

PROJECT INFORMATION

Project title: **Bioclimatic niche of insect pests and trees in response to climate change**

Project ID: 121

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PROJECT DESCRIPTION

The overall goal of this project is to develop a procedure aimed to interpret and predict plant response to climatic variability considering the characterization of species bioclimatic niche and the interaction with others non-climatic factors such as insects pests. The project will focus on drought-induced die-off episodes affecting forests and shrublands in Europe.

Specifically, the data shall be used (1) to build correlative niche models (CNMs) characterizing bark-beetles bioclimatic niches from its regional distribution and climate datasets (WorldClim); data from the ICP Forests PCC Collaborative Database will be used to describe the regional pattern of distribution (occurrences) of bark-beetle species such as *Tomicus piniperda*, *Tomicus minor*, *Ips sexdentatus* and *Ips acuminatus* in the whole European region and will feed CNMs (2) to analyze *Pinus sylvestris* (Scots pine) population responses (i.e. die-off and mortality), as recorded in recorded ICP dataset, to episodic or chronic drought, concurrent with bark-beetles outbreaks (3) to evaluate the relationship between CNMs outputs of bark-beetles and Scots pine demographic responses to drought by statistical models (GLMs, GZLMs) considering the spatial structure of the data (4) to apply future climate scenarios to assess the geographical vulnerability of Scots pine to insect outbreaks by modelling combinations of maximum bark-beetle climatic suitability and lower suitability for Scots pine estimate with the created models their distribution expected under future climate scenarios. Our hypotheses are:

- 1) There is a positive relationship between drought-induced die-off of *Pinus sylvestris* and the climatic suitability of bark-beetle species.
- 2) The intensity of bark-beetles' affectation will be higher where Scots pine bioclimatic niche will be less suitability.
- 3) An expansion of climatically suitable habitat of bark beetles will be expected under future climate scenarios due to decreasing Scots pine climatic suitability and increasing bark-beetle one.

These hypotheses will be tested with data from the ICP Forests PCC Collaborative Database recording the health status of Scots pine for the whole Europe, and also for local surveys in some particular countries as Spain. If successful this approach will be tested for other conifer species experiencing bark-beetle attack.