

Hymenopteran communities and their parasitoids for two environmentally different locations

Miquel Ferrín Guardiola - Environmental Biology Student

INTRODUCTION

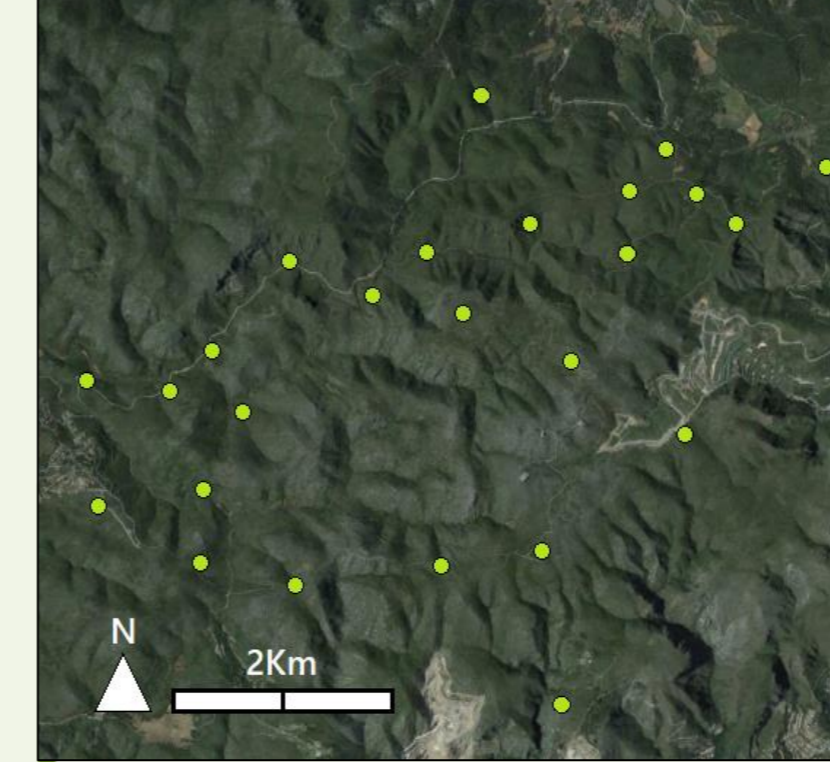
Hymenopterans are in a worrying decline, endangering its conservation and ecosystem service [1]. A correct use of pollination management is mandatory for the wellbeing of humankind and worldwide ecosystems, and the use of CNBW (Cavity Nesting Bees and Wasps) is becoming a common strategy to fight against the upcoming crisis [2]. Therefore, a better understanding of CNBW ecology is essential to optimize management and conservation. But despite all this, the effect of environmental variability on parasitoid interactions with CNBW remains poorly investigated.

OBJECTIVES

1. To analyze the dissimilarities between the two CNBW host communities and between their related parasitoids. We asked ourselves to what extent environmental variability within the same climate region can affect both guilds separately.
2. To explore the interactions between guilds. We asked ourselves if this same environmental variability alters the interactions between hosts and parasitoids.

