# 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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# Nectar in I and E meadows

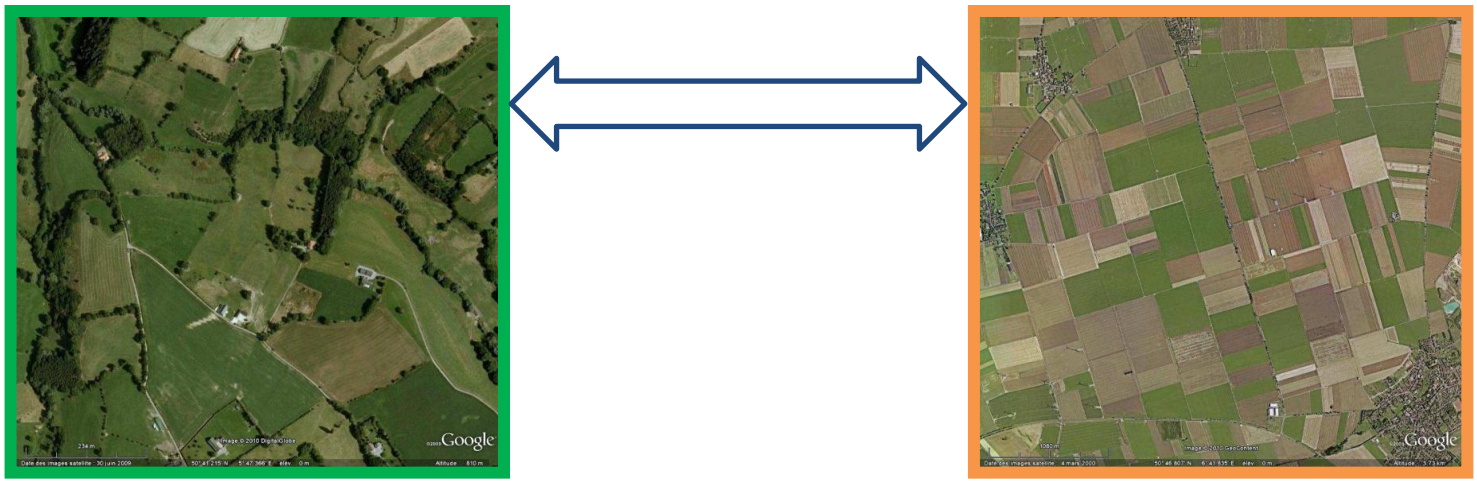
## Grassland management

**Intensive meadows**

**Extensive meadows**

| I | Nectar | E |
|---|---|---|
| Low | Quantity | High |
| Low | Diversity | High |
| ? (fertilizer ↗ AA in nectar) | Quality | High because diversity? |

# PhD project



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

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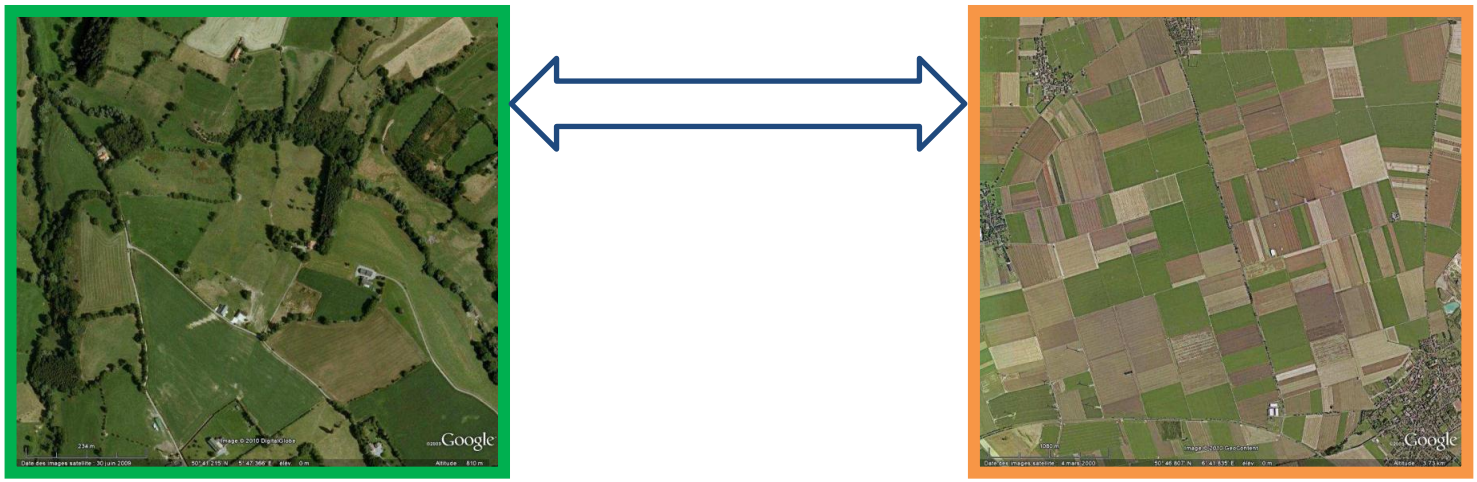


