S4 – Science for action. Mapping tools to incorporate plant data into decision making

2nd Mediterranean Plant Conservation Week

Implementing GIS tools to analyse geospatial distribution factors to the reproductive success of sexual deceptive orchids: *Ophrys balearica* P. Delforge as an example

Joshua Borràs & Joana Cursach

Introduction

Deceptive pollination

- Generalized food deception
- Batesian floral mimicry
- Brood-site imitation
- Shelter imitation
- Pseudoantagonism
- Rendezvous attraction
- **Sexual response**

Serapias nurrica

Oncidium sp.

Anacamptis pyramidalis

Allium roseum

Orchis papilionacea

Introduction

Deceptive pollination
Sexual response

- Mimic female insect mating signals
  - Visual and tactile cues
  - Pheromones
- Highly specific (Paulus & Gack, 1990; Schiestl *et al.*, 2004)
- Unique mechanisms of orchids
- Pseudocopulation

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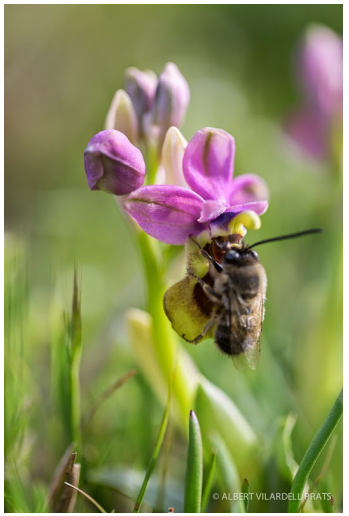


Ophrys tenthredinifera

Ophrys speculum

Introduction

Current analysis of factors that affect reproductive success

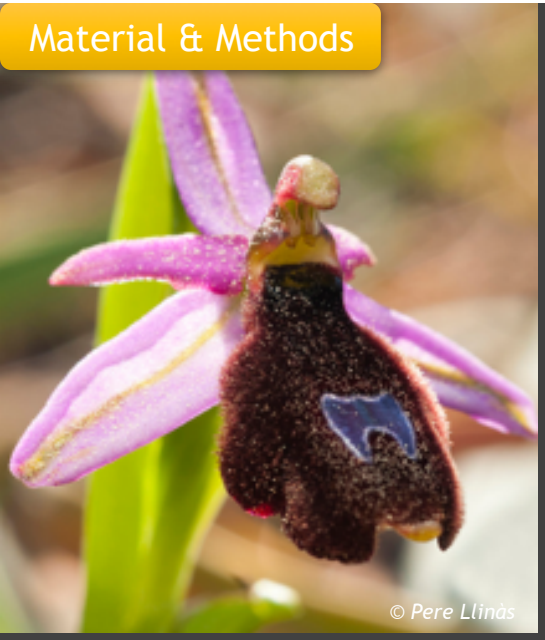
In orchid, few studies have assessed male fitness as a factor

