How do habitat support pollinators in order for them to travel to pollinate other areas?

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Introduction

Ski resorts can be very beneficial to a local community for many socio-economic reasons. For example, the ski resort brings in income to be shared for the local community, from tourists both visiting the ski resort and also staying in the locals housing. But it may also be seen as somewhat of an eyesore. Ski resorts also have damaging ecological and environmental impacts where they are located, despite the benefits they provide. Firstly, ski resorts require many constructions and also they use mechanical snow compaction, which extends the season as it lasts longer, consequently there is a longer winter for the plant life. The snow then melts in later May which means once the snow has melted it is already spring. Therefore, the plants have to undergo a dramatic climatic shift. Once the snow is melted the plants also get a sudden influx of water, which they are not used to as they are adapted to survive in dry conditions.

The ski resort itself is quite small, for this reason it has it localised impacts, however there are still potential fragmentation effects occurring at the site. This is where the ski lift, for example, was placed in the middle of a habitat, and so created an obstruction to the other side of the habitat for species. Therefore, if any plants rely on pollinators such as bees or wasps to spread their pollen, corridors are needed to other habitats to ensure the species survival. The study we conducted looked into how different habitats support pollinators in order to allow them to travel to pollinate other areas.

Methods

We could not access the ski resort itself, so we travelled to a close location of a variety of different habitats close to one another in order to replicate the study. Our site had 5 different habitats within it, including grassland, grassland/scrub ecotone, heather scrub, heather/broom ecotone and broom. Within these habitats we surveyed 2 quadrats, totalling 10 quadrats per individual team for the whole site. The quadrats were 2m x 2m, and at each quadrat we decided on were to measure % cover of bare ground, vegetation and open flowers. Then from the % cover of open flowers, measure % cover of each species of open flowers in a break down. To identify the areas to quadrat we set some 'rules', they needed to be placed at least 1m from the edges of the habitats, the habitat needed to be homogeneous (such as no stream or reeds) and we needed to use haphazard sampling.

We then conducted a 50m transect which we were to walk whilst counting how many pollinators were present and on which species of flower, using the species flower list which we would've compiled from our quadrat surveys. We identified four different categories of insect types to look for, which were (i) Bumblebees, (ii) Hoverflies, (iii) Butterflies and moths and (iv) Honeybees and Solitary bees. With a rule which was no fly-by's, so the pollinator had to be on the flower identified.

Results

The location surveyed contained a variety of heath types, the basin of the valley was overwhelmingly grass dominated, transitioning into dense heather and finally broom as one moved toward the periphery of the area. The initial survey of ground coverage indicates that flowering vegetation was markedly more abundant in the heavy broom areas, a positive gradient was apparent as one proceeded through the site from grass to broom.

Conversely, where open flowers grew more abundant, other vegetation receded. A clear correlation can be seen between the two (fig.1), which is to be expected as bare ground cover was largely unchanged throughout.

