Management of bilberry (*Vaccinium myrtillus*) as a resource for Capercaillie (*Tetrao urogallus*)

What is the effect of excluding deer grazing on the growth of Vaccinium myrtillus and its value as a resource for Tetrao urogallus

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Billbury is a common plant in the northern part of Picos de Europa national park in Spain. ((Prince, Heather, Bunce and Jongman 2012)). It is also known that T.uogallus uses Billbury throughout its lifecycle ((EU 2009))and therefore is a vital part within the ecosystem (EU 2009). T.urogalls, as young and as adults use V.myrtills to feed (EU 2009). V.mytrillus is used as a cover to protect the young from predation as well as used for nesting materials(Munich university 1993, Euro 2009). The ideal Capercaillie nesting site according to the EU birds directive (2009) is one that has covered areas but also has large open areas for lek sites (Haysom 2013).

In Picos de Europa the main use of areas that have Billbury is that of grazing or recreation (Pollo, Seijas, Robles and Ottero 2005). This causes disturbances to the possible Capercaillie sites preventing the shy bird from using the sites (Munich university 1993). Picos de Europa used to be a grazed area but due to the movement out of the area by people it has become less grazed and more rewilded allowing for the growth of Billbury and the ideal conditions for Capercaillie (Diaz 2016; pollo et al 2005). Within Picos there is little grazing done for ecological purposes and more for the lifestyle of farming. (Diaz 2016), allowing for the rewilding of open grasslands and meadows.

The site is known as Puerto de Panderrueas. This site is in the northern part of spain but in the south west of the Picos de Europa national park. The plots were up the side of the mountain on the eastern footpath.

Methods

The surveys that were conducted on the site in picos de Europa were to see which method of surveying would be quickest to tell the quality of Billbury. To investigate whether the exclusion of deer grazing affects the value of vaccinium myrtillus for Tetrao urogallus, five different questions were asked

1) Does the % cover of abundance of bilberry (Billbury) and other plant species/groups differ between fenced and open plots?
2) Does the structure of vegetation (height, volume, number/length of shoots) differ between fenced and open plots.
3) Are some methods of recording structure work better than others in terms of their replication and time consumption.
4) Does the amount of grazing (% nibbled) differ between fenced and open plots?
5) Does the resource availability of fruits and flowers differ between fenced and open plots?

To find the answers to these questions several different surveys were set up in 10 different plots on the site, each plot being 2x2m. 5 of these plots were fenced to protect it from grazing pressure the other 5 were directly outside its fenced companion to be able to directly compare it with its partner plot. Each plot was done by a 2-person team following the same rules.

The first survey completed was a basic ground percentage coverage survey. Within the plots each team measured roughly what percentage cover was bare ground, Forbes, Grass, Heather, bilberry and broom. This survey was timed.

The second Survey completed on each plot was recording the basic structure of each plot. To do this each team had a tape measure and took 5 random measurements of height within the plot. Ensuring that the base of the tape measure was on the ground. This was then timed and repeated by the other team member to help answer question 3.

The Third survey completed was a Minimum, Maximum and Mean height of the entire plots plants. To complete this the person completing the survey would choose by which of the plants was the smallest tallest and average of plants and record the heights and the length of time it took to complete the survey.

The fourth survey completed was volume calculation. This survey required that every 10 cm off the ground the percentage between 0-10 covered was assessed. For example, taking slices of a 3D model of the site and assessing how much of it was covered. This was completed every 10cm until the plot was at 0% coverage. Again this was timed to help assess Question 3

The Fifth survey completed was to count up each of the Billbury rammits within the plot. To do this the surveyor counted each individual rammit in the plot and timed how long it took to complete.

The sixth survey entailed that the surveyor found 10 marked Billbury rammits and completed 4 different methods on each rammit. If not all 10 could be found, then the surveyor would mark the new rammit with a red ribbon. The first method was to count all the flowers and fruiting bodies on the rammit. The second method was to count how many been had been nibbled off of each of the ten rammits. The third method was to count the length of each branch on the rammit and recording them. The final method was to measure the longest length of the rammit. Each method was completed for each of the ten rammits and the entire 10 rammits were timed as one survey.

Each of these surveys bar the first were timed and then repeated by the second team member to help investigate question 3.

Results

Our hypothesis was that the percentage cover and height of Bilberry in open quadrats would be considerably less than the percentage cover and height in fenced (controlled) quadrats due to access from species such as bears, wolves, deer and various bird species. Figure 1 and Figure 2 show the data that we collected for five CV plots and five PAN plots. For each of the five plots, the percentage cover was taken in both open and fenced (controlled) quadrats.

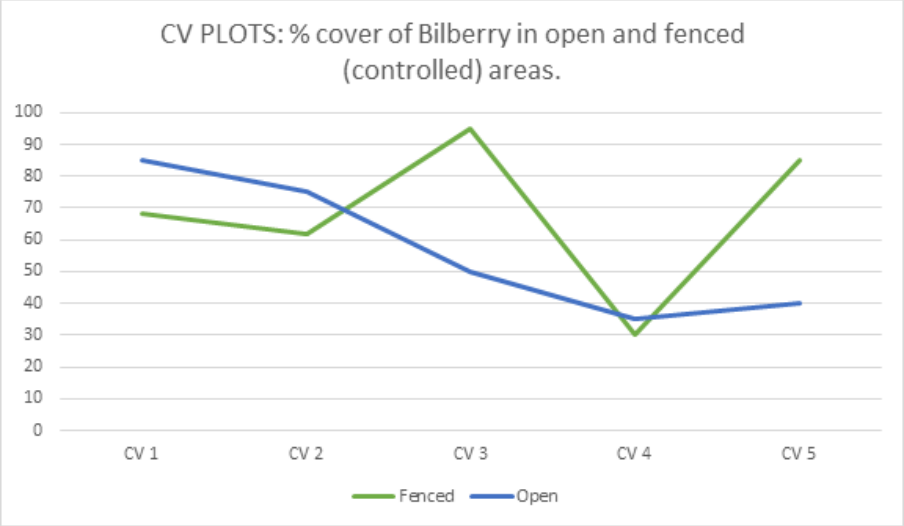

Fig.1. % cover of Bilberry in open and fenced (controlled) quadrats for each of the five CV plots. Survey taken on the 22nd July 2016, Picos de Europa National Park.

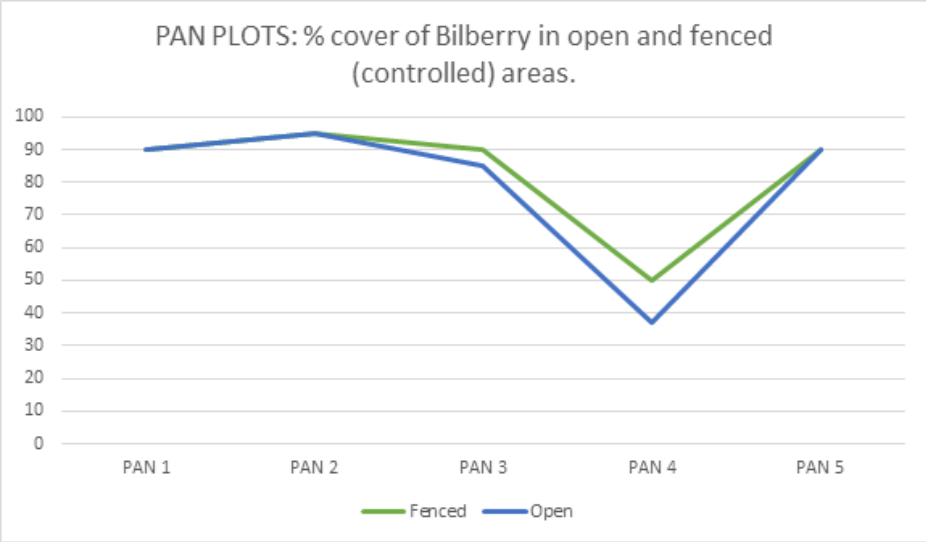

Fig.2. % cover of Bilberry in open and fenced (controlled) quadrats for each of the five PAN plots. Survey taken on the 22nd July 2016, Picos de Europa National Park.

These tables do not prove our hypothesis. In both the CV and PAN plots the percentage cover in fenced (controlled) areas was only greater than the open areas in two of the five plots (CV 3 and CV 5, PAN 3 and PAN 4).

Each person in the pairs had to take their own average height of the Bilberry in the plot they surveyed. In Figure 3 the quadrats are named open and fenced with (1) and (2) relating to the individual who took the data. This allows for more accurate results as the data was collected using visual observations perhaps making the survey bias/subjective.

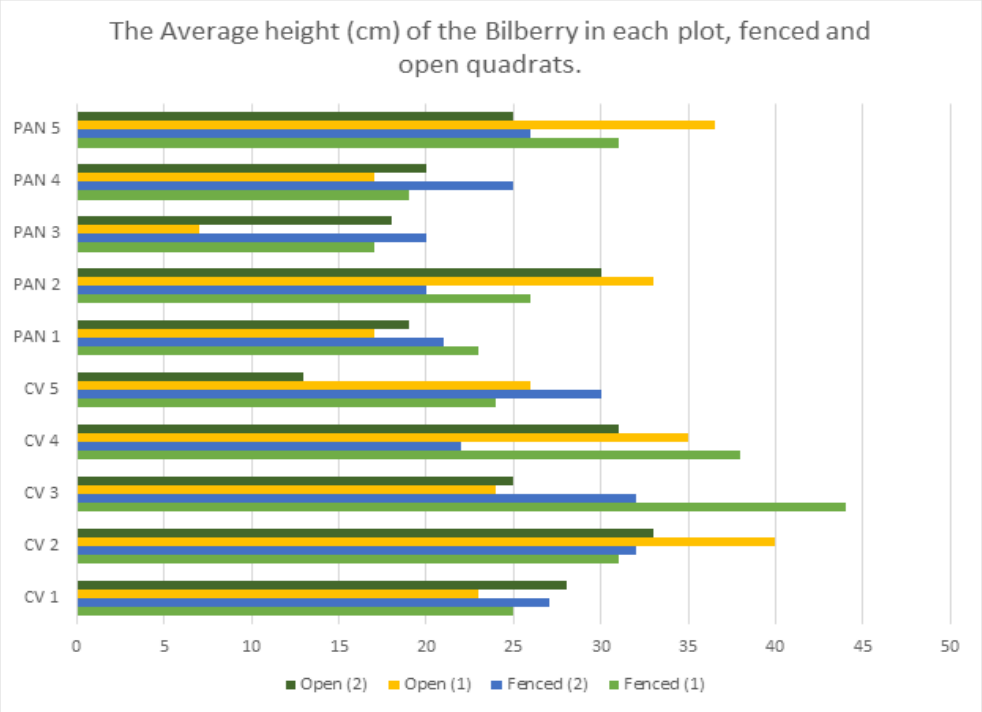

Fig.3. The average height (cm) of the Bilberry in open and fenced quadrats in both CV plots and PAN plots. Data collected by person (1) and person (2) for every quadrat. Survey taken on Friday 22nd July, Picos de Europa National Park.

The results for each plot vary immensely between person (1) and person (2) and this graphs shows that for each quadrat person (1) and person (2) did not measure the same average height. Only the data collected by both persons for CV 3 and PAN 1 proved our hypothesis that the height of Bilberry is greater in fenced (controlled) quadrats. These results do not show any correlation between the average height of Bilberry and whether the quadrat was open or fenced in each plot. The data collected for the fenced quadrat in CV 4 showed the largest differentiation between the average height surveyed by person (1) and person (2) with a 16 cm gap (38cm-22cm). Overall Bilberry in the CV plots had a higher average height than the Bilberry in the PAN plots.

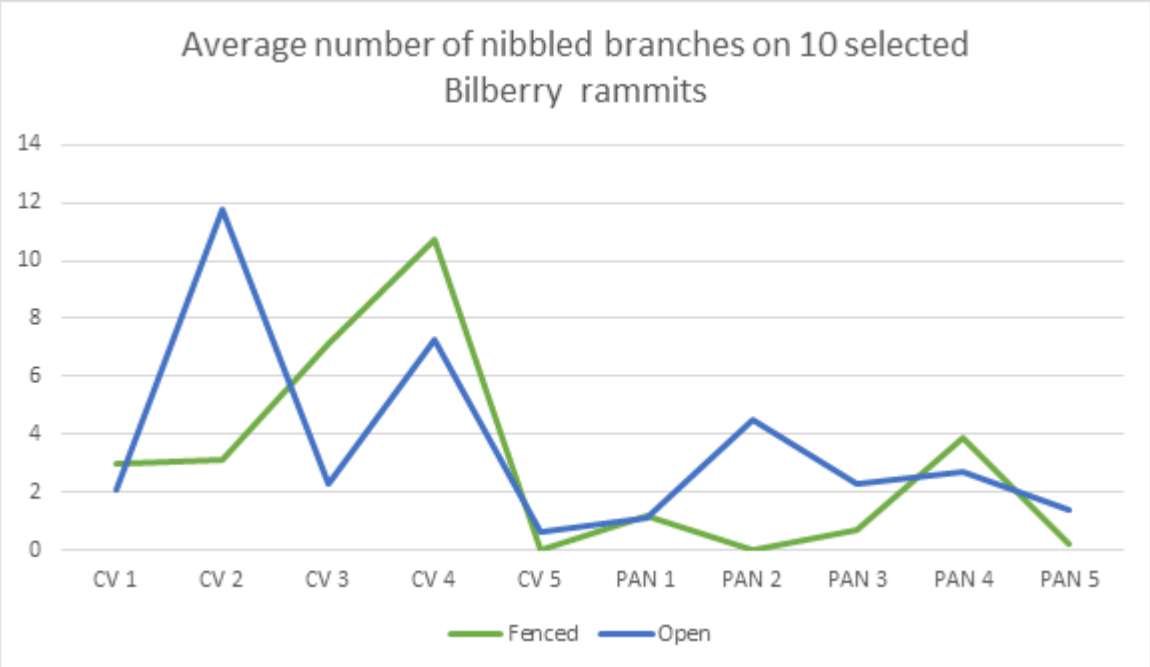

Fig.4. The average number of nibbled branches on 10 selected Bilberry rammits from the fenced and open quadrats in each plot. Survey taken on Friday 22nd July, Picos de Europa National Park.

In each quadrat ten Bilberry rammits had been selected with ribbon and for each rammit we counted the number the branches that had been nibbled. Figure 4 shows the average number of nibbled branches across the 10 rammits in each quadrat. Our hypothesis was that there would be more branches nibbled in the open quadrats due to access from animals such as the Capercaillie, deer, and bear. This was demonstrated in the PAN plots as there were more nibbled branches in the open areas. However, in the CV plots, there were more nibbled branches in the fenced (controlled areas). This is odd as the results in fig.3. show that Bilberry in the CV plots had a higher average height Bilberry in the PAN plots.

Discussion

The results show that Bilberry in the CV plots had a higher average height than the Bilberry in the PAN plots (figure 3). This is perhaps because the CV plots were on the top of a mountain with no, or very little canopy cover. This allowed access to direct sunlight. The PAN plots were under a dense canopy cover in the woodland which means much less sunlight and heavy leaf fall in the autumn and winter seasons. Furthermore, the PAN plots were situated in habitats more suited to animals such as bears and deer. This is because it is less exposed so there are more hiding places for prey species and more cover for predator species to sneak up upon their prey. The probable higher rates of activity in the woodlands means that Bilberry is subjected to heavier grazing and trampling, perhaps explaining why the average height of Bilberry in CV plots is higher.

As shown in figure 4. the CV plots had a higher average of nibbled branches on ten selected rammits than in the PAN plots. These results are odd as figure 3. demonstrated that the average height of Bilberry in CV plots is higher. This shows a negative correlation as usually a smaller number of nibbles would result in higher growing Bilberry. Furthermore, there were more nibbled branches in fenced (controlled) areas in the CV plots. These fenced areas were established to investigate whether Bilberry grew more efficiently when grazers could not access it, allowing it to flourish for the Capercaillie. However, this data would suggest that the fenced (controlled) areas made no such difference. Another explanation for nibbled branches in the fenced areas could be smaller species such as rodents, reptiles, amphibians, and insects. The higher average of nibbled branches on ten selected rammits in the PAN open quadrats could further be explained through the higher rates of activity in the woodlands.

Figure 1 and Figure 2 do not support our hypothesis as the overall percentage cover of Bilberry in fenced (controlled) areas was less than in open areas. Figures 3 and 4 provide further evidence that the data collected did not show any continuity or correlation between healthier Bilberry and fenced quadrats. However, the data collected could be regarded as unreliable as only one pair studied each plot which means results could be skewed or biased. To make the data more reliable, the survey would need to be carried out a few more times from different pairs and then averages could be taken. This would gather more accurate and substantial results.

A methodological problem with this study is that we wouldn't be able to prove the hypothesis as we would need to repeat the experiment more than once to create more repeatable and reproducible results. Also, different variables would have to be altered such as different pairs repeating the experiment on different plots to avoid biased or help reduce the effect of human error and make the results more accurate

The results collected have a large influence on ecological management of the area. For example, one factor which decides the number of deer culled in the area is the amount and height of bilberry. If

there is not sufficient amount and height bilberry to accommodate for the Capercaillie, then more deer will be culled. This is because deer graze on the bilberry and too many deer means that too much bilberry is being destroyed and therefore having a negative impact on the Capercaillie.

Références

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