it is sufficiently different from all the other sequences observed in the data. This is helpful, for example, when the ecologist wants to classify DNA extracted from the soup of insects captured in Malaise traps.

We tested our method on the FinBOL library of arthropod species of Finland. We may apply this classifier to Lifeplan Malaise trap material as well, especially for regions where the existing DNA barcode reference libraries do not sufficiently cover the barcodes recovered from the samples.

Github tutorial: https://alessandrozito.github.io/BayesANT/vignette.html

Link to the paper: https://besjournals.onlinelibrary.wiley.com/doi/10.1111/2041-210X.14009

Progress as of December 20 in numbers:

Of 170 global + Nordic + Madagascar sites or site pairs, 144 have all their equipment and contracts and are OK to start. 144 sites have now sent in some image/audio data. 26 still lack some contract or permit, and 6 still lack some equipment. From the 144 sites that have started some sampling, we have received 7 348 952 camera trap images and 166 TB of audio recording, which is equivalent to about 24 946 957 minutes of recording.
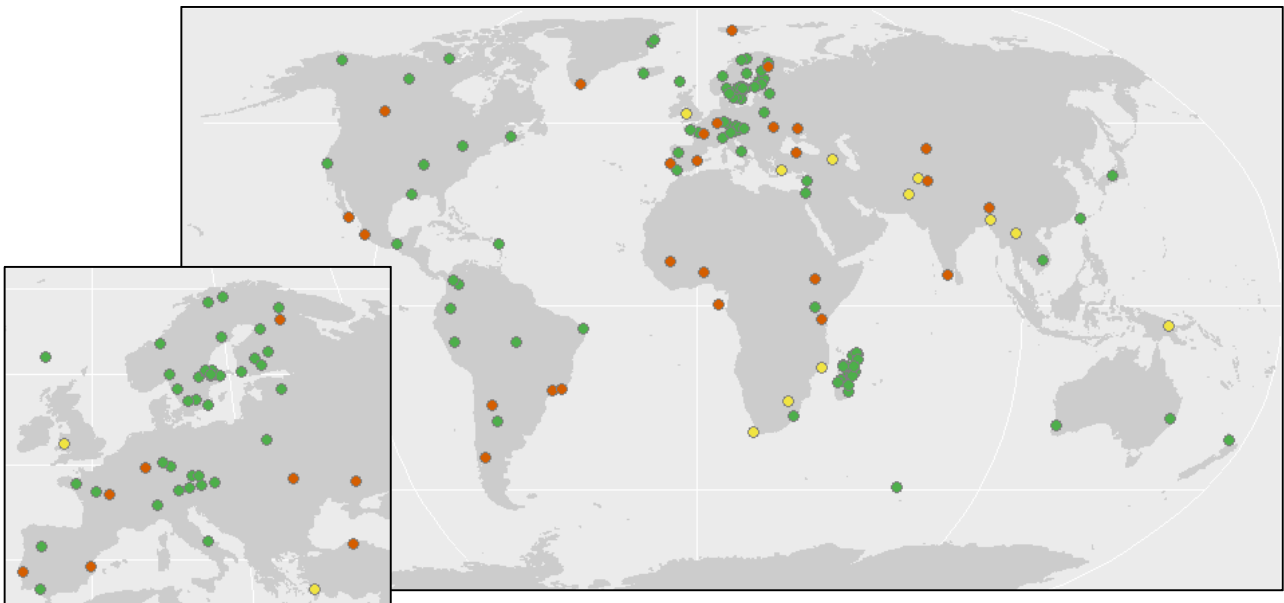
Maps with teams colour coded: Red = lacking some equipment or contract, Yellow = has all equipment and contracts, OK to start sampling if local permits received, Green = has contracts and equipment, and has uploaded image or audio data

Sampling team of the month: Lebanon

The Mediterranean region is identified as one of the world's 36 biodiversity hotspots, with the earth's most biologically rich yet threatened areas. Lebanon is a hub for Eastern Mediterranean Region (EMR) biodiversity and is recognized as a regional hotspot. Lebanon's diversity is likely derived from the geographic position of Lebanon, connecting three continents (hybridization zone for many species), as well as its complex geomorphology, which offers a mosaic of habitats for fauna and flora.

Lebanon's natural Lifeplan site lies in the Kadisha Valley, opposite to the Saint Antonio's monastery facing north on the ubac facies of the mountain. This Valley is recognized as one of the 31 IPA (Important Plant Area) identified in Lebanon. In 1998, the valley was inscribed on the UNESCO World Heritage List as a cultural landscape. It holds thousands of species of flora and fauna; of which many are endemic either to Lebanon or to the region.

