My summer with the SalGo team

This summer I had the privilege of working with the SalGo team on their long-term grassland experiment at Wytham Woods. I was under the supervision of Roberto Salguero-Gomez and was supported by the Rokos Award. The aim of the on-going field study is to contribute the global network of experiments on the effect of drought, flood, fertilisers and disturbance on species composition (DRAGNet and DroughtNet). Plant ecology has been my favourite part of the biology course so far, particularly the applications to conservation and climate change mitigation. And this summer I got to experience how such complex topics are investigated.

From the end of term to the 29th of June, I was going up to Wytham Woods each day to collect data with three other interns and John Jackson, who taught us how to identify the grassland species. I also learnt about the many opportunities the SalGo team has taken to incorporate technology into data collection. In August, I returned to Oxford for further work based in the offices at the Mansfield Road Biology building. The internship concluded with an independent investigation on the prospects for root research at Wytham next summer.

Recognising species and patterns

For the last seven years, the relative abundance of each of the plants in the plots has been collected. To record what plants are in each of the plot, I had to learn all the species, which was an exciting challenge. Each day that we returned to the plots, I recognised more plants. With time, I started referring to plants with their Latin names, rather than their common names (but we also made up nicknames for our favourites!). Tricky distinctions between plants with very similar leaf structures became easier. I started to notice patterns in what plants seemed to be more abundant with added fertiliser. Or the plants that may be "early colonisers" as they were more established in the disturbance (i.e. soil is ground up each year and all plants are removed) plots in comparison to others. When identifications were more challenging, we used the Collins Guide to Wild Flowers, which required learning terms for particular floral and leaf structures that distinguish species. Now when I walk around parks in England, I recognise lots of grasses, forbs and legumes.

There's more than one experiment to a field site

Producing a record of the plants in plots was not the only active work happening at Wytham at the time either. There was a Biology masters student collecting samples of the insect diversity in each of the plots, while another woman was following the change in growth of a specific plant she was interested in. On some days, the Oxford Robotics team was there running trials for Husky – an automated rover that will drive around each of the plots and take photos of the plants! I also got the chance to fly a drone over one of the plots, which senses the light given off by the plants. This data will be put in combination with the observations we made to determine the biomass of each species in the plots. The hope is then that the rover could drive around the plots, taking the same kind of imaging that the drone currently does, and producing an estimate of the biodiversity within each plot, without a human ever having to take a seat around the plot.

DIYs

DIYing is more prevalent in ecological research than I had thought. For example, one technological addition to the field site this summer that I helped set up were PhenoCams. PhenoCams take photos of the plot at a set interval, producing a time lapse of the change in phenology of the plants. One of the research stations in Germany just added PhenoCams to their site and sent us the cameras with complementary rain guards. What had to be sourced was a pole that was sturdy enough to hold the heavy apparatus but also tall enough so that the camera could point down at the plot. So, one morning was spent visiting several stores and trying out many poles. To no avail with metal poles, we turned to… broom sticks! The brooms sticks were trimmed and stuck into a larger, sturdier pole, which could withstand the weather. Working within a budget, while also matching the requirements for quality data collection are important to scientific work.

Subject to the elements

The grasslands are surrounded by the woodlands of Wytham, which meant that the field site was subject to the weather and the local wildlife. The heat waves during June data collection meant that we had to regularly take breaks from sitting around the plots to cool down in the shade. The rover also felt the heat as its tent's insulation caused computers to over-heat (the tent has a fan now!). And as the drought set in in August, planned plant collection by another lab member was not possible because the plants were too desiccated. Also, the drone couldn't fly over the plots for data collection on a windy or rainy day. The drone also had to be careful to not fly too close to birds. Other wildlife made a more impressionable visit to the field site when they chewed up one of the solar panel wires (we spent the following few days putting cable tubing over all wires). Ecologists get their most representative data out in the field but must adjust to the elements.

Team-effort

Even before the official data collection in June, I already felt like I was a part of the team. I was welcomed to the weekly lab group meetings, where everyone is asked to introduce themselves and give their "high and low" for the week. I also attended the lab retreat day at the Wytham field station, where I got to learn more about everyone's research and what's brought them to the current point of their academic career. While based in the office, I dipped into conversations between lab members about their work. I spoke to one woman about the many reviewer comments she had to address for her most recent paper. And I spoke to another lab member about his frustrations with the limits to his computer storage that prevented him from running his code. Others were writing grant applications, navigating new software, or emailing other labs so they could pull together enough test tubes of the right size. The members of the group supported each other through their research, pushing each other forward in their scientific discovery.

Realising what you want to know (and if that's possible)

My investigation into the roots of the grassland plants was the culmination of all I had learnt this summer. Rather than having a specific question that I wanted to answer, it

was rather a realisation of all there is to know about roots. Root architecture, root biomass, the surrounding microbiome, the rate of root growth and many more characteristics are measurable. And each attribute of roots requires different experimental set ups. So, I started with trying out the different tools we had based on the techniques that I read about in the most recent ecological guide to roots (Freschet et al. 2021). I realised that root cores are much easier to work with than monoliths. Root cores were faster to soak and extract roots from, so more of a plot could be sampled in the same time it would take for just one monolith. However, monoliths are necessary for gaining insight into full root architecture. Comparing sampling techniques and ways of extracted roots is just the beginning of getting to the research hypothesis I would want to explore.

I had such a wonderful time this summer. I loved the hands-on botany and I've gained insight into what scientific research looks like. Scientific discovery is not a linear path and it's not necessarily the smooth cycle that those scientific method diagrams suggest either. Teamwork, creativity and resourcefulness are key to the field of ecology. This experience has gotten me very excited about a pursuit in post-graduate studies and further contribution to conservation research.