PRACTICAL ACTIVITY 1
CHARACTERIZATION OF A MEDITERRANEAN FOREST ECOSYSTEM

1.1 FIELD NOTEBOOK

Objective:

Evaluate the effect of environmental factors variations on the ecological characteristics of an ecosystem.

For this purpose, we will study the south exposed (S) and north exposed hillsides (N) of a hill near the *Maigmó massif* (check the aerial photograph at the end of the guide). It is intended to obtain data needed to answer the following questions:

¿How affects the orientation of the hillside to:
- Biological and spatial structure of a pine forest,
- Foliar morphology of the dominant species,
- Pines growth,
- The floristic composition of the community.

For this task and with prior knowledge given in the lectures you should set out the study hypothesis*. These hypothesis or others, that may arise when we are analysing the field data, should be responded with the collected data.

This practical activity will consist of:
- A FIELD session, where it will be taken data from physical environment and different parameters of vegetation.
- This session has half an hour in the laboratory to weight fresh samples and introduce them into the fridge or oven.
- A LABORATORY session where samples will be handled organized or filled tables and will obtain or calculated additional data. Once all the necessary data are available, they will be introduced in a common database before the end of the practical activity.

- A COMPUTER session where from the common database will attempt to obtain relations between environmental variables and biological parameters to corroborate the hypothesis.

To evaluate if the horizontal and vertical structure of vegetation or other functional variables differ between the two hillsides, it will be done all the next steps to both, south exposed (S) and north exposed hillsides (N)

* Each team can take all additional data if appropriate to demonstrate or reject the different hypothesis but must provide the necessary material.

TASKS IN THE FIELD (SUMMARY)

Both south exposed (S) and north exposed hillsides (N), will follow the next outline:

0. Vegetation transect line of 15 meters in length.
1. Horizontal and vertical structure of shrub and herbaceous species. It will be taken on the transect line.
    1.1.   Data collection of the shrub horizontal structure.
    1.2.   Data collection of the shrub vertical structure.

2. Horizontal forest pine structure and growth of pine shoots which will be determined by a total of five pines per hillside.
3. Soil temperature measurements.
4. Collect soil samples for gravimetric moisture determination in the laboratory
5. Sampling of plant material for laboratory determinations related to the amount of water content and foliar characteristics.

You must complete the tables whose numbers are given in this text.

Note: Consider that for the same number of table, there is one for the south exposed (S, refers to the south exposed slope) and one for north exposed (N).

METHODOLOGY

0.- Vegetation transect line of 15 meters in length.. Methodology:

Every team should:

- Be located in a place of the hillside, which is not influence by the "edge effect" whose produce in it the interaction with the adjacent ecosystems.

- Respect a safe distance between teams (at least 3-4 meters).
- Select randomly a point for the beginning of the 15m transect.
- Hold the beginning of the tape (15 meters or more) to the soil or a shrub.
- Extend the tape respecting the level curve to the end point.

This transect will be used to study the horizontal and vertical structure of the vegetation (following step).

NOTE 1. Mark the transect following the level curve.

NOTE 2. The tape itself marks the line at which it will be sampled the height and coverage of the understory.

1.- Horizontal and vertical structure of herbaceous and shrub layer along the transect.

1.1. Linear plant cover (horizontal structure).

On the transect line (tape) will be made the method of the linear plant cover.

For this purpose it will be imaginary extended to the soil (over the plants) the line created by the tape. In the Table 1 (1-S for the south exposed, or 1N for the north exposed slopes), it will be written down the centimetres occupied by each species along the 1500 cm (15 m). The Table A is an example of how it should be taken the data of the linear plant cover and how to do the first calculations if from the beginning of the transect (cm 0), to the (cm 15) there is bare soil+ litter, from the (cm 15) to the (cm 82) there is kermes oak, from (cm 82) to (cm 92) there is boulders, from (cm 92) to (cm 120) there is rosemary, etc…. In addition to the different herbaceous vegetable and shrubs species majority, it will be consider other types of coverage such as: bare soil, lichens, stones, herbaceous species, bare soil + litter, etc) that will allow to analyse with more detail the type of plant cover and structure of the ecosystem, both vegetation and edaphic types.

In order to give an accurate description of the vegetation, you must obviously indicate the plant cover by species and for that, it has to be distinguished each one of the species that composed the ecosystem. To have some help with the species it will be provided some photographs printed of some of them. Also, in the Table B it will be provided a list of the majority species in the area. If you find different species with a considerable presence whose name is unknown, you can ask the teacher or write a code to identified it (check the example in the interval from 250 to 305 of the table A) and take a small sample to identify in the laboratory.

1.2. The vertical structure of the scrub.

It will be estimated with the height data of the herbaceous and shrub layer. You should measure the height in the point where the tape marks the beginning of each meter. The data will be written down in the Table 1 (1-S y 1-SS).

2.- Horizontal structure of the forest pine and pine sucker growth.

2.1. For the study of the tree stratum (formed almost exclusively of Aleppo pine, *Pinus halepensis*), each team will have to select five pines and they should estimate the surface in which they are living. In this way, we will have a calculation of the density of the pines per surface. For that, you will measure the length of the sides of an imaginary square in which these five pines are included. This means each team will sample the tree density on its own sampled surface.

In each of the pines it will be measured: a) the perimeter at 130 cm to the soil (P130)*, for the calculation of DBH-diameter at breast height; b) Also it will be obtained the cover of the crown (horizontal projection) by measuring the diameter ($\varnothing$) of the crown projection on its longest side and the perpendicular side. These data will also recorded in Table 2 (2-S and 2-N).

From these measures, you should calculate in the laboratory: density of trees (nº trees/hectare); canopy cover (square meters covered by leaves/hectare) and basal area (trunks surface/hectare). The data will be recorded in Table 3 (3-S and 3-N)**.**

- *Caution: if the pine to be measured is lower than 130 cm to the soil you should measure the perimeter at 50cm from the soil and write it down.*

2.2. To estimate the <u>pine shoot growth</u>, you should measure with a ruler (without cutting the twigs) the length of the twig growth of the last year with a precision of 0,1cm. You should take 5 measurements per pine*[4] (25 total data) and the data will be written down in the Table 4 (4-S and 4-N).

[4] Note: If the pines are too high it can be taken another smaller individual for this measure.

3.- Soil temperature.

It will be measured using the digital thermometers for the field**[5]. You should take the temperature at 1 cm of depth, in 6 points in open areas and 6 points located under the pines or shrubs. They will be written down in the Table 5 (5-S y 5-N)**.

[5] Caution: To measure the temperature not force the thermometer when goes into the ground. Choose a place where you can insert it comfortably.

4.- Collecting soil samples for gravimetric moisture determination in the laboratory.

It will be taken composited samples**[6] of approximately 200 gr of soil in open areas and in areas under plant cover in each hillside (north and south). The samples will be taken between 1 and 5 cm depth after remove the litter. Then, you will keep the samples into plastic bags until you arrive to the laboratory. Take into account you have to zip them well to avoid the loss of moisture and then code them properly: Team/cover type (open or under vegetation) S or N (depending of the hillside where it is).

In total you will have 4 *composited* samples (two per hillside), that it will be transported to the laboratory.

The table 6 refers to these data.

**[6] Composited samples means you should mix the soil from different points (take 5 points per each sample). To obtain a homogeneous and correct sample, you can take a soil sample in 5 different points from the same depth and in a similar amount, put them together, mix them and put in a bag about 200gr. This sample will be transported to the laboratory. Keep the excess *"in situ"*.

5.- Sampling of plant material for laboratory determinations.

The teacher will assign two shrub species to each team to taking samples that it will be analysed in the laboratory.

5.1. Select 4-5 individuals of each assigned species.

5.2. Take three terminal twigs about 10 cm length of each. Introduce the three twigs in the same plastic bag and code*: Team/ Team's code/ T (twigs)/*

species X or Y (depends on which it is)/ S or N (depending on the hillside)*[7].
These samples will be kept in the fridge when they arrive to the laboratory
and they will be used to determine the specific leaf weight (SLW) and the
ratio leaves weigh to stem weigh in the next session.

[7] *Each team should keep all the collected samples until they arrive to
the laboratory (with special caution those taken in points 5.1 and 5.2).*

5.3. Leaves sampling. From the same species selected in points 5.1. and 5.2.
Each team will sampling a total 30 leaves (approximately) of each species.
The samples will be introduce in different plastic bag, so you will have one
bag per sample and it will be coded as: *Date/team's code/ L (leaves)/ species
X or Y (depends on which it is)/ S or SS (depending on the hillside)**[8].

[8] *NOTE: When you arrive from the field, you have to weight the samples
and put them into the oven. In the next laboratory session, you will have the
dry weight and the ratio between the dry weight and fresh weight.*

WARNINGS:

1. You should distribute the tasks. Not recommended that the 4 people
   do the same.
2. Label (code) the samples correctly (*very important*). Not to mix
   them either in the field or in the laboratory.
3. Avoid moisture loss in the samples for a correct data determination.
   It is recommended to do the sampling of the soil and twigs at the end
   of doing the other tasks in each hillside.
4. Control all you personal and materials belongings all the time.
5. Material devolution. You will have a list of the borrowed materials
   to return at the end of the activity.

The basic data will be obtained for each hillside are, at least:

Hillside slope	Percentage of water in plants
Orientation	Specific leaf weight (SLW)
Shrubland cover, %	Soil temperature and moisture
Cover of different shrub species, %	Density of the pines
% bare soil, stony, …	Tree/canopy cover
Shrub height average and by every species	Basal area

This amount of data will allow us to differentiate between both hillsides in case that there were differences.

Field workplace

Maigmó petrol station and restaurant