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Main focus: identify changes in resources (mainly **nectar**) and their effect on common butterflies

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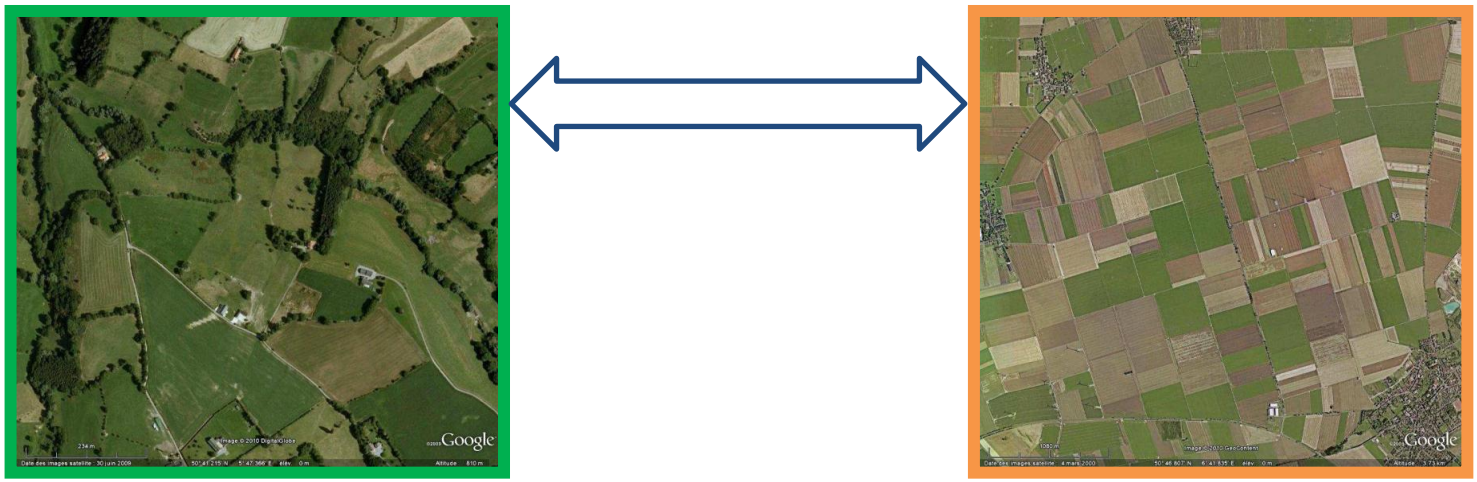

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## Observations

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

## Experiments

- Behaviour of nectar use
- Life-history
- Morphology

# Talk focus

**Fitness consequences of nectar regimes in intensive and extensive meadows for *Maniola jurtina* (meadow brown butterfly)**

## Observations

- Nectar quality, quantity and conformation
- Behaviour of nectar use
- Functional morphology

