Abstract for docent lecture Petter Axelsson

Why intraspecific genetic variation matters for the broader understanding of ecology and function of forest ecosystems

Abstract

One of Charles Darwin's greatest insights in the development of the theory of natural selection was recognizing that conspecific individuals differ in many characteristics such as morphology, behaviour, and physiology. This variation provides the raw material for natural selection and evolution, and determines the ability of species to adapt to changing environmental conditions. Moreover, we now know from studies in asexual (clonal) model tree species such as *Populus* spp. that the impact of genetic variation may flow beyond the individual and have broader implications for associated communities and ecosystem processes. Determining if similar effects occur in tree species with a sexual mating system would provide new insights into the broader understanding of ecology and evolution in natural forest ecosystems. Working with forest trees in two different systems, I address here how some of the natural and anthropogenic factors that drive genetic structure within and among populations, i.e. genetic connectivity, directional selection and climate change, may impact the broader function of forest ecosystems. With an almost 100-year-old tradition of forest genetic research in Sweden we have a wealth of knowledge about how forest genetic resources can be utilized in tree breeding to break the geographical constrains of outcrossing and maximize production. With my most recent work I produced pioneering research on the ecological importance of genetic variation in boreal tree species and show that outcrossing and breeding is very likely to influence the communities and ecosystem properties associated with these trees. In hyper diverse tropical forests, in which genetic variation is at threat from reduced population sizes and fragmentation, there is a clear need to understand how genetic variation influences the function of these ecosystems. In response to this need, I have orchestrated the setup of a 4500 tree, multi-species common garden experiment in the heart of Borneo - one of the world’s biodiversity hotspots – with the aim to assess intraspecific functional variation in tropical tree species. I have demonstrated that genetically derived trade-offs among important functions, i.e. growth potential and drought tolerance, will be important for understanding the full consequences of climate change in these valuable yet vulnerable ecosystems. Lastly, I present some of the future directions of my research on the importance of intraspecific variation in tropical forests, which includes assessing biotic interactions as a key mechanism for generating the extraordinary diversity in these hyper diverse ecosystems.