Using remote-sensing to map suitable road verges for a rare small mammal, the Cabrera vole (*Microtus cabrerae*)
Introduction

Land Cover Maps

- Conservation Biology
- Support decision making
  (e.g. protected areas delineation, impact assessment, ...)

Pros:
- Easy to obtain
- Large extension

Cons:
- Relatively low spatial detail
- Low temporal detail
- Main habitat classes

OVERVIEW
ROAD VERGES OFFER OPPORTUNITIES

- Habitat/corridors
- Plant diversity
- Pollinators

(Ascensão et al. 2015)
High resolution:
• Spatial (up to 10 m)
• Temporal (each five days)
• Spectral (13 bands)
• Radiometric (12 bits)

MISSION

• Quantify the importance of Sentinel-2 derived predictors relative to more conventional predictors in predicting vole microhabitat suitability.

• Identify which Sentinel-2 derived predictors best explain vole distribution at fine spatial scales.
Methodology

Sampling sessions (2017-2018):
1. Wet season (February-April)
2. Dry season (October-November)

Species data

Road verges

Water bodies

Montado

Evora
Predictors (67)

**Passive**
- Sentinel-2A (MSI Level-1C)
- Spectral Bands

**Active**
- ASTER (GDEM)
- Inference

**Spectral Bands**
- Super resolution

**Topography**
- e.g. Altitude

**Inference**
- e.g. Distance from roads

**Wet season**
- Spectral Indices
- Textural and Diversity Indices
- Co-occurrence matrix

**Dry season**
- Spectral Indices
- Senescent Vegetation Indices
- Diversity index

**Vegetation**
- Biomass Indices
- Water Content
### SPECIES DISTRIBUTION MODELS (SDMs)

<table>
<thead>
<tr>
<th>Random Forest</th>
<th>Parametrization</th>
<th>Model fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Presence/absences = response variable</td>
<td>• maxRuns = 2000</td>
<td>• Area under the curve of receiver operating characteristic (AUC)</td>
</tr>
<tr>
<td>• Remote sensing products = explanatory variables</td>
<td>• ntree = 2000</td>
<td>• Sensitivity</td>
</tr>
<tr>
<td></td>
<td>• p value = 0.01</td>
<td>• Specificity</td>
</tr>
<tr>
<td></td>
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<td>• Error rate (%)</td>
</tr>
</tbody>
</table>

(Leitão and Santos 2020) (Franklin 2010)
Performances:

AUC (High score) 0.904

Sensitivity 0.73

Specificity 0.778

Error rate 19.15%
• We demonstrated that the use of Sentinel-2 data support the identification of linear habitats (road verges, pond banks, field margins) for small and elusive species in humanized landscapes.

• This is useful for fine-scale conservation planning and population monitoring of small and rare species, but also for the biological and ecological assessment of habitats adjacent to linear infrastructures.