## Experiments

- Behaviour of nectar use
- **Life-history**
- Functional morphology

# Nectar for adult butterflies

**Nectar**

**=**

- **water**
- **sugars**
- **Amino Acids**
- **other compounds**

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**Reproduction**

**Sugars**

**AA**

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

**Survival**

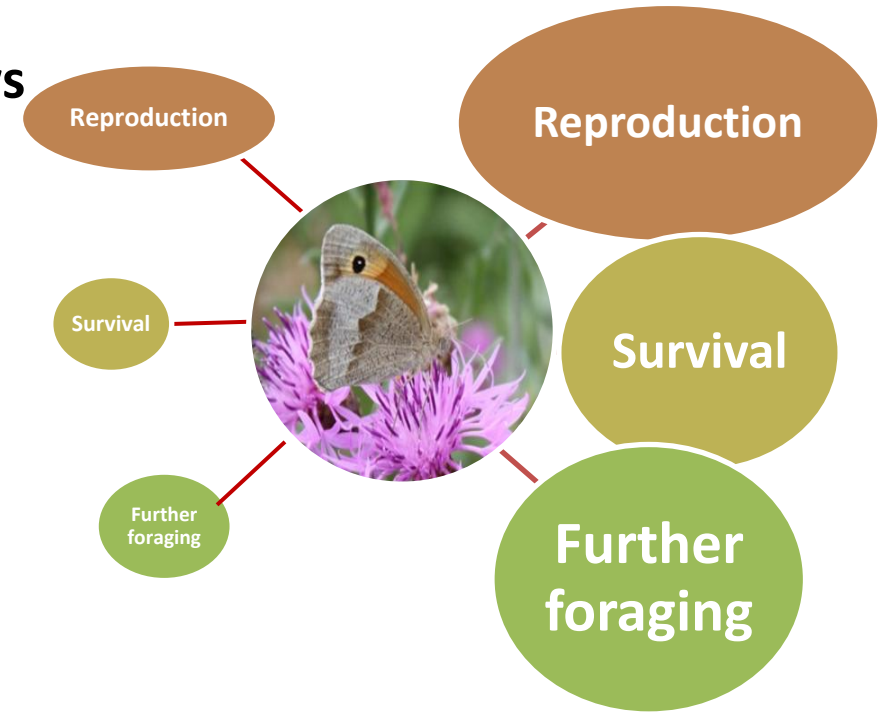
Somatic maintenance
Dispersal
…

**Further foraging**

Adapted from Boggs, Functional Ecology (2009)

# Nectar for adult butterflies

**Intensive meadows**




**Extensive meadows**

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# *Maniola jurtina*

- Univoltine
- Flight period (in Belgium):

  Mid june ➔ mid august
- Adults: ♂ and ♀ feed
- Occurs naturally in intensive and extensive meadows