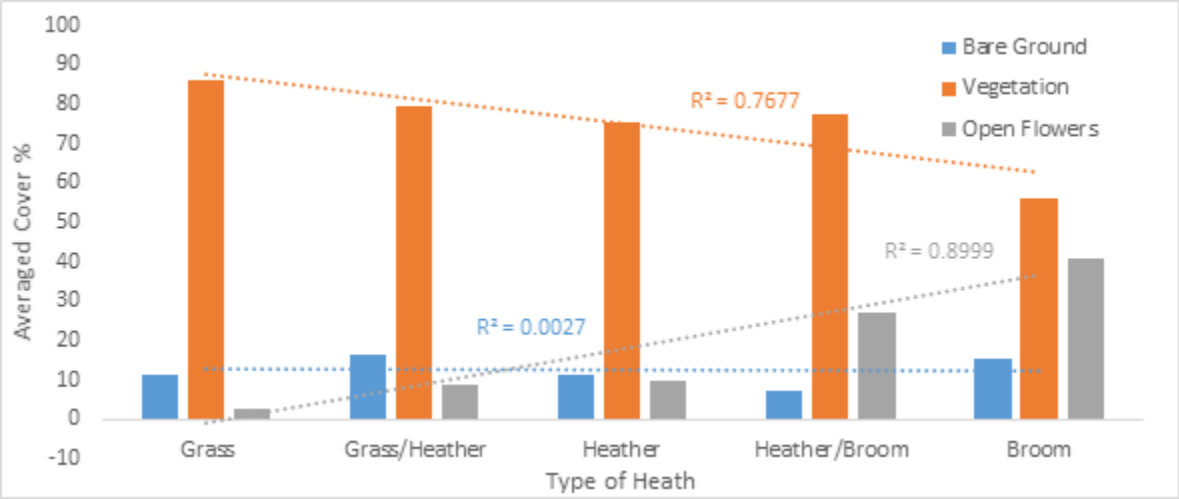

Figure 1. A comparison of bare ground, non-flowering vegetation and open flower coverage in each of the heath types and ecotones surveyed.

The flower survey data suggests that although the grassland had a far lower coverage, it contained a much greater diversity of flowering plants. This too is to be expected as heather and broom were the dominant flowering species in the other areas, allowing little scope for smaller, less robust plants to flourish (fig.2). It should be noted that much of the flowering heather had wilted and died under the relentless Spanish sun, which had allowed pignut to prosper in that region.

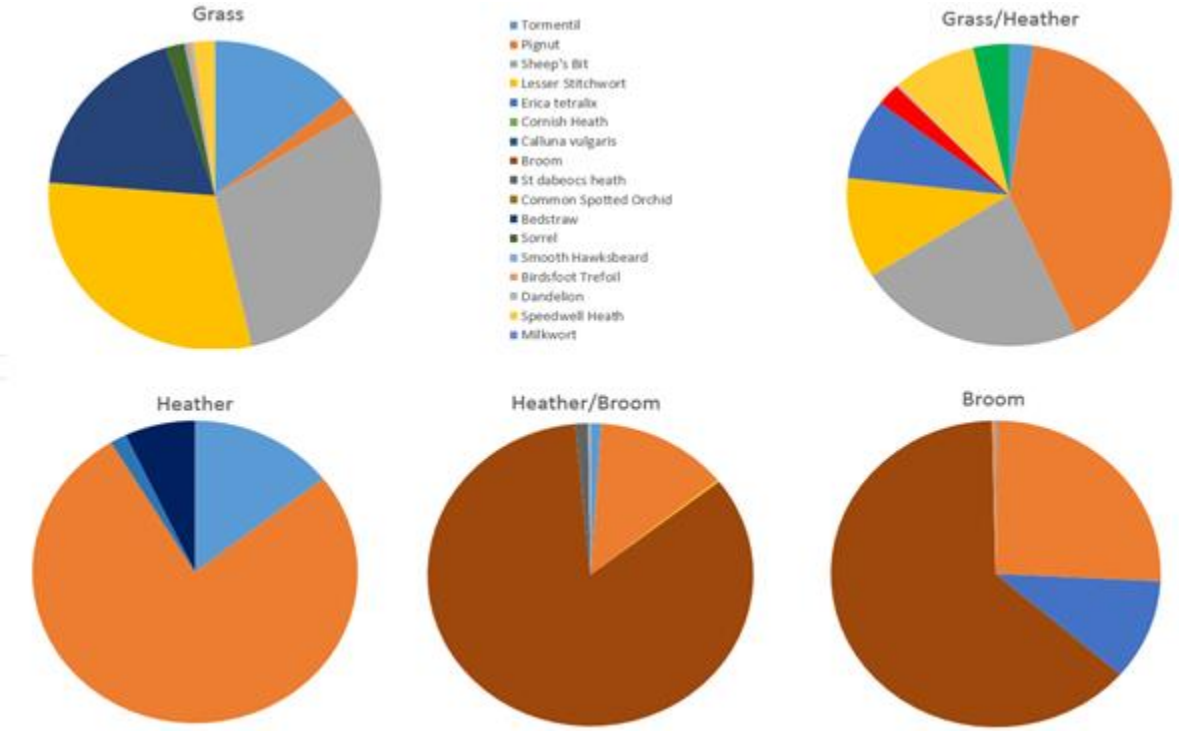

Figure 2. Coverage (%) of flowering plants in each of the heath types and ecotones sampled.