The plot has a ranging altitude of 960 m to 990 m. The site is a typical mixed Mediterranean forest, woodland and scrub dominated by pines and oaks.

In 2023, the second phase of the project will start along with the sampling of the urban site located at Mrouj.

Figure 1: Rhea Kahale collecting the cyclone tube, Christie Atallah changing the malaise trap bottle and Magda Bou Dagher Kharrat taking pictures. Photo credit: Leila Rossa.

Our team, led by Professor Magda Bou Dagher Kharrat, is formed of researchers from the Saint-Joseph University of Beirut -USJ (Rhea Kahale, Carole Saliba and Christie Atallah), field and site coordinators (Tony Massaad, Karl Kharrat and Sayed Marcos) responsible of the sampling processes, along with Jouzour Loubnan Association who financially supporting the project's needs (Figure 1, 2 and 3).

Figure 2: Karl Kharrat, responsible of sampling the urban site.

Figure 3: From left to right, Tony Massaad, Carole Saliba and Sayed Marcos after setting up the natural site.

Biodiversity assessments and inventories in Lebanon remain relatively scarce, mainly due to lack of governance and funding deficiencies.

We have discovered the Lifeplan project from Professor Paul Hebert through Lebanon's involvement as a National Node in iBOL. The fact that Lebanon was selected for this initiative, will help us achieve bioliteracy by providing the tools to identify, understand and recognize the biodiversity present locally while contributing the understanding of the state of biodiversity worldwide.

The sampling process was relatively smooth. The protocols are "user friendly". As expected in these kind of projects, we encountered some minor difficulties with the audios, the cyclone sampler and the power supply but the issues were quickly resolved and the sampling was not affected. However, our main concern was to secure the site because due to the economic crisis that Lebanon is still facing, the number of thefts increased tremendously and we were very afraid that the material will be stolen. Unfortunately, the situation got worse but thanks to the understanding of Lifeplan coordinators, we were able to change the location of the natural site to a different site (the current site). We didn't know how to proceed or if we should go on with this project but you were very responsive and helped us to remain part of this project.

Lifeplan will help us unravel, illuminate and protect Lebanese biodiversity. We are so happy to be part of this international project and we are hoping that Lifeplan can lead to tremendous change in understanding Lebanon's biodiversity. We are impatiently waiting for the results!

Family of Golden jackals from the Lebanon natural site

Researcher of the month: Johanna Orsholm

I am a first year PhD student at the Swedish University of Agricultural Sciences working within the Lifeplan team based in Uppsala, Sweden. Before I started here, I did my master's degree in ecology, and I have always been interested in learning more about biodiversity and what happens with it as the environment changes. It is especially compelling when such topics can be addressed in search of general principles or on a large scale, so the Lifeplan project feels like a perfect match to me!

Within Lifeplan, I am working on insect samples from the Malaise traps, aiming to make use of both genetic data from metabarcoding and images of the samples to describe the communities. Of course, one of the main benefits of the Lifeplan project is the enormous amounts of data produced. However, it also makes it challenging when current methods, for example to cluster sequences or infer phylogenetic trees, turn out to be either too slow or simply incapable of handling such large amounts of information. Fortunately, I have a lot of collaborators with great ideas on how to tackle this and we're currently testing if a modified version of MrBayes – a well-used program for Bayesian inference of phylogenetic trees – can build a tree of up to 10,000 taxa. We are also developing a machine learning algorithm to classify insects from the bulk images with, hopefully, minimal human input required.

As one can imagine, method development and near unlimited potential for data analysis means that I am doomed to spend most of my time in front of a computer screen. Fortunately, Uppsala happens to be the base of the team that runs the hierarchical sampling sites in Sweden, and I am occasionally lucky enough that they decide to bring me with them for a day. Who knows, maybe they'll even make a field biologist out of me in the end?

The best thing about my work on Lifeplan: collaborating with so many great researchers with different expertise. It is inspiring and motivating to hear the many different approaches we can come up with when all working towards the same goal.

