Postdoctoral position (M/F) on the adaptive dynamics of European beech in response to climate change

Subject description

In response to climate change, species may (i) persist within their original populations through plasticity, acclimation, or adaptation to new climatic conditions, and/or (ii) track shifting climatic conditions through their dispersal ability, which is modulated by habitat connectivity (Thurman et al. 2020). The efficiency of these responses also varies within species' geographic ranges. Thus, we expect persistence strategies to be favored at the warm edge of the species range, whereas migration strategies should be favored at the cold edge (Oliveira et al. 2026).

The objective of the postdoctoral project is to quantify and understand the adaptive dynamics of European beech in response to climate change, and how these dynamics vary across its distribution range in the Pyrenees. The postdoctoral researcher will analyze a dataset combining whole genomes from 288 individuals and derived genetic metrics (SNPs, genetic diversity, etc.), individual performance measurements (growth, drought resistance, etc.), and environmental descriptions (microclimate, soil, forest stand structure) collected across 56 Pyrenean sites along altitudinal transects exposed to varying levels of hydric and thermal stress. Half of the sampled individuals at each site are mature trees and the other half are regenerating individuals, meaning that they may have experienced different selective pressures (particularly in terms of climate). This unique design will make it possible to investigate the eco-evolutionary dynamics of beech populations in the Pyrenees.

During the postdoc, the candidate will be expected to:

1. Determine how beech genetic diversity (Ho, Pi, theta) varies according to hydric and thermal conditions and developmental stages. The project will also evaluate the relative contributions of neutral evolutionary processes (genetic drift) and adaptive processes (selection) to climate-associated variations in genetic diversity and their temporal dynamics.
2. Assess allelic frequency variation and signatures of selection in candidate genes associated with climatic stress in plants across the beech distribution range, where climate-related selective pressures vary spatially. This analysis will compare developmental stages in order to distinguish past effects (affecting mature trees) from more recent effects (regeneration), and to reveal potential adaptive dynamics.
3. Option a : Identify genomic regions whose diversity is strongly associated with environmental gradients (altitude, hydric stress, and thermal stress), and which may be under selection under particular environmental conditions. The interpretation of these results will rely on the functional roles of the identified genomic regions.

   Option b : Determine the level of maladaptation of beech populations in the Pyrenees to current and changing climatic conditions using genomic offset analyses (e.g. Capblanc et al. 2020). The resulting models and metrics will then be extrapolated under future climate change scenarios to identify populations where beech populations may become maladapted during the 21st century and therefore threatened. This approach could also be used to inform a process-based redistribution model for beech.

References:

Capblancq, T., Fitzpatrick, M. C., Bay, R. A., Exposito-Alonso, M., & Keller, S. R. (2020). Genomic prediction of (mal) adaptation across current and future climatic landscapes. *Annual Review of Ecology, Evolution, and Systematics*, 51(1), 245-269.

Oliveira, B. F., Bertrand, R., Comte, L., Lenoir, J., Grenouillet, G., Lancaster, L. T., ... & Rolland, J. (2026). Genetic Diversity Impacts Climate-Induced Species Range Shifts. *Ecology Letters*, 29(4), e70345.

Thurman, L. L., Stein, B. A., Beever, E. A., Foden, W., Geange, S. R., Green, N., ... & Young, B. E. (2020). Persist in place or shift in space? Evaluating the adaptive capacity of species to climate change. *Frontiers in Ecology and the Environment*, 18(9), 520-528.

Working context

The proposed postdoctoral project is part of the FREEvol project, which aims to study the eco-evolutionary mechanisms determining how forest ecosystem functioning responds to climate change. The candidate will be hosted at the Centre for Research on Biodiversity and Environment (CRBE) in Toulouse (France), on the campus of the University of Toulouse 3 – Paul Sabatier.

The work will be supervised by Romain Bertrand (CRBE, CNRS Toulouse), and the candidate may interact and collaborate with other researchers from the CRBE (such as Jordi Salmona, Jonathan Rolland, etc.) and from other laboratories (Thibault Capblancq, Joris Bertrand, Simon Blanchet, etc.), as well as with the GENOTOUL bioinformatics platform (responsible for the bioinformatics analyses associated with sequencing data, from variant identification (SNPs, indels, etc.) to bioinformatics support throughout the postdoc).

The postdoc will most likely begin with field data collection in the Pyrenees (microclimate measurements, tree coring, and tree size measurements).

Researched skills

- Hold a PhD in evolutionary ecology;
- The candidate must have strong knowledge in genomics, bioinformatics, and the analysis of complex and spatially explicit data (linear or non-linear mixed-effects models, etc.);
- A good understanding of the concepts involved in the eco-evolutionary responses of species to environmental change is desirable;
- Previous experience studying forest responses to climate change and/or the evolutionary adaptation of plants;
- Experience with, and interest in, field data collection and laboratory trait measurements would be an asset.

How to apply ?
Applications must include:

- a detailed CV (maximum 2 pages) including the contact details of two references (people who may be contacted);
- a cover letter (maximum 1 page) explaining how the candidate’s background and skills match the proposed project;
- two scientific publications and/or the PhD manuscript (a link is acceptable if the publication is available in open access; otherwise, the publications should be merged into the cover letter document).

The application and all required documents must be submitted through the emploi.cnrs.fr portal : https://emploi.cnrs.fr/Offres/CDD/UMR5300-ROMBER-003/Default.aspx?lang=EN

The application **deadline is July 5, 2026**. An initial selection will be based on the evaluation of the submitted documents, followed by an interview during which candidates will present their experience and explain how it will help them successfully carry out the postdoctoral project.

The postdoc is expected to **start on September 1, 2026** (October 1 at the latest) for a duration of 12 to 16 months (depending on the candidate's experience), with a possible extension of 2 to 3 months.