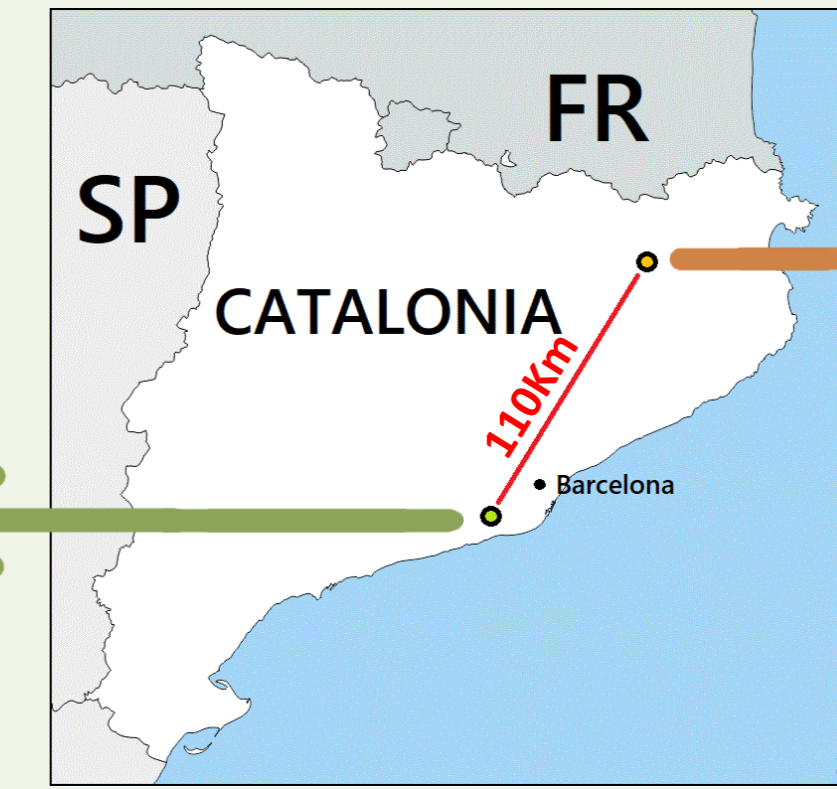
METHODS

GARRAF NATURAL PARK (GNP)



25 Trap-nesting Stations

- Mediterranean Climate
- Coastal Influence
- Shrublands
- 32Km²
- 02/2011-10/2011 + 02/2013-10/2013
- Analyzed nests: 1761



SURROUNDINGS OF OLOT



16 Trap-nesting Stations

- Mediterranean Climate
- Continental Influence
- Agricultural Mosaic
- 100Km²
- 04/1991-09/1991
- Analyzed nests: 1538

Data was provided by two studies [3][4]. Each station contained 175 paper straws with a given diameter of 2, 3, 4, 5, 6, 7 or 8 mm. Tubes containing complete nests were replaced every two weeks, so all paper straw diameters were always available. Complete nests were then hatched in temperature chambers simulating the thermoperiods of each location. Once the hatching period ended, nests were dissected, and hosts and parasitoids were identified.

RESULTS

1.
 - Olot had a significantly higher abundance and diversity for both guilds, and a higher parasitoid richness, but host richness did not differ between locations.
 - Parasitoid richness was correlated to host abundance in both locations.
 - Host and parasitoid richness correlation only took place in GNP.
 - Jaccard and Bray-Curtis indices showed significant composition dissimilarities between communities for both guilds.
 - β_S was significantly greater in GNP suggesting that Olot's sampling plots had a more homogenous composition between them than with GNP's. (Fig.1)

