



Assessing changes in the diversity of Irish semi-natural grasslands – my MSc project

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Ireland has a large land cover of grassland habitats, which is primarily dominated by intensive agricultural grasslands. A small proportion of the grassland is extensively managed semi-natural grassland, which may have originated as a result of 5,000 years of human activity (Hall & Pilcher, 1995). As a result, these grasslands have a greater diversity of species. They provide a range of ecosystem services such as plant diversity, pollinator abundance, water regulation and carbon sequestration. Globally, research has shown, in some cases, that an increased plant diversity can generally increase carbon storage in response to climate stress (Isbell et al., 2015; Craven et al., 2016; Chen et al., 2018). To date, little is known about the capacity of Irish semi-natural grasslands to store carbon, and how plant diversity affects this.

The Department of Agriculture, Food and the Marine funded ‘StableGrass Project’, based in University College Cork, and University of Galway,

Above: Upland acid grassland at c. 700 m, Galty Mountains, Co Limerick. *Oliver Lynch Milner*. Below: the author in action. *Phoebe O’Brien*



aims to investigate this using various approaches, including functional trait assessment, as well as using novel methods in remote sensing. My project forms a Masters by Research degree, which is being undertaken at the University of Galway. My study began in October 2022, with the objective to resurvey 12 grassland sites from the 2007–2012 Irish Semi-natural Grassland Survey (ISGS) (O'Neill et al., 2013) to analyse changes in diversity since that survey. These sites were resurveyed during the months of June and July 2023. For the 12 resurveyed sites, three of the most frequently encountered habitat types in the ISGS were re-surveyed, namely Dry Calcareous and Neutral Grassland (GS1), Dry-humid Acid Grassland (GS3) and Wet Grassland (GS4) – classifications according to ‘A Guide to Habitats in Ireland’ (Fossitt, 2000).

My MSc will run until October 2024. The remaining time will be used to analyse the relevé data collected for all of the sites, and to relate the data to the other StableGrass components, to assess the impact of plant diversity on the carbon sequestration potential of Irish grasslands.

Grassland study sites and associated floral diversity

My survey sites range from highland calcareous EU Annex 1 grassland near Manorhamilton, Co Leitrim, to lowland calcareous grasslands of



Upland calcareous grassland near Manorhamilton, Co Leitrim. *Oliver Lynch Milner*

Leitrim and the Burren, Co Clare; lowland *Molinia* meadows in Galway and Limerick; and upland acid grasslands in West Cork, South Kerry and Limerick. This subset, which has a large range in terms of location, habitat, internal habitat mosaics, etc. will allow for the determination of the current diversity that occurs in Irish semi-natural grassland types, under different managements. The twelve sites also vary considerably in the topography, geology, hydrology and pedology (soils). This will capture the range and variation in the semi-natural grassland vegetation types that occur across Ireland, based on the various abiotic factors.

With this variation, a vast diversity of habitat types was observed, each with their associated diversities and flora. The calcareous grasslands were on average the most diverse, with a high number of species recorded per relevé, however, some of the *Molinia* meadow (wet grassland) sites were on par with this species diversity. However, as I learned from my observations of the sites, the number of species within a site, does not fully define the uniqueness or importance of a site. Within each site, a continuum of vegetation communities occur, each with a varying number of species, depending on the abiotic or biotic factors. This makes it more difficult to assess and compare the conservation value of different grassland types across a national scale. Hence, the goal of future analysis of the relevé data for these communities is to determine, in light of the expected diversity for that community, the current diversity and conservation value for each vegetation type encountered. Changes between the baseline ISGS data and the data collected during this survey will be analysed to assist in these determinations.

Also, the sites surveyed varied based on the conservation potential, with some of the sites containing examples of the protected EU Annex 1 grasslands, which was not the area of focus. However, in addition to these the more typical grasslands (or ‘standard’ grasslands; i.e non-Annex), were also surveyed. While these non-Annex grasslands may appear less diverse to the Annex counterparts, it was in my opinion very beneficial to survey a set of non-Annex grasslands. These would not have had

the same exposure to monitoring programmes such as Article 17 reporting or the 2015–2017 Grassland Monitoring Survey, which resurveyed many of the Annex ISGS sites.

It is the hope that this project will better describe the current and changing diversity of non-Annex grasslands, as well as give them recognition, as they still have their own role in the promotion of biodiversity and heritage. For example, an upland grassland in Lauragh, Co. Kerry, which was not previously recorded as EU Annex 1 grassland, was steeped in culture, and diversity of species with restricted distributions. This site had areas of Chamomile (*Chamaemelum nobile*) lawns, which, historically has resulted in locals naming fields in this area as Fíogadán (Irish for Chamomile) (P. O'Brien & C. Heardman, pers. comm., August 2023). In terms of species richness, it would not be the most diverse, but still so important for maintaining diversity of this vegetation type, and the cultural and landscape heritage.