# *Maniola jurtina*




## Prefered 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**

**10**

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**Activity**
**1 hour/day**

**100**

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## Longevity

**Unlimited acces to food**

- Body mass
- Lipid content

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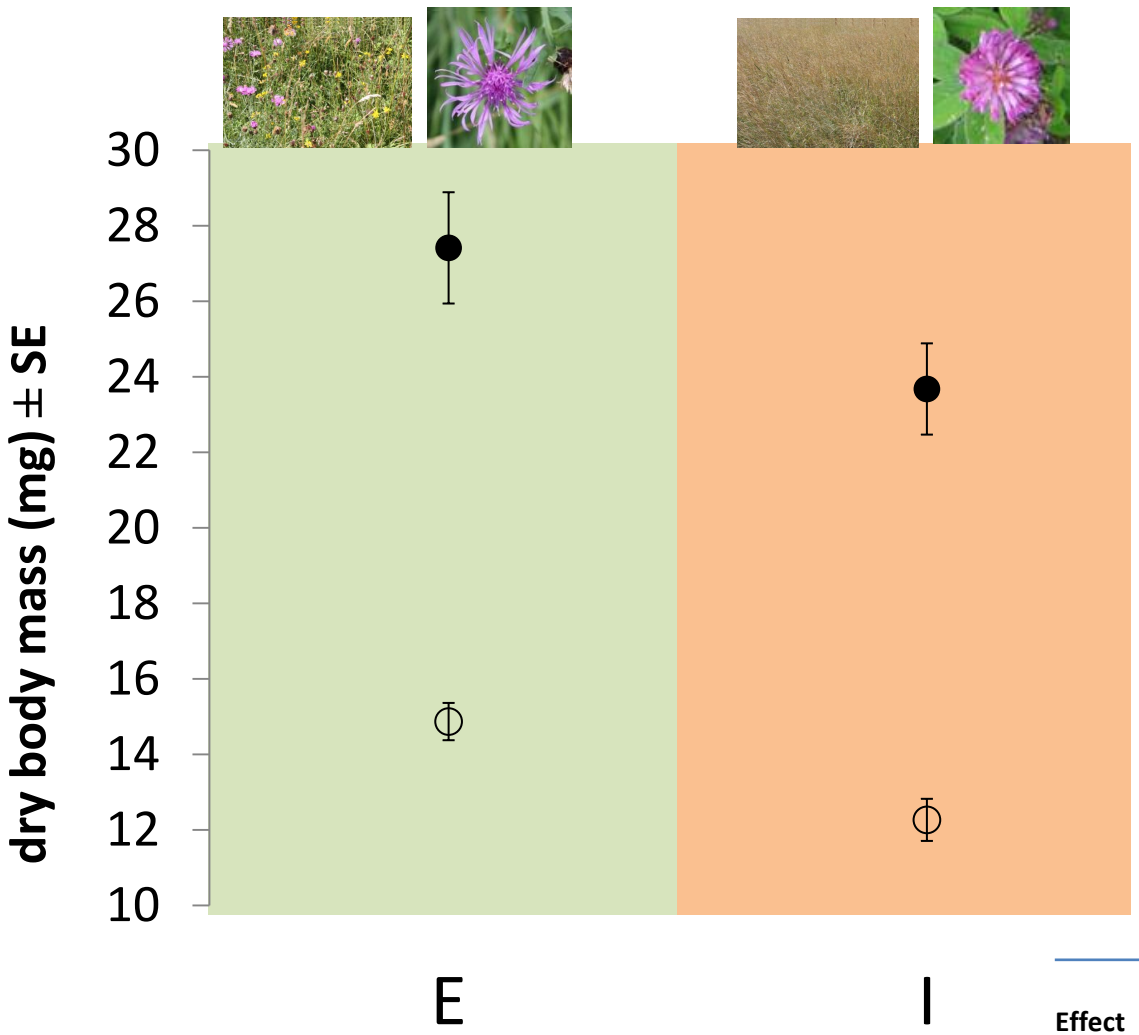
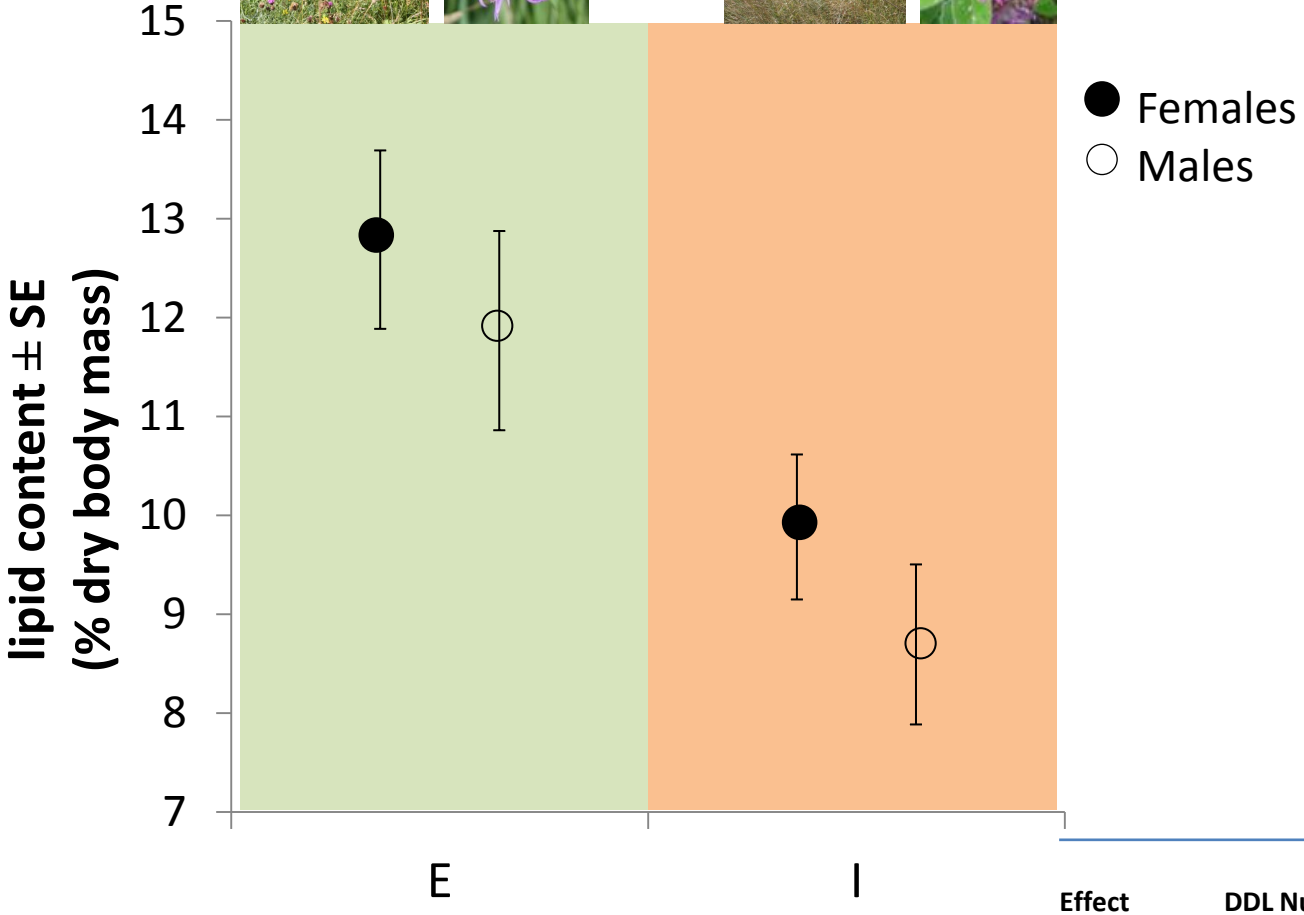
# Body mass