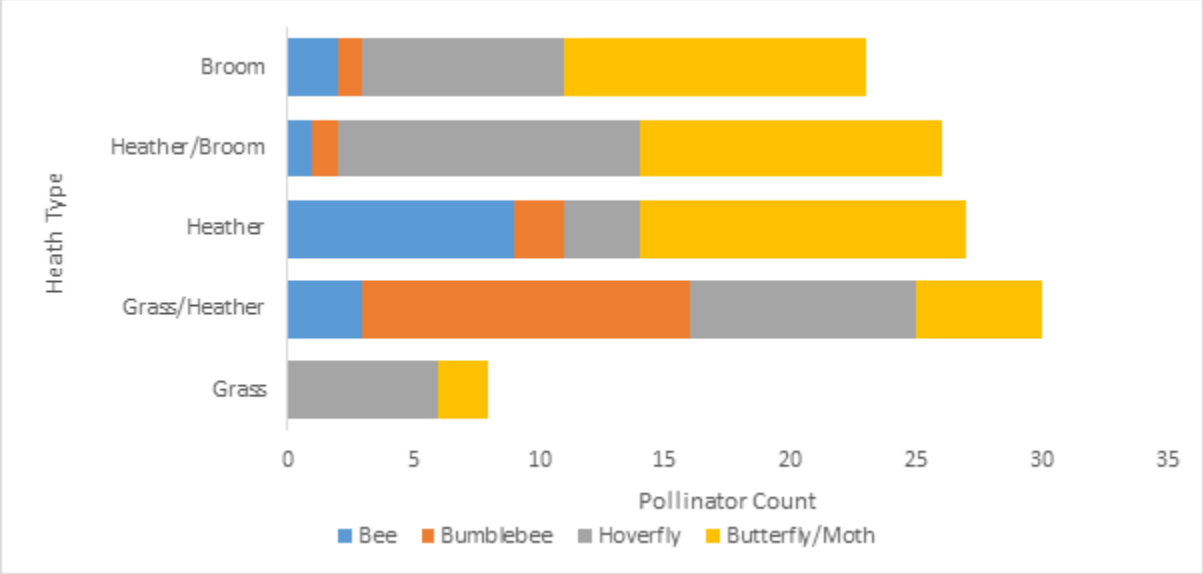

Figure 3. Combined distribution of pollinators observed on flowering plants throughout the area.

Most of the pollinator categories showed distinct preferences for different heath types (fig.3), the most abundant were hoverflies, butterflies and moths. Hoverflies were observed in all areas and mostly in similar quantities. However, proportionately butterflies and moths exhibit a clear inclination toward both heather and especially broom over grass. Bees of all types were almost entirely limited to the heather dominated regions of the site and none at all were found in the grassy heath. The most diverse pollinator count was recorded in the grass/heather ecotone, which is also the most diverse in terms of flowering plants (fig.2), suggesting that diversity in plants correlates positively with pollinator diversity.