Geospatial analysis by nearest neighbour distance (NND), measured manually

Analysis of ecological services

-
- Mapping and modeling floral distribution
- In-field variability detection

Material & Methods



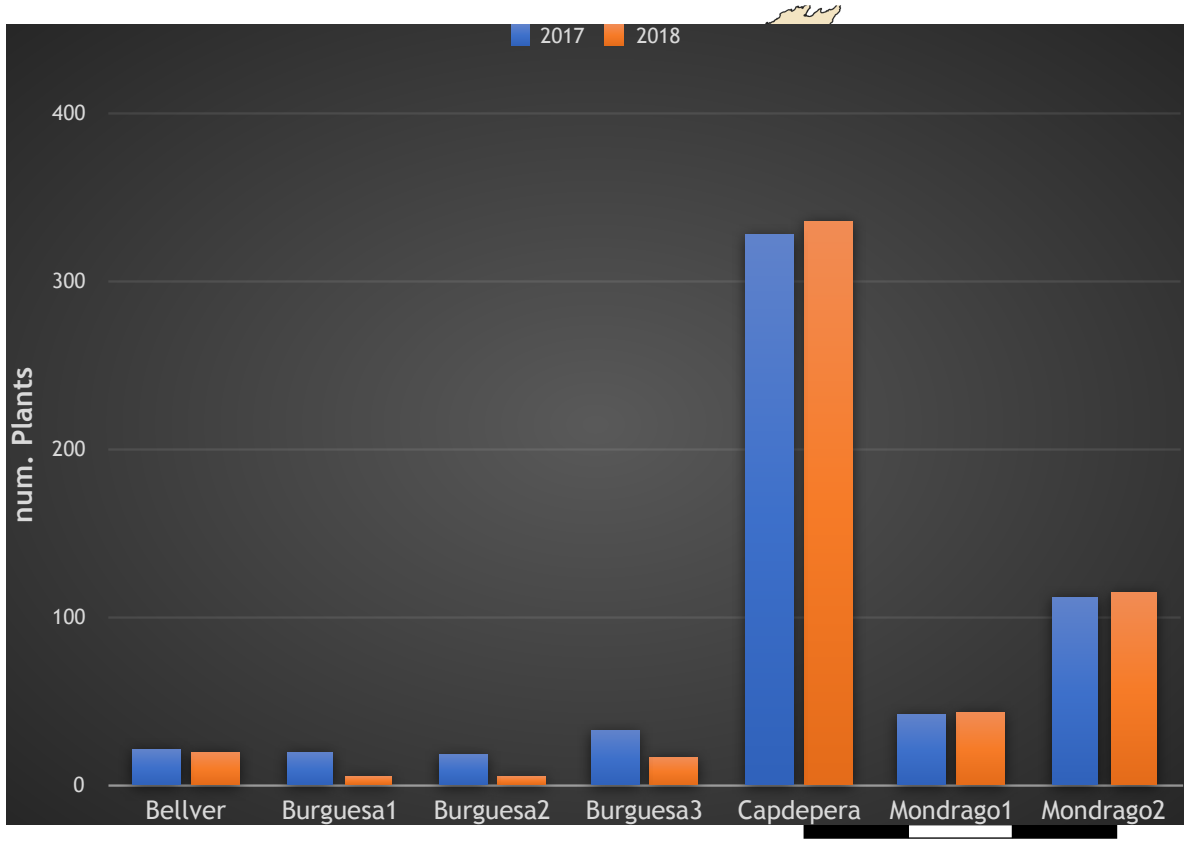
Ophrys balearica P. Delforge

- Balearic orchids: 14 genus and 40 species (Jonasson, 2015)
- Single endemic orchid from the Balearic islands
- Sexual deception → Highly specific
- *Megachile sicula* subsp. *balearica* (Tkalců, 1977)

Material & Methods

Study Zone

- 4 Locations
  - 7 populations
  - From 5 to 335 flowering individuals
- Spring of 2017 and 2018

