Butterfly resource-use in intensively and extensively managed meadows: experimental data with *Maniola jurtina* as a model

Future of Butterflies in Europe
Wageningen, March 2012

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Biodiversity Research center
Earth and Life Science Institute
Louvain University, Belgium
### Nectar in I and E meadows

#### Grassland management

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>Nectar</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Quantity</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Low</td>
<td>Diversity</td>
<td></td>
<td>High</td>
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<tr>
<td>? (fertilizer ↠ AA in nectar)</td>
<td>Quality</td>
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<td>High because diversity?</td>
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</table>
Changing organisms in Changing environments using a resource-based approach
**PhD project**

**Changing organisms in Changing environments using a resource-based approach**

*Main focus:* identify changes in resources (mainly *nectar*) and their effect on common butterflies.
Changing organisms in Changing environments using a resource-based approach

Main focus: identify changes in resources (mainly nectar) and their effect on common butterflies

Observations
- Nectar quality, quantity and conformation
- Behaviour of nectar use
- Morphology

Experiments
- Behaviour of nectar use
- Life-history
- Morphology
Fitness consequences of nectar regimes in intensive and extensive meadows for *Maniola jurtina* (meadow brown butterfly)
Nectar for adult butterflies

Nectar =
• water
• sugars
  • Amino Acids
  • other compounds
Nectar for adult butterflies

Nectar =
• water
• sugars
• Amino Acids
• other compounds

Reproduction
• Sugars
• AA

Survival
Somatic maintenance
Dispersal
...

Further foraging

O'Brien, Oikos (2004); Mevi-Schütz, American Naturalist (2005)

Adapted from Boggs, Functional Ecology (2009)
Nectar for adult butterflies

Intensive meadows

Extensive meadows

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</table>
• Univoltine
• Flight period (in Belgium):
  Mid june ➔ mid august
• Adults: ♂ and ♀ feed
• Occurs naturally in intensive and extensive meadows
**Maniola jurtina**

**Preferred flower species**

*Personnal observations*

- *Trifolium pratense*
- *Centaurea jacea*
Methods

Wild butterflies
- 20 males + 20 females
- Same origin (extensive meadow)

Flight cages 48h
- 10 females + 10 males
- Intensive: 10 red clover (*Trifolium pratense*) inflo
- Extensive: 100 knapweed (*Centaurea jacea*) inflo
Methods

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Activity
- 1 hour/day
Methods

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Longevity
Unlimited access to food
- Body mass
- Lipid content
Methods

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Longevity
- Unlimited access to food
  - Body mass
  - Lipid content


**Body mass**

<table>
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<tr>
<th>Effect</th>
<th>DDL Num.</th>
<th>DDL Res.</th>
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**Dry body mass (mg ± SE)**

- Females
- Males
Lipid content (potential fecundity)

<table>
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<tr>
<th>Fixed effects tests</th>
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<th>DDL Res.</th>
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Longevity

### Fixed effects tests

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<th>Pr &gt; F</th>
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<td>0.3141</td>
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</table>

**Diagram**:
- **Longevity (days ± SE)**
- **E** represents females, **I** represents males.
Activity: number of flights

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<th>F</th>
<th>Pr &gt; F</th>
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<td>mngmt*day</td>
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<td>25</td>
<td>1.22</td>
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△ day 1
▲ day 2
Consequences

Poor nectar availability in intensive meadows

Poor physiological conditions

Impact on populations dynamics
Consequences

Poor nectar availability in intensive meadows

Poor physiological conditions

Impact on populations dynamics

Öckinger, Ecography, 2007
Consequences

Poor nectar availability in intensive meadows

Adults rely less on nectar intake and more on resources from larval stage

Selection for «more capital» breeders in intensive landscapes
Consequences

Poor nectar availability in intensive meadows

Freshly emerged adults

Preliminary analysis

Adults rely less on nectar intake and more on resources from larval stage

Selection for «more capital» breeders in intensive landscapes?
Acknowledgements

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Evolutionary Plant Ecology Group
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