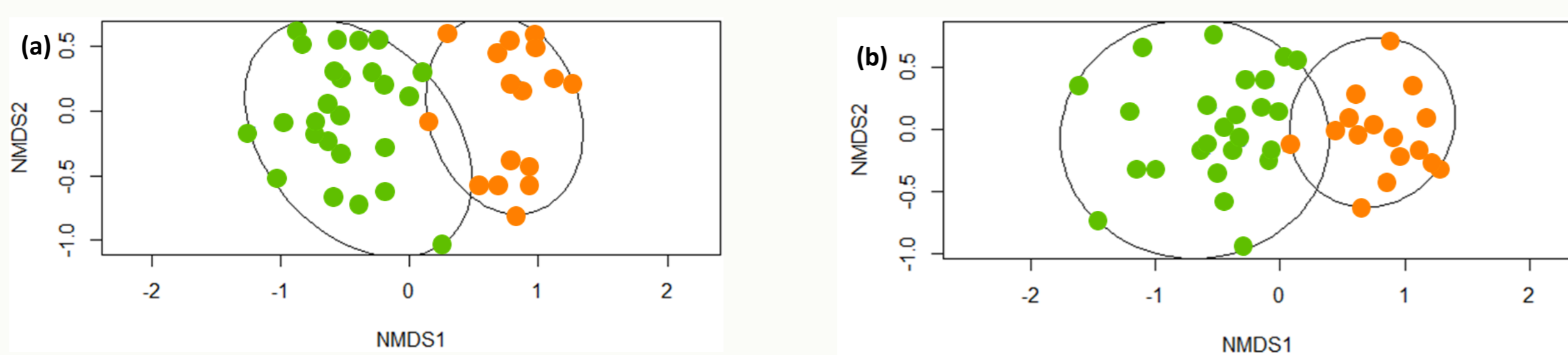


Fig.1 Non-metric multidimensional scaling, showing plot similarities between (a) hosts and (b) parasitoids, each green dot representing a GNP plot and each orange dot representing an Olot plot.

2.
 - Olot was significantly nested, whereas GNP was not. (Fig.2)
 - β_{WN} was significantly greater in GNP, with β_{ST} being significantly greater in GNP, whereas β_{OS} did not show significant dissimilarities between communities. (Fig.3)

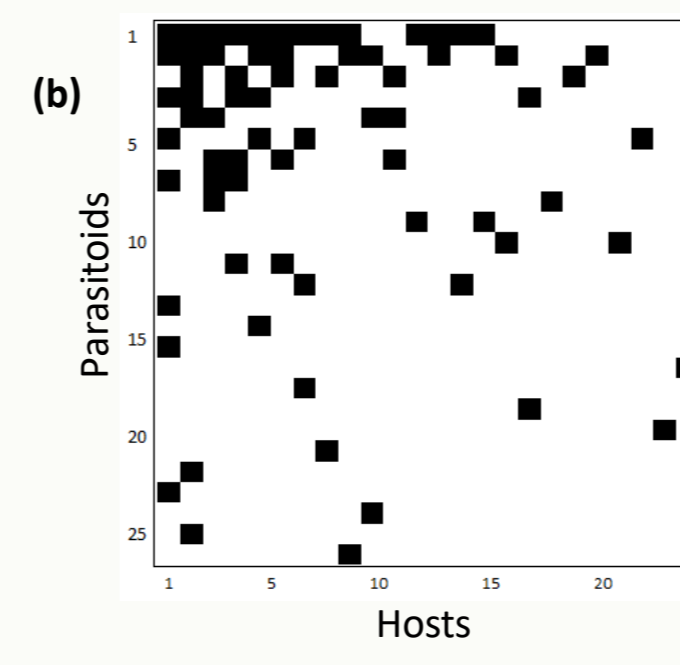
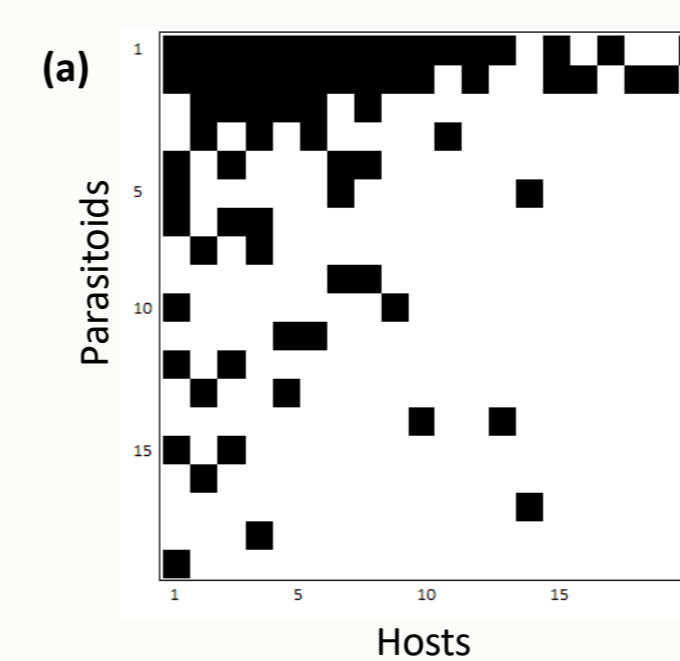


Fig.2 Host-Parasitoid interaction matrices of (a) Olot and (b) GNP.