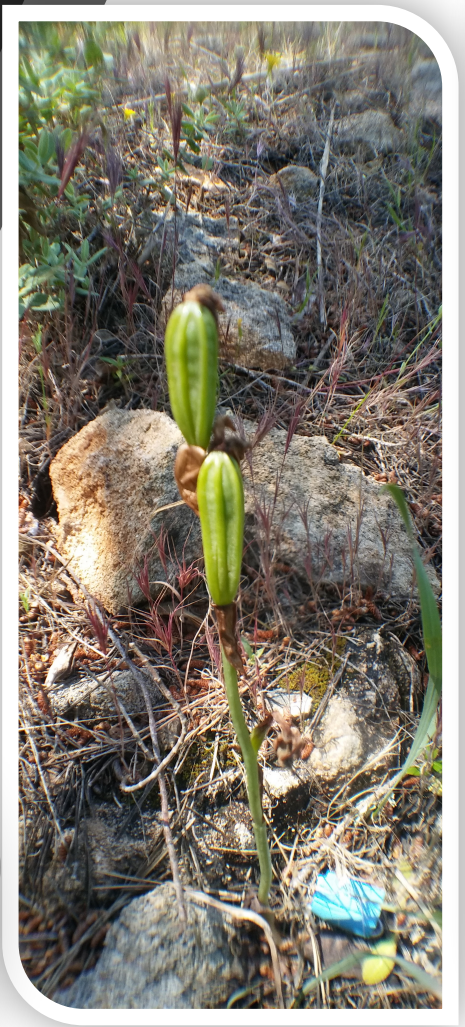


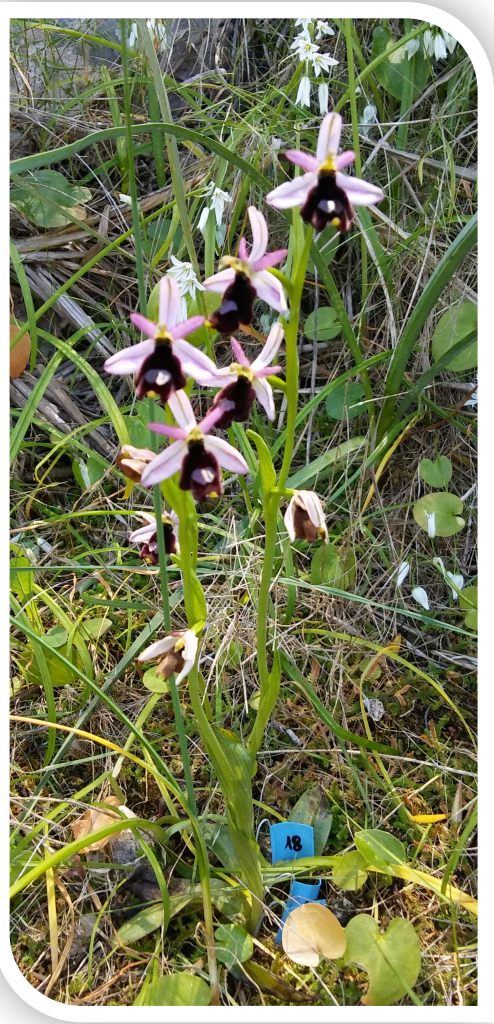
Material & Methods

Reproductive success factors

Fruit set (or female fitness)

Pollinia removal (or male fitness)