The most challenging thing about my work on Lifeplan: I must confess, I have not done much work on insects before this, so it is a bit of a steep learning curve to make sense of the image data. Luckily, the most critical classification is done by actual experts, and for the less critical steps, I have many kind co-workers who are happy to help guide me in this jungle of slightly-different-looking segments and antennae.
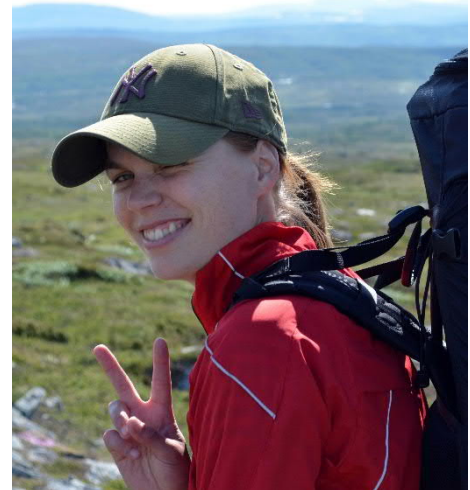
Camera trap image of the month
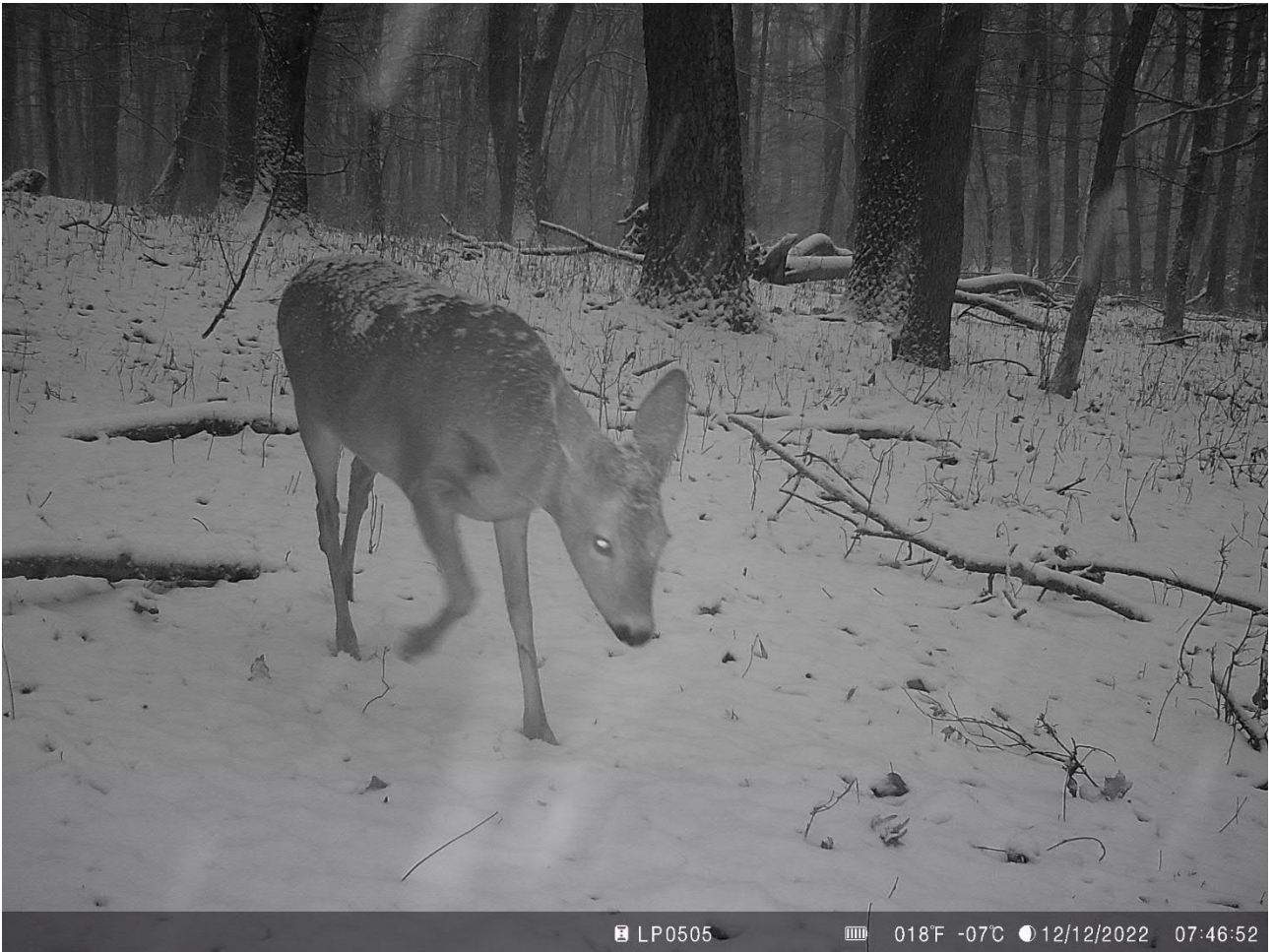
Deer trudging through the snow near Vienna, Austria. Photo by team Vienna.