Calcareous grasslands in Ireland are possibly the most restricted in distribution, as many of these have been agriculturally improved, which made them difficult to select for the study. Frequent species in these habitats include *Festuca* (fescues), *Agrostis* (bents) and other common grasses; with forbs such as *Achillea millefolium* (Yarrow), *Lotus corniculatus* (Common Bird's-foot-trefoil), *Hypochaeris radicata* (Cat's-ear) and *Galium verum* (Lady's Bedstraw) (to name a few – there were often 30–40 species in one relevé). *Briza media* (Quaking-grass), *Avenula pubescens* (Downy Oat-grass) and *Sesleria caerulea* (Blue Moor-grass) defined the more strongly calcareous grasslands. These sites were located in some lovely locations, and the most typical calcareous grasslands were those of shallow soils with exposed limestone in the vicinity.

The acid grassland sites, as with their nature, were largely on mountain/hill slopes of Lauragh, Co. Kerry, Ballyourney, Co. Cork, and Galtees, Co. Limerick, with the exception of an unusual lowland GS3 site on the shores of Lough Mask, Co. Mayo, which had habitat mosaics of calcareous and wet grasslands, fen, tall herb and scrub communities. The more typical acid grassland sites are generally

more species poor, than the calcareous and wet grasslands, with species such as *Agrostis*, *Festuca*, *Molinia caerulea* (Purple Moor-grass), and in some sites *Nardus stricta* (Mat-grass) being the distinctive grass species for this habitat, as well as *Carex binervis* (Green-ribbed Sedge) and other *Carex* species. Herbs which were dominant in my GS3 sites included *Galium saxatile* (Heath Bedstraw), *Potentilla erecta* (Tormentil), *Succisa pratensis* (Devil's-bit Scabious) and *Viola* spp (violets). Interestingly, some of these species were also recorded at GS1 sites, which indicated the degree of variation that influenced the vegetation communities at my sites.

Finally, the wet grassland sites included *Molinia* meadows of Portumna, Co. Galway; Foynes and Lough Gur of Co. Limerick; and a 'standard' wet grassland (GS4) in Co. Clare. This habitat is still arguably the most frequently occurring semi-natural grassland in Ireland, as it typically occurs in lands that are marginal for agriculture and have not been improved. The species richness on average across my wet grassland sites has been quite high, but this has been influenced by the Annex 1 grasslands surveyed. The common species that denote this habitat, and recorded during the surveys included *Juncus* spp. (rushes), *Carex flacca* (Glaucous Sedge), *Carex panicea* (Carnation Sedge), *Holcus lanatus* (Yorkshire-fog), *Molinia caerulea*, *Agrostis* spp., *Cirsium palustre* (Marsh Thistle), *Potentilla anserina* (Silverweed), *Filipendula ulmaria* (Meadowsweet), *Mentha aquatica* (Water Mint), *Galium palustre* (Common Marsh-bedstraw) and *Cardamine pratensis* (Cuckooflower) to give a few examples. Some of the more exciting species in these sites included *Parnassia palustris* (Grass-of-Parnassus) and *Dactylorhiza kerryensis* (Irish Marsh-orchid).

Notable flora records

Besides the data being collected for a research project, they will also contribute valuable records. One example is the discovery of *Achillea ptarmica* (Sneezewort) in a site just South of Foynes, Co. Limerick. This species was last recorded in 2019 and as such, was included on the County Limerick Rare Plant Register (Reynolds, 2021). I also observed species which were new to me, including

Chamaemelum nobile, mentioned above, and *Hypericum elodes* (Marsh St. John's Wort). *Parnassia palustris* (Grass-of-Parnassus) and *Epipactis palustris* (Marsh Helleborine) were two species which I have wanted to see during the past year, and to my delight, these were observed at sites in Portumna, Co. Galway, and Lough Mask, Co. Mayo.

While these are only a few examples of the flora encountered during my surveys, they were amongst my most notable records and gave me great excitement.

Future work

It is intended that the data gathered during these grassland surveys will be used to assess how the species diversity has changed with time and define the vegetation communities present in the study areas, using the Irish Vegetation Classification system. When grouped with the overall StableGrass project,

it will contribute to the larger understanding of how plant diversity may impact carbon sequestration in these grasslands. Science aside, I have had a very enjoyable journey, recording many lovely plants, and continuously developing my plant identification skills.

Acknowledgments

I would like to acknowledge all of the useful and ongoing support of my Supervisor, Dr. Karen L. Bacon (University of Galway), the StableGrass team; Prof. Astrid Wingler (UCC), Dr. Fiona Cawkwell (UCC), and Dr. Samuel Hayes (Postdoctoral Researcher, UCC). I would also like to thank Phoebe O'Brien (VCR for Co. Clare) for her assistance in the field and the useful training that she provided. Finally, I would like to acknowledge the funding received from the Department of Agriculture, Food and the Marine.

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Parnassia palustris (Grass-of-Parnassus) and *Epipactis palustris* (Marsh Helleborine). Oliver Lynch Milner

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