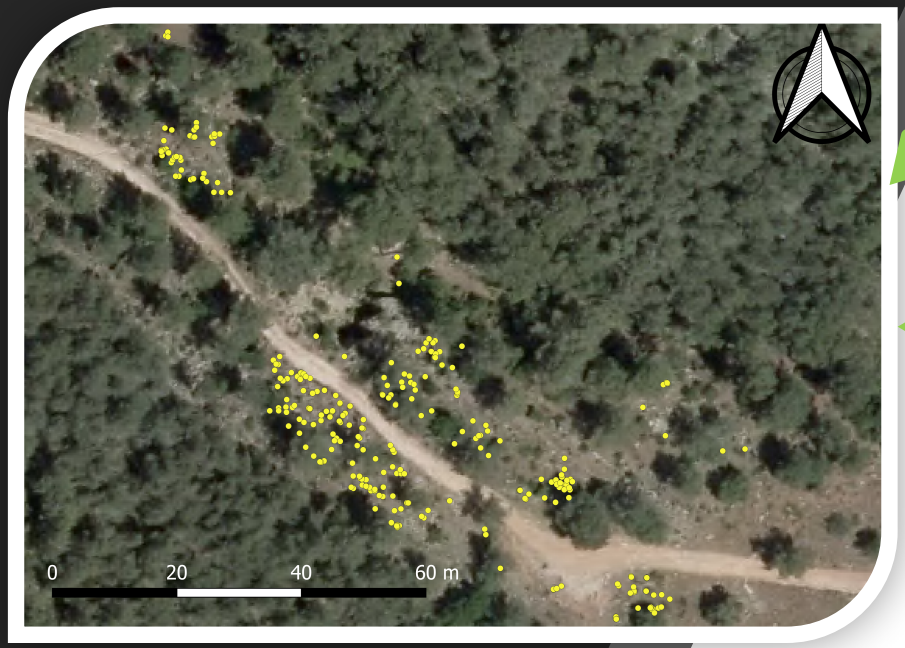


Material & Methods

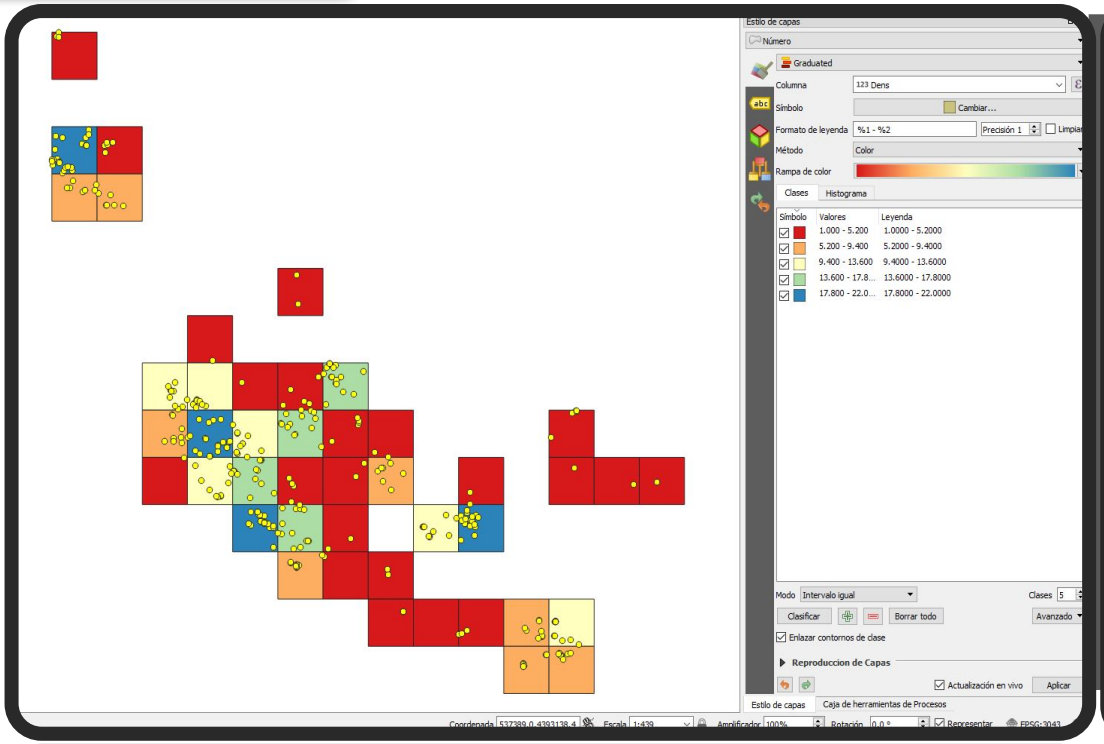
Population structure study

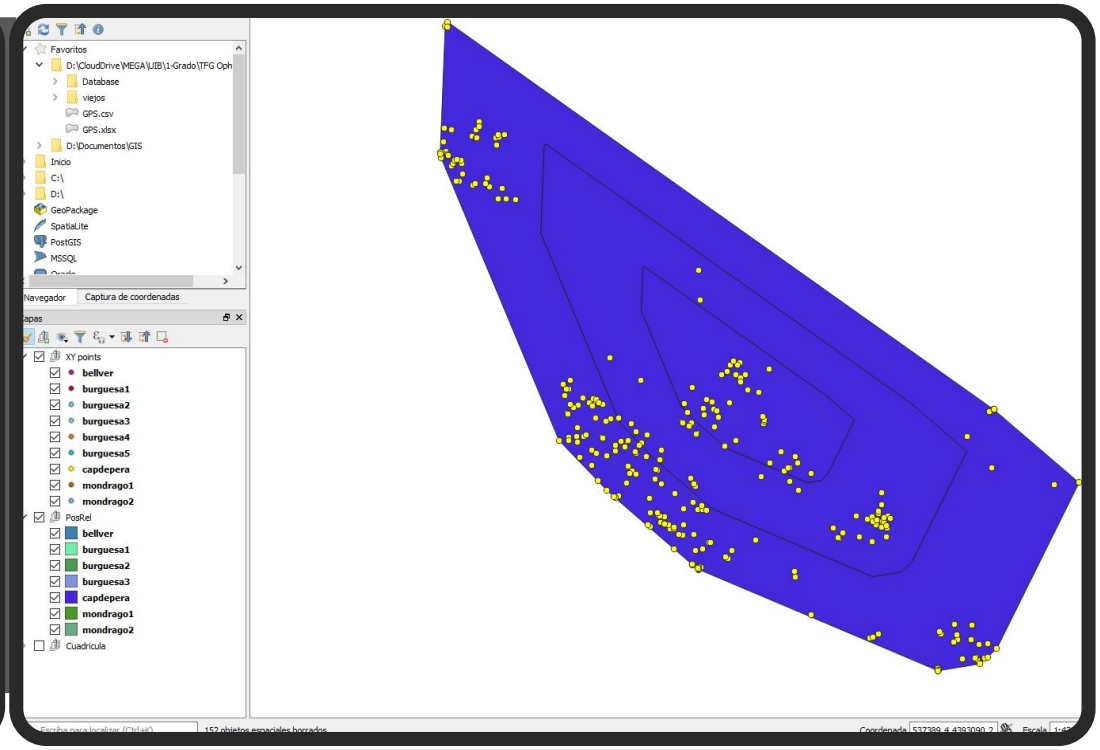
GPS position of each flowering individual

