



Increasing Spring temperature favors oak seed production in temperate areas

Thomas Caignard (1), Antoine Kremer (1), Cyril Firmat (1), Manuel Nicolas (2), Samuel Venner (3), and Sylvain Delzon (1)

(1) BIOGECO, INRA, Univ. Bordeaux, 33615 Pessac, France, (2) Office national des forêts, Département recherche, boulevard de Constance, F-773000, Fontainebleau, France, (3) Laboratoire de Biométrie et Biologie Evolutive UMR5558-CNRS, Université de Lyon, Université Claude Bernard Lyon 1, Villeurbanne F-69365 Lyon, France.

Although changes in vegetative phenology have considerable consequences for ecosystem functioning, little is known about how tree reproduction responds to climate change, while reproductive traits are key determinants of plant fitness. Assessing the response of tree reproduction to climate variations is needed for understanding tree and forest adaptation to environmental changes. We analyzed an extensive dataset of tree reproduction in 28 temperate oak forests distributed throughout France and examined how seed production responded to temperature variations over 14 years. In addition, a “space-for-time” substitution experiment has been used to quantify the temperature sensitivity of acorn production. The amount of acorn produced in 10 *Q. petraea* populations along two parallel elevation gradients in Southern France were quantified from 2012 to 2015.

During the past two decades, we observed a significant increase in reproductive effort for *Q. petraea* that correlates with a rise in spring temperature. Although no significant trend over time has been observed for *Q. robur*, a significant increase in seed production was also found with spring temperature. Such sensitivity to temperature of seed production has been confirmed along the elevational gradients. Our findings show that increasing spring temperature favors oak reproductive effort in temperate ecosystems. Nevertheless, while fitness can be enhanced by higher seed production, it also depends on the frequency and on the synchronization of mast seeding production that climate change may influence too.