Are structural factors explain bat activity in Mediterranean Oak ecosystems in Luberon – Lure Biosphere reserve?

Presentation by: Emmanuel Cosson / David Sarrey
Provençal bat group / Groupe Chiroptères de Provence

Place: workshop on Mediterranean forest management and Natura 2000, Goult, PNR Luberon
Date: 11/05/2016
1. Introduction

- On 30 species in Provence, 25 use forest habitats/ecosystems for foraging
- 17 are dependant on tree microhabitats for roost (Regnery et al. 2013)
- Currently, forest bats are very rare in mediterranean forest ie-Bechstein bat or Barbastelle bat
- Old growth forest in mediterranean area are now disappeared
- Trees in mediterranean forest are 50-70 years old → too young for many microhabitats

So

- Is the mediterranean Oak forest important for bats ?
- What is the use of mediterranean Oak forests by bats ?
- Is there a difference of bat use with maturation of the woods ?
I. Protocol

• **Goal**: comparison between 2 plots in *Quercus pubescens* stands with various variables
  – One plot with old trees (plot « Matures »)
  – One plot with young trees only (plot « Youngs »)

• **Many environmental variables are measured on each plot**:
  – La *Data sheet « naturalité WWF »*
  – La *Data sheet « Indice de Biodiversité Potentielle » IBP*
  – La *Data sheet de forest habitat description from ONF « MCH100 »*
  – La *Data sheet of « Arbres Réservoir de Biodiversité » du GCP : « A.R.B »*

• **Recording Equipment**:
  – 2 simultaneously recorders S.M.2 with 2 Microphones (1 near ground/ 1 in canopy)
  – Sampling rate 192 kHz each microphone (no more 96 kHz earring sounds)
  – Mast for microphone at 12 m maximum (in the canopy)

• **Recording Protocol**:
  – 3 consecutives nights recording on the pair of simultaneous two plots
  – 16 plots and 2 repetitions (1 spring et 1 summer), 32 samples

• **Analysis**
  – Comparison of 1- global activity and 2- activity per species WITH environmental variables from Data sheet « naturalité WWF »
I. Field installation

- Canopy Microphone
- 12 m Mast
- Near ground Microphone
- SM2 box
17 bat species contacted

<table>
<thead>
<tr>
<th>RAW DATA - Med Oak forest</th>
<th>Total</th>
<th>Mature</th>
<th>Young</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nb of nights</td>
<td>96</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Total contact number of bats</td>
<td>9092</td>
<td>7179</td>
<td>1913</td>
</tr>
<tr>
<td>Mean activity per sample</td>
<td>314</td>
<td>497</td>
<td>131</td>
</tr>
<tr>
<td>Mean nb of species per sample</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Minimum nb of species per sample</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

sample = 3 consecutive nights for one plot at one season
II. Results

Firstly on global notation between 2 methods

<table>
<thead>
<tr>
<th></th>
<th>Mature/Jeune t.test</th>
<th>Note WWF Linear model</th>
<th>Note IBP Linear model</th>
</tr>
</thead>
<tbody>
<tr>
<td>All species</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest species</td>
<td></td>
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<td></td>
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<tr>
<td>Pipistrellus pygmaeus</td>
<td>3</td>
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<td>2</td>
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<tr>
<td>Myotis nattereri</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Plecotus sp</td>
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<tr>
<td>Myotis emarginatus</td>
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<td>0</td>
</tr>
<tr>
<td>Rhinolophus hipposideros</td>
<td>0</td>
<td>0,5</td>
<td>1</td>
</tr>
<tr>
<td>Barbastella barbastellus</td>
<td>0</td>
<td>0</td>
<td>0,5</td>
</tr>
</tbody>
</table>

3 = significatif P<0,001 ; 2 = significatif P<0,01 ; 1 = significatif P<0,05 ; 0,5 = P [0,05;0,1]
### II. Results

Secondly on species for few environmental variables

<table>
<thead>
<tr>
<th></th>
<th>Nb tree species</th>
<th>Lianes Creepers</th>
<th>Futaie irrégulière uneven-aged high stand</th>
<th>BM sur pied Dead wood on stand</th>
<th>Ecorces décollées Unstick Bark</th>
<th>Note ancienneté Ancientness</th>
<th>Trou de Pic Woodpecker owl</th>
<th>Indice de Micro-habitats</th>
<th>Cavité en pied Cavity on trunc feet</th>
<th>BM au sol. Dead wood on ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>All species</td>
<td>3</td>
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<tr>
<td>Sum</td>
<td>15,5</td>
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<td>10,5</td>
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3 = significatif $P<0.001$ ; 2 = significatif $P<0.01$ ; 1 = significatif $P<0.05$ ; 0,5 = $P [0.05;0.1]$

BM = Bois mort ; Note ancienneté = Cassini maps, « État major » maps and Aerial photography before 1950
II. Results

Significative variables

Matures forest vs young forest
II. Results

Significative variables

Diversity of tree species
uneven-aged
high stand management
II. Results

Significative variables

Stand Dead wood
II. Results

Significative variables

Ancientness of the forest cover since 1800

Cassini maps and Etat major maps
II. Results

Significative variables

Woodpecker owl and Unstick barks
Conclusion

Regnery et al. 2013 demonstrate that microhabitats are a key for bats and birds in Mediterranean Oak forests related with roost need.

In this study we demonstrate that Mediterranean mature Oak forests are a key of bat species diversity, activity (use) and density (biomasse) probably related to the higher complexity of the forest ecosystem in mature forests and ancientness.

Mature forests seems to be closer to a natural ecosystem for bats and better for bat conservation.

We are looking for funds to precise this ecological research. Laboratory CESCO of Museum d’histoire naturelle de Paris will reanalyse our datas on all the Data sheets.


Citation :

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Kevin Lhoyer             Floriane Merel
Antoine Robiquet

Partners

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