- Diferential GPS *Leica™ System RTK RX 1200*
- Total station *Leica™ TPS800*



Material & Methods





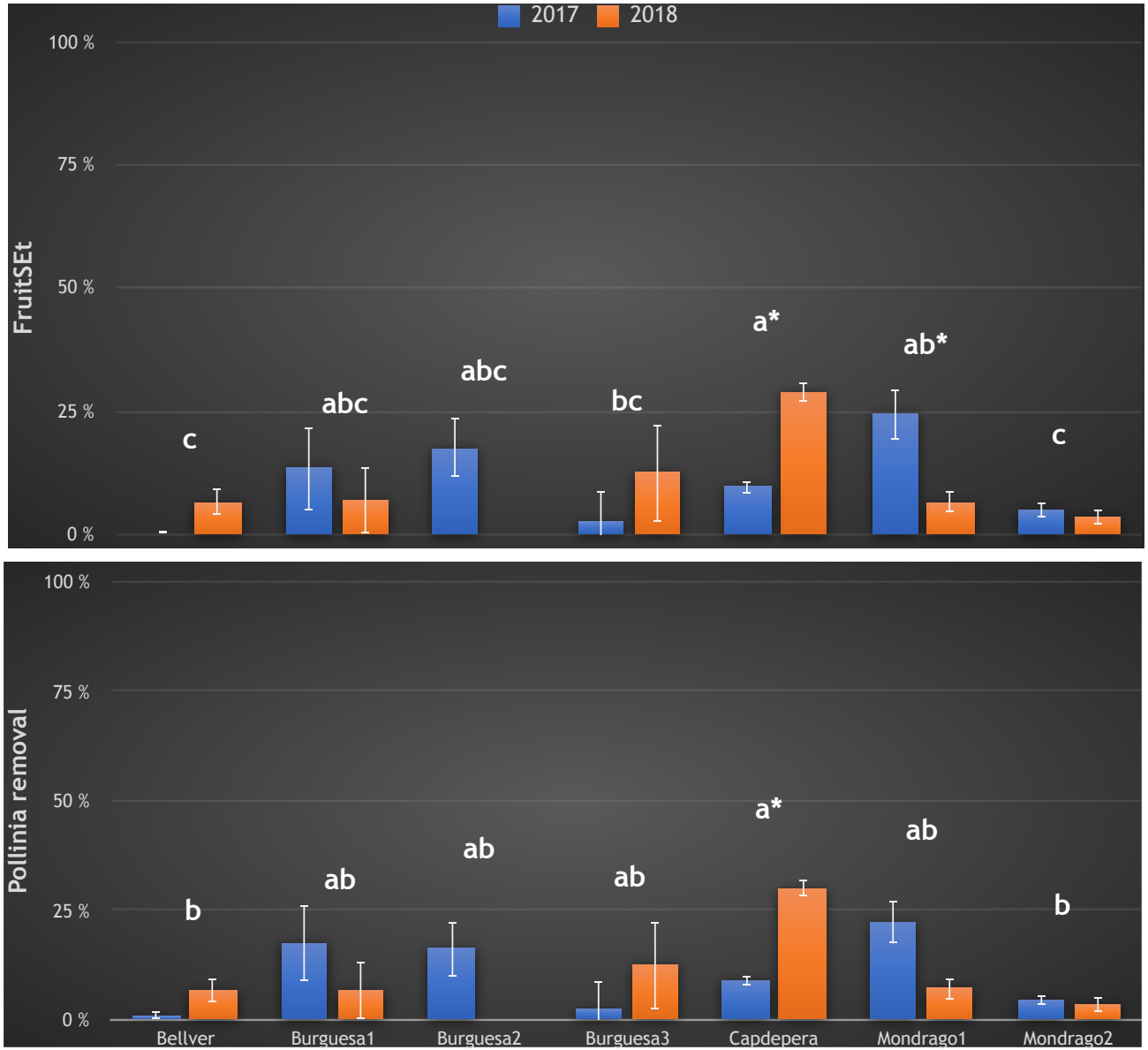
Population structure analysis

QGIS R

Results

Natural pollination

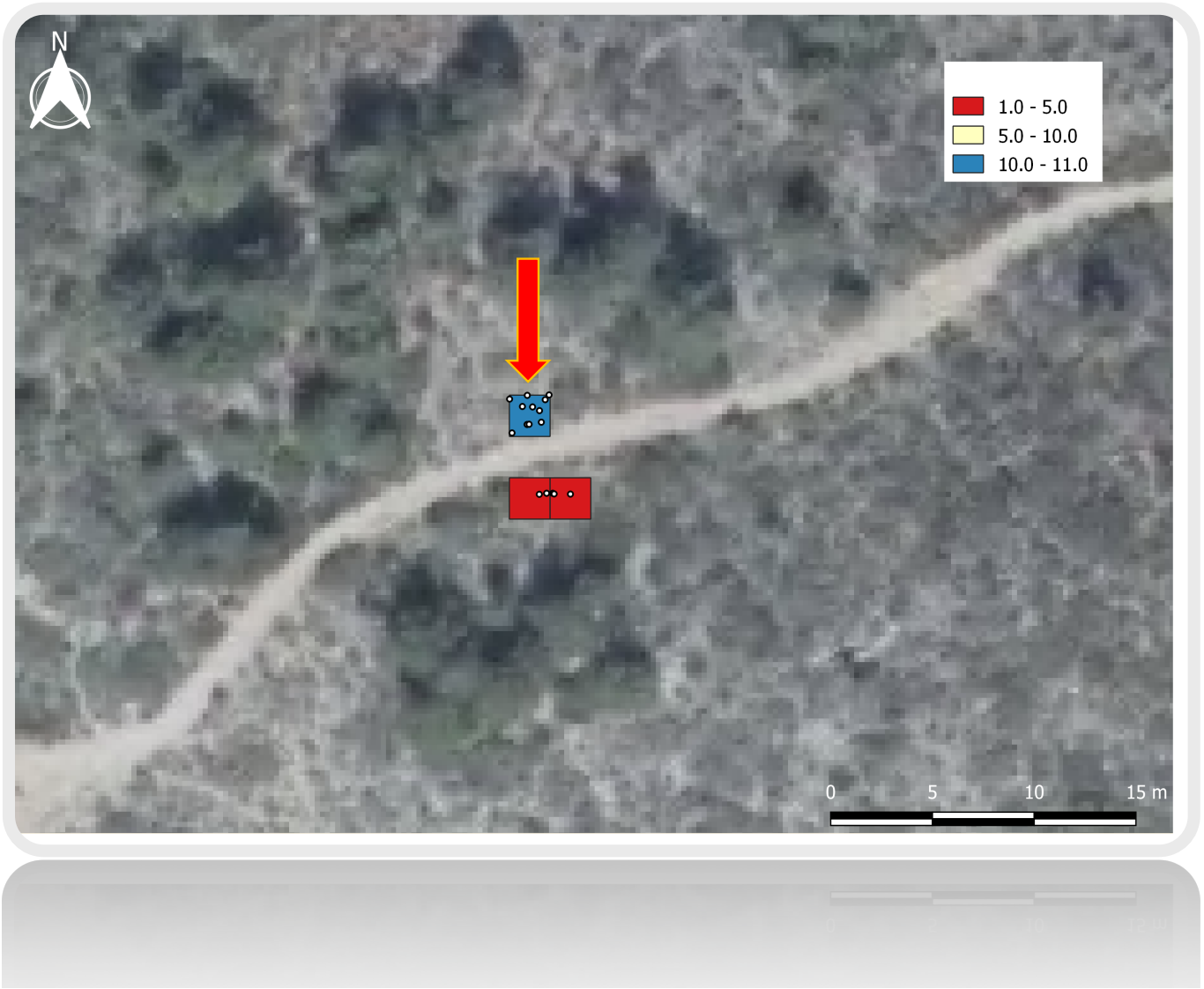
- Global Lineal Model (GLM) with Binomial structure
  - Year → p-value < 0,001
  - Population → p-v < 0,001
  - Year:Population → p-v < 0,001
- Tukey's *post-hoc*
- Letters indicate differences between populations
- Asterisks indicate differences between years