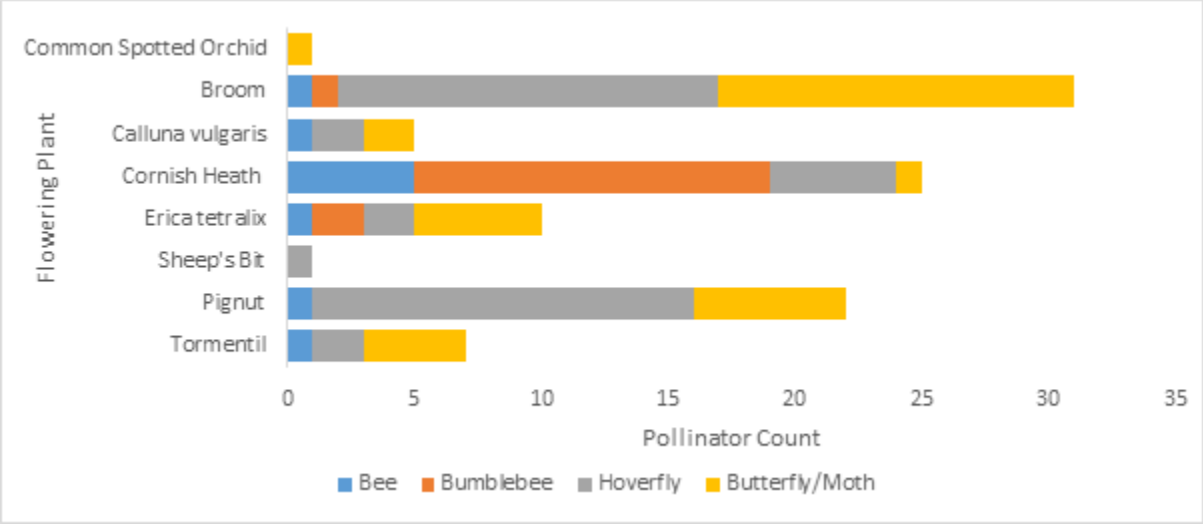

Figure 4. Observed flowering plant preference of pollinators.

In terms of plant preference, broom is chiefly occupied by hoverflies, butterflies and moths, followed closely by pignut. As the areas containing the majority of broom were also those most abundant with flowering plants, this may explain why most of the pollinator sightings were associated with broom. Bumblebees almost exclusively

prefer Cornish heath as fig.4 shows, fourteen were encountered on this flower, whereas only two were seen on Erica tetralix and one on broom. There were no sightings of bumblebees on any other flower. Solitary and honey bees however are less explicit in their choice of flower, having been sighted on all pollinator containing plants except for sheep's bit and the common spotted orchid. However, there does remain a slight preference for Cornish Heath.

Discussion

Pollinators overall were more abundant in the grass/heather heath type but were more commonly seen throughout all habitat types on the flowering broom plants. Broom and heather were present in most of the habitats making them the most abundant plants. This could indicate a preference for these plants, or that they were the most prominent food source making it easier for pollinators to feed.

Butterflies and moths seemed to prefer the broom, heather/broom and heather habitats over the grass and grass/heather habitats. This could be because bees preferred the grass/heather habitat leaving less plants for butterflies and moths to pollinate or because their preferred plant is broom whereas bees prefer heather.

All types of pollinators were found on broom, Cornish heath and Erica tetralix which could indicate these plants being the most popular among all species of pollinators observed. A significantly lower number of pollinators overall were found on Erica tetralix, this could be due to smaller numbers of this plant being observed and that heather and broom are the more dominant and easily accessible plants.

Hoverflies were seen in high numbers on both broom and pignut, meaning that this would be the preferred plant for this species of pollinator. This also indicates that this pollinator could move with ease through different habitats as pignut was only found in the grass/heather habitat but broom was found in multiple habitats.

The grass and grass/heather habitats contained the most diversity out of all habitats, but not many pollinators were seen in the grass only habitat. This could suggest that this type of habitat is mainly used as a corridor for other areas, which would explain why the most amount of pollinators were found in the grass/heather habitat as it is highly diverse compared to other locations and can easily be used to access to other habitats.

Bumblebees were the dominant pollinator on Cornish heath in the grass/heather habitat, this would suggest it is the preferred plant from this species as they are quite exclusive in their choice of plant and could explain why higher numbers of the different pollinators observed were found on other plants.

All other species of bee also preferred the Cornish heath but were found more in the heather only habitat. This could be because bumblebees were dominating the plant in the grass/heather or that their preferred habitat if heather only.

The results suggest that all species have a plant preference, but some species stay in one habitat type to find those species. As all species were observed in each habitat types, it would suggest that most pollinators can move between habitats with ease. Bumblebees were mainly only seen in the grass/heather habitat suggesting that this species may not be able to travel as far as other or that it's preferred plant was in an easy to access areas and did not need to move between habitats as much as other species. Butterflies, moths and other bee species seem to have a plant preference, but were observed on many different plants in various habitats, suggesting that these species can easily move between habitats.

During this study there were many limitations which could have affected the results. The main limiting factor to this study is that the methods were made up around 10 minutes before the results were collected, this could have caused confusion and uncertainties whilst not being able to validate the study using already known or similar methods. Another limitation is the way the transects were undertaken, walking through the habitat could have scared many of the pollinators away from the area or their desired plants meaning that the numbers observed will not fully represent the number of pollinators in those areas or on those plants. Identification of plants is another limiting factor, in order to ensure the correct plants were observed, they were identified as a group after the data collection, and therefore some plants may have been recorded wrongly during the experiment.