Ultan O'Donnell is a PhD candidate from University College Dublin funded by the Department of Agriculture Food and the Marine (DAFM) to develop methods to help the proactive protection of forestry on the island of Ireland from invasive forestry pests and pathogens. His supervisors Associate Professor Jon Yearsley and Dr. Conor Francis McGee are based in University College Dublin and The Plant Risk Analysis Unit in DAFM, respectively. His research, which he explains below, aims to address gaps in quantitative methods to help with identifying invasive forestry pest species that are most likely to arrive on the island of Ireland, and developed a method to optimise surveillance networks to detect specific pests species early. Implementing these networks would improve the ability to prevent the spread and impact of pests on healthy trees across Ireland.

Invasive forestry pests and pathogens, exacerbated by globalisation and climate change, pose a growing threat to Ireland's native and commercial forestry. Ultan's PhD thesis focused on methods that enable proactive forest protection by analysing past, present, and future potential invasions on the island. Using a data-rescue approach, we digitised data from historic annual reports of forestry pests from 1970-2020, identifying the effects of historic surveillance and control efforts, and developed three key recommendations to improve data reporting and understanding of forestry pest invasion dynamics. To identify future potential pests, a novel host-based Species Distribution Modelling method was developed to test the validity of using host records as proxies for their respective pest species, ranking their risk of establishment in Ireland and Sweden based on habitat suitability, and identifying a list of high risk of establishment pests that were not yet present in either study area. Finally, to safeguard from potential forestry pests, we developed an iterative solution to designing surveillance networks for early detection, by using a 'one more node' approach to maximise the probability of detection by optimising where traps are placed. We applied this approach to a n identified high risk pest, Ips typographus, and found that a 25% increase in the current surveillance network would double the probability of detection. The research in this thesis supports the risk management process of invasive forestry pests by developing a baseline understanding of prior forestry pests invasions where information is available but difficult to access. The SDM methodology presents an opportunity to predict the potential distribution of invasive forestry pest species where location records for potential pests are scarce, and provide a methodology for comparative prioritisation of future risks. Finally, the surveillance network optimisation algorithm provides a biological underpinning to surveillance site selection, allowing for gradual expansion of a surveillance network alongside available proactive protection resources within a jurisdiction.

The first chapter of his PhD thesis is available as a published paper in Biological Invasions here, where you can also find the rescued data. Additionally, a preprint of the host proxy SDM methodology is available here. He also has an online webinar discussing his research on the International Pest Risk Research Group's Youtube Channel