Results

Density of plants

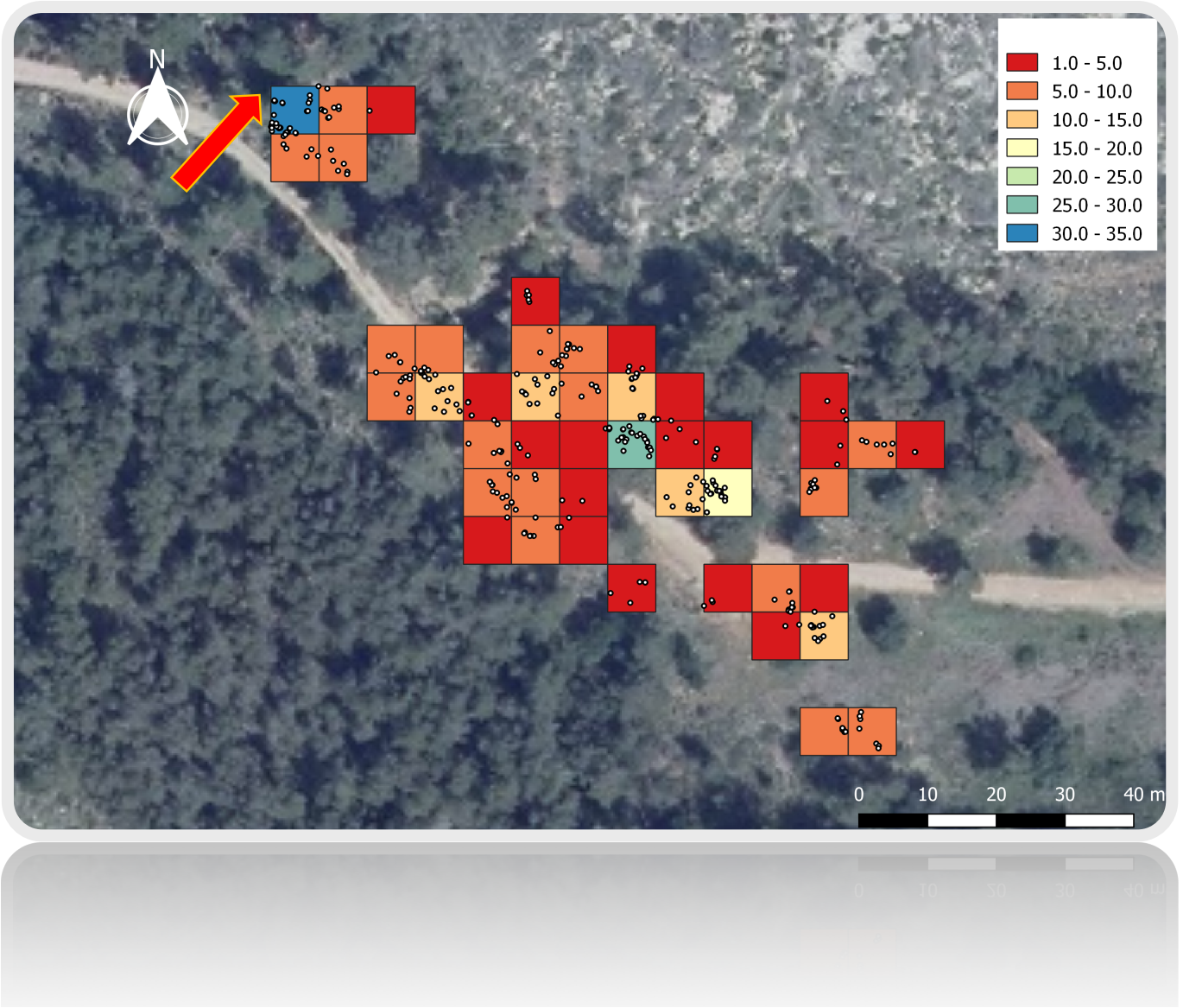
- Global Lineal Model (GLM) with Binomial structure for Fruit Set
  - Density 2x2 m → p-v < 0,001
- Tukey's *post-hoc*
- Letters indicate differences between density squares
- Number of plants in density squares