| Fixed effects tests | | | | |
|---|---|---|---|---|
| **Effect** | **DDL Num.** | **DDL Res.** | **F** | **Pr > F** |
| **sex** | 1 | 62 | 82.72 | <.0001 |
| **treatment** | 1 | 62.1 | 7.65 | 0.0075 |
| **sex*trtmnt** | 1 | 62 | 0.07 | 0.7940 |

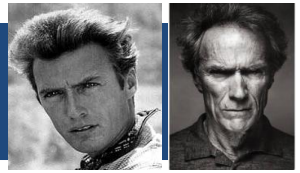
# Lipid content (potential fecundity)

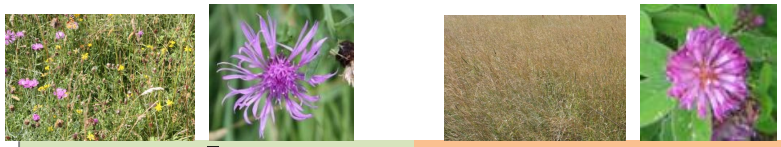


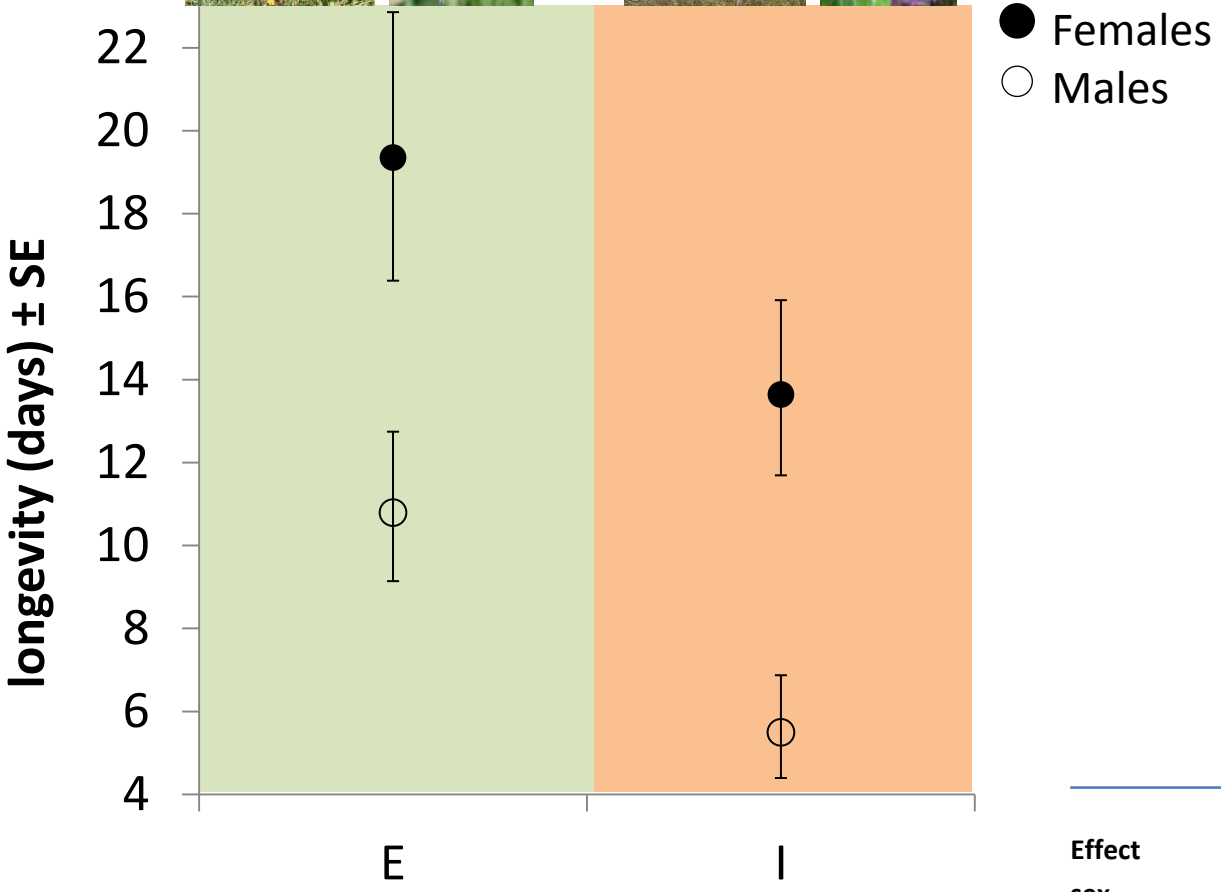

**Fixed effects tests**

| Effect | DDL Num. | DDL Res. | F | Pr > F |
|---|---|---|---|---|
| sex | 1 | 61.2 | 1.17 | 0.2830 |
| treatment | 1 | 61.3 | 13.08 | 0.0006 |
| sex*trtmnt | 1 | 61.2 | 0.10 | 0.7532 |

# Longevity



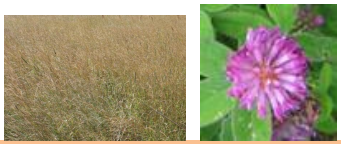


