Demo-genetic consequences of acorn harvesting by jays: bridging seed dispersal and recruitment in oak woodlands

Efficient regeneration by natural means is critical for the conservation of forests across Europe as it sustains their biodiversity, improves resistance to a wide array of natural and anthropogenic disturbances and considerably facilitates management and silviculture. Its integration in forest management requires a sound understanding of the actual mechanisms of natural tree recruitment and of their consequences for the genetic structure of tree populations. The dispersal of seeds is a key stage in that process.

This research project investigated how the dispersal of oak acorns by animals shapes the spatial patterns of plant recruitment within and around an expanding pedunculate oak (Quercus robur) forest fragment. Around 300 adult trees and 900 seedlings were mapped, genotyped and submitted to parentage analyses in order to reconstruct spatial patterns of acorn dispersal. The performance of genotyped seedlings was monitored through two growing seasons in order to assess the effects of acorn dispersal on seedling survival, growth, and interactions with herbivores and pathogens. Flanking studies explored why some trees attract seed dispersers more than others (thereby propagating their genes more efficiently), or why some landscape patches receive disproportionately many dispersed acorns (thereby representing hotspots of regeneration).

Preliminary results underpin the critical role of acorn dispersal, which seems to be almost a prerequisite for successful regeneration within the investigated oak forest fragment. They also demonstrate the potential of acorn-dispersing animals to initiate remarkably rapid and widespread colonisations of surrounding areas without the necessity of an active forest management.

The combination of genetic and demographic studies within a spatially explicit context make it possible to develop realistic estimates of how the fates of individual oak recruits translate into the spatial genetic structures of populations across complex landscapes. A better understanding of acorn dispersal and its demo-genetic consequences for oak regeneration may have important implications for diverse research disciplines and applications including forestry practice, tree conservation genetics, landscape ecology and planning, or models of plant migration under past and anticipated climate changes.