Results

Density of plants

- Global Lineal Model (GLM) with Binomial structure for Fruit Set
  - Density 7x7 m → p-v < 0,001
- Tukey's *post-hoc*
- Letters indicate differences between density squares
- Number of plants in density squares



Results

Position of plants

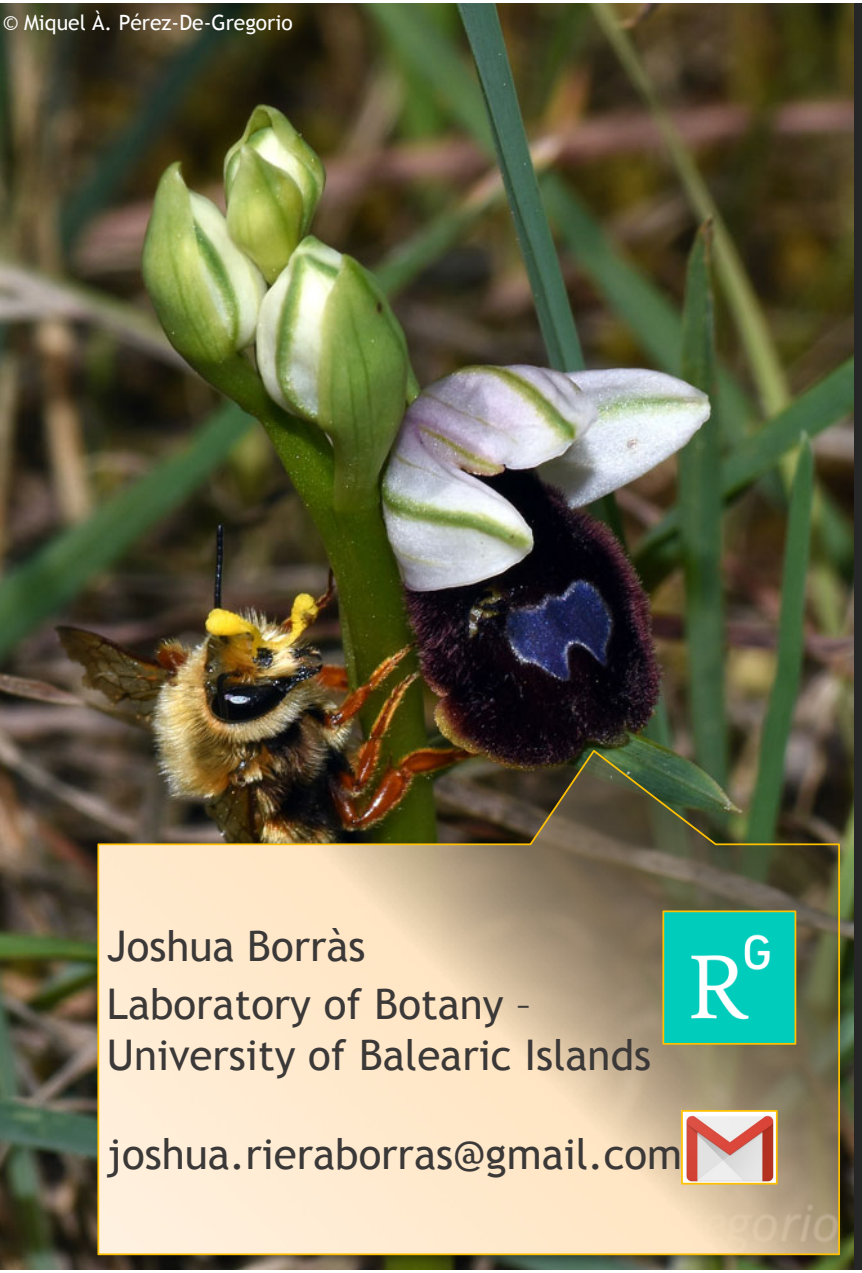
- Global Lineal Model (GLM) with Binomial structure for Pollinia Removal
  - Tertiles → p-v = 0,019
  - Population:Tertiles → p-v < 0.001
- Tukey's *post-hoc*
- Letters indicate differences between relative position
- Number of plants in relative position

Conclusions

1. Reproductive success is highly variable between years and places due, likewise to changes in the density of pollinators

2. Dilution effect of the pollinator in high density areas. As reported in Courchamp *et al*. (1999)

3. Claim effect of the external individuals of the population. As seen in Vandewoestijne et al. (2009).



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