Flying period of the major pollinator groups on a Mediterranean scrubland

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1. Introduction

Pollination is an extremely important ecosystem's function, and most plants rely on arthropod vectors to carry out the pollen transfer. From the point of view of pollination, the most important part of pollinators' phenology is the flying period.

It is easy to suppose a different flying period during the season for the different pollinator groups because of its dependence on different floral resources. The aim of this work is to check the differential temporal behavior hypothesis of the five major pollinator groups: bees, beetles, butterflies, flies, and wasps (Figure 1).

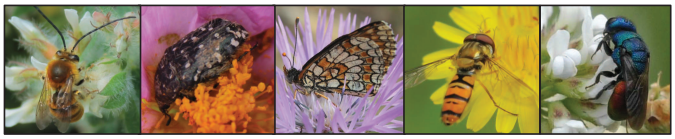

Figure 1. The five groups of pollinators. From left to right: bees, beetles, butterflies, flies and wasps.

2. Material and methods

Figure 2. Location of the study area (top) and scrub landscape (below).

The database belongs to a CREAF study of pollination carried out in the Garraf Natural Park (Figure 2). Twenty-one plots were established throughout the park, which were sampled eight times during the spring season, from March to June (Requesens, 2012).

Abundance and species richness were estimated from the samples. Abundance data was transformed to a Normal (0,1) in order to visualize temporal variation of each group.

Statistical analyses are based on a General Lineal Model (GLM) with Repeated Measures to assess temporal variation of the five groups (Abell, 2012), both with abundance and richness data. Bivariate correlations were carried on to study relation between abundance and richness of each group and overall data.

3. Results and Discussion

Abundance

The GLM test concluded that there exist significant differences among groups ($F=36.336$, $p<0.001$) (Figure 3.a) and between surveys ($F=9.606$, $p<0.001$) (Figure 3.b). There is a significant interaction between survey and group ($F=13.615$, $p<0.001$) (Figure 3.c).

Normal-transformed data of abundance reveals the flying period of each group regardless the other ones. The results show that they have different flying periods during the season (Figure 3.d).

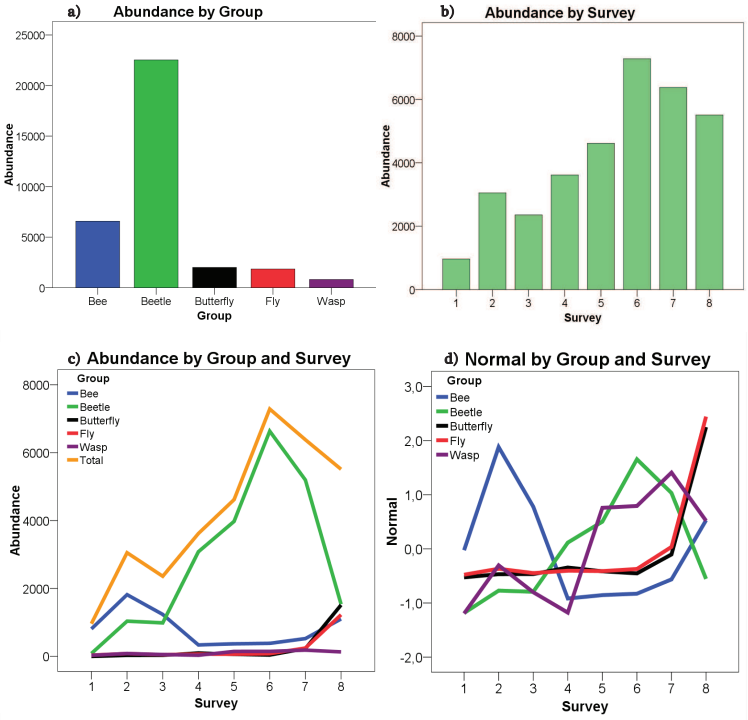

Figure 3. a) Amount of individuals of each group. b) Amount of individuals sampled for each survey. c) Amount of individuals of each group and overall abundance for survey. d) Normal-transformed abundance data, showing accurately the temporal distribution of each group.

Species Richness

There are significant differences among groups ($F=415.985$, $p<0.001$) and between surveys ($F=107.848$, $p<0.001$). There is also a significant interaction between survey and richness factors ($F=54.098$, $p<0.001$) (Figure 5).

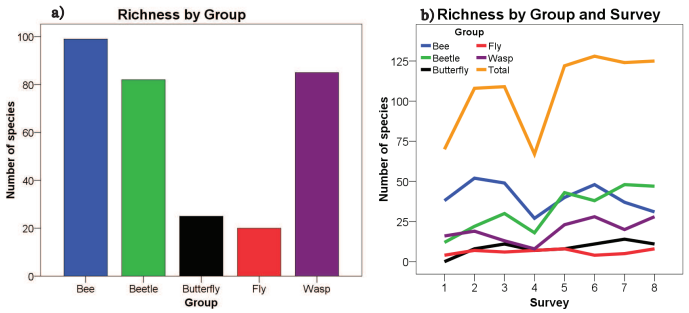

Figure 4. a) Amount of species of each group. b) Amount of species of each group by survey.

Abundance-Richness Correlation

To explain the different results between abundance and richness of the groups, it was made a correlation between them for each group. Pearson correlation coefficient is different for every group (Figure 5). It is only significant on wasps and total data ($p<0.05$).

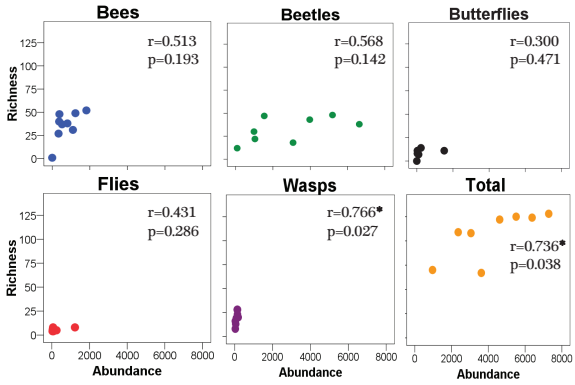

Figure 5. Correlations between abundance and richness of each group and the overall groups, with Pearson correlation coefficient and significance for each one.

4. Conclusions

–The five groups have different flying periods. Some of them can be gathered regarding to its peak proximity: first are bees, showing their peak at early season; beetles and wasps reach their plateau at the middle-late season and decrease at the end; butterflies and flies are few the entire season but strikingly increase at the last survey.

–Total amount of species increases the first half season and stabilizes at late season. There is a variation in the amount of species of each group along the season but without clear patterns.

–Proportional values between abundance and richness of the groups might be expected; then with more species, more individuals (or vice versa). This tendency is only found when the community is analyzed as a whole, but this tendency is not found when each group is analyzed separately.

5. References

1. Requesens, M.A. Spatial distribution of a pollinator community: differences among functional groups and the effect of flower resources. (2012). Master thesis, UAB, Barcelona.
2. Abell, K. J; Van Driesche, R. G. (2012). *Impact of latitude on synchrony of a scale* (Fiorinia externa) *(Hemiptera: Diaspididae) and its parasitoid* (Encarsia citrina) *(Hymenoptera: Aphelinidae) in the Eastern United States.* Biological Control 63: 339–347