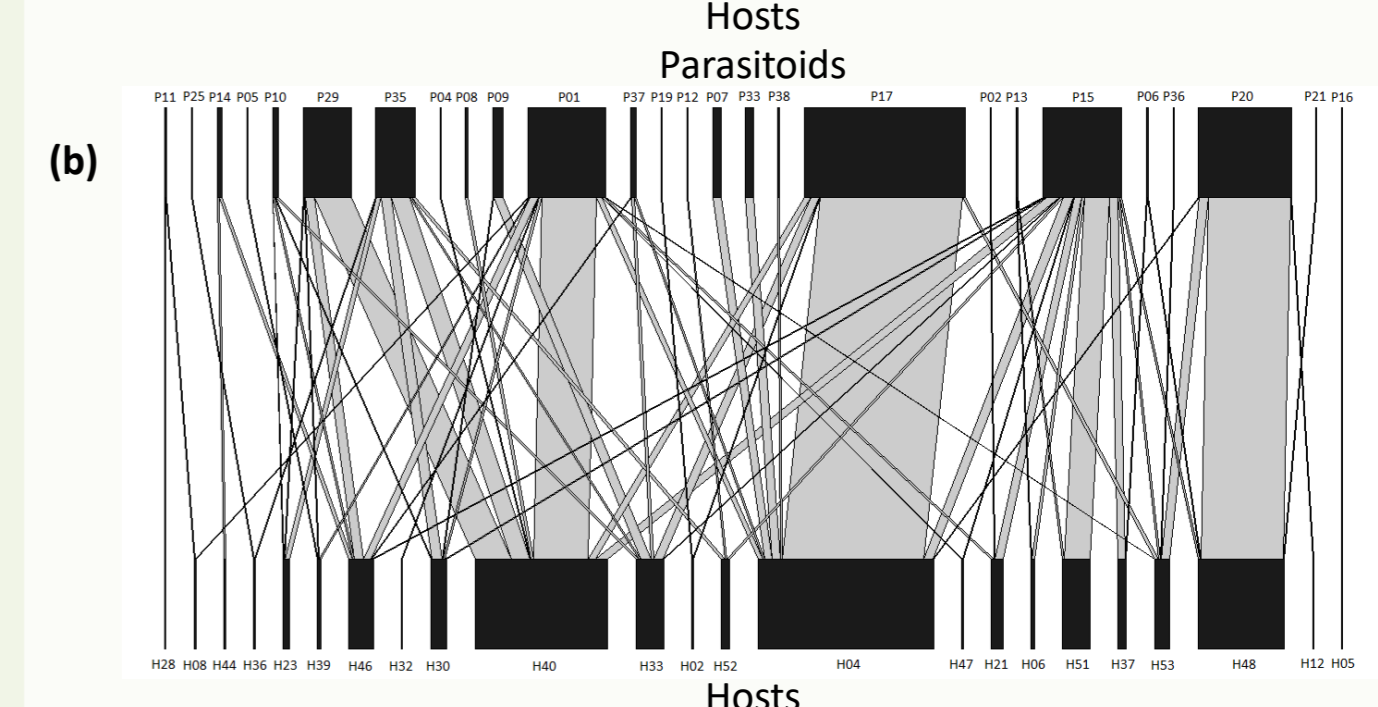
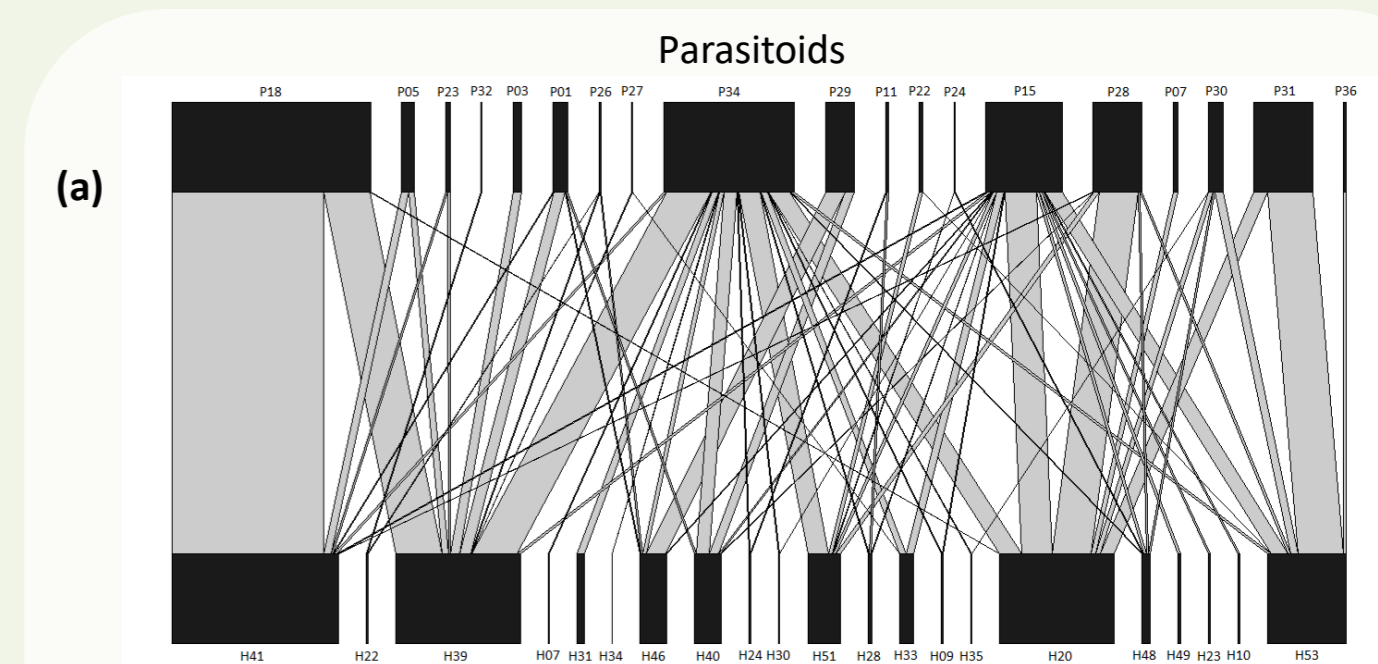


Fig.3 Host-Parasitoid bipartite networks from (a) Olot and (b) GNP.

DISCUSSIONS

- Olot's higher abundance could be explained by the environmental mosaic rich in croplands positively influencing bee abundance [5].
- Given the higher environmental heterogeneity of Olot, its β_S was unexpectedly low when compared to GNP. Suggesting the existence of an unknown environmental factor affecting CNBW composition.
- Olot's nestedness was most probably influenced by the lower β_S (which ensures species' connectance between guilds) and species composition.
- The dissimilarities in interactions between guilds were mainly driven by changes on species composition rather than changes on parasitoids' ethology.

CONCLUSIONS

We can confirm that communities differ greatly in terms of richness, abundance, diversity and composition, with parasitoids tending to follow host's dynamics due to their top-down interactions with the other guild and its high degree of specialization.

As for host-parasitoid interactions, we have shown how Olot has a higher nestedness than GNP, and how the interaction networks (β_{WN}) differ greatly between locations.

Dissimilarities are ultimately the result of differences in environmental conditions.

