FunDivEUROPE

Functional significance of forest biodiversity in Europe

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Humus form description and sampling field protocol

FunDivEUROPE (FP7) field protocol

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Content

1 Introduction

The humus form is the expression of the equilibrium between litter production, litter decomposition and humification in a forest ecosystem, resulting from the biological action of bacteria, fungi, and soil fauna. The observed humus form reflects a certain combination of ecological factors as climate, soil, tree species composition and management (Jabiol et al., 2005). In a site with constant climate and soil the effect of tree species composition on humus form becomes determining (Muys, 1995). The effect of tree species mixtures is less well understood and so far mainly studied in microcosm experiments.

2 Scope and application

The idea is to quantify the mass of the ectorganic horizon and to describe the humus form. These features will be further related to microbial activity, litter decomposition and earthworm biomass and diversity.

3 Objectives

To determine mass of ectorganic horizons (in g/m^2), to describe the diagnostic horizons of the humus form and to finally classify the humus form according to the European Humus Form Reference Base (Zanella et al., 2011).

4 Location of measurements and sampling

4.1 Field sampling design

4.1.1 Number of replicates

The (30 x 30) m^2 plots are divided in nine (10 x 10) m^2 subplots. 1 sample per (30 x 30) m^2 plot is taken in a randomly assigned subplot. .

4.1.2 Sampling scheme

One sample is taken in a randomly assigned subplot, more specifically in the dedicated zone for soil biological sampling. Preferably, within that dedicated zone, the sample is taken nearby the earthworm sampling location, but the sample should not be taken close to tree stems, and whenever possible, a location in between trees of different species should be preferred over crowns of single species. The tree IDs of, and the estimated distance to, the three nearest trees are noted on the Humus description datasheet (see below). Also the rest of the datasheet is filled before taking the sample.

4.2 Sampling equipment

- A spade with straight and sharp blade of minimum 25 cm high (also needed for earthworm sampling)
- A wooden frame of (25 x 25) cm^2 inner size
- 1 transparent **polyethylene** bag with closing zipper of 10 litres with a label for writing sample code
- Garden shear
- Trowel
- Knife (long and sharp)
- A permanent marker
- A datasheet for humus description with a humus description form
- A pocket eye loupe
- A digital pocket camera with macro option and internal flash, with spare battery
- A pencil

The following equipment is needed in the field station (central place near the plots where samples are temporarily stored and pre-treated).

- Dry and clean storage space for one plastic bag per plot, placed side by side to air-dry before being sent to the laboratory.

4.3 Frequency of sampling

Sampling is done only once in every plot, for the Experimental Platform in 2011, and for the Exploratory Platform in 2012. The period of sampling is spring and autumn, more specifically a period with humid soil conditions and positive temperatures (preferably no night frost). In spring sampling can start from the moment that all the snow is melted and no night frost occurs (probably March in Mediterranean, April in cold temperate and early June in boreal zone). In autumn, sampling can be done starting from full litterfall period onward (probably September in boreal, October in cold temperate and November in Mediterranean zone).

4.4 Sample collection, transport and storage – quality control in the field and between plots and sites.

Sampling of ectorganic horizon

If ground vegetation is present, cut it away just above the ground with a garden shear on an estimated 30 by 30 cm square. Put the 25 x 25 cm wooden frame on the ground in the middle of the cleaned area. If the slope of the terrain at the subsampling location is more than 5%, measure the slope with a clinometer, note it in the datasheet for later correction of the area sampled. Carefully remove the ectorganic horizon from within the frame and put it in a labelled polyethylene bag. Use trowel or knife to cut the sides perpendicular to the surface and scrape the bottom of the sample. Sample OL, OF and OH, but not OLn and the mineral

soil (more details in Futmon report on soil and water sampling: Cools & De Vos, 2010). Close the bag. It is ready for transport to the field station, where it will be stored.

Humus form description

Half a meter away from that, an observation trench (50 cm long and 20 cm deep) is made with the spade. Along the middle of the trench organic layers are pealed with knife and trowel over an area of 25 by 25 cm. Humus form description is made following the European Humus Form Reference Base (Zanella et al. 2011). Diagnostic horizons are identified and ticked off in the Humus description form. Their thickness in mm is noted. Other diagnostic features (indications of zoogenic and non-zoogenic activity) are described (The eye loupe is used to recognize zoogenic pellets). For all features observe at four places along the trench to decide and note. At least one photo of the humus profile per plot is made. The humus form classification is tentatively written on the humus description form.

Sample storage

When arriving in the store, plastic sample bags are stored side by side and opened in order to get air-dried during their time in the store. Every three days their content is turned to dry better. Within maximum three weeks bags are closed, put in a box, and shipped to the laboratory.

Transport

At the end of the field campaign when all plots are sampled, samples are carefully packed in a strong box and brought or sent to the lab for further manipulations.

5 Datasheet Humus description

should contain:

- Date of sampling:
- Name(s) of sampler(s):
- Weather conditions (general weather description at the day of sampling: temperature, precipitation, cloudiness):
- Plot number:
- Diversity level:
- Tree ID's of and distances to the three nearest trees to sample point:
- Observations made: (e.g. slope percentage for every sample where slope > 5%)
- Problems encountered (indicate for which plot):
- Humus description form (one per plot):
  Humus description form allows to describe diagnostic horizons in a simple straightforward way according to the European Humus Form Reference Base.

6 References

Cools N, De Vos B, 2010: Sampling and Analysis of Soil. Manual Part X. In: Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests, UNECE, ICP Forests, Hamburg. ISBN: 978-3-926301-03-1. [http://www.icp-forests.org/Manual.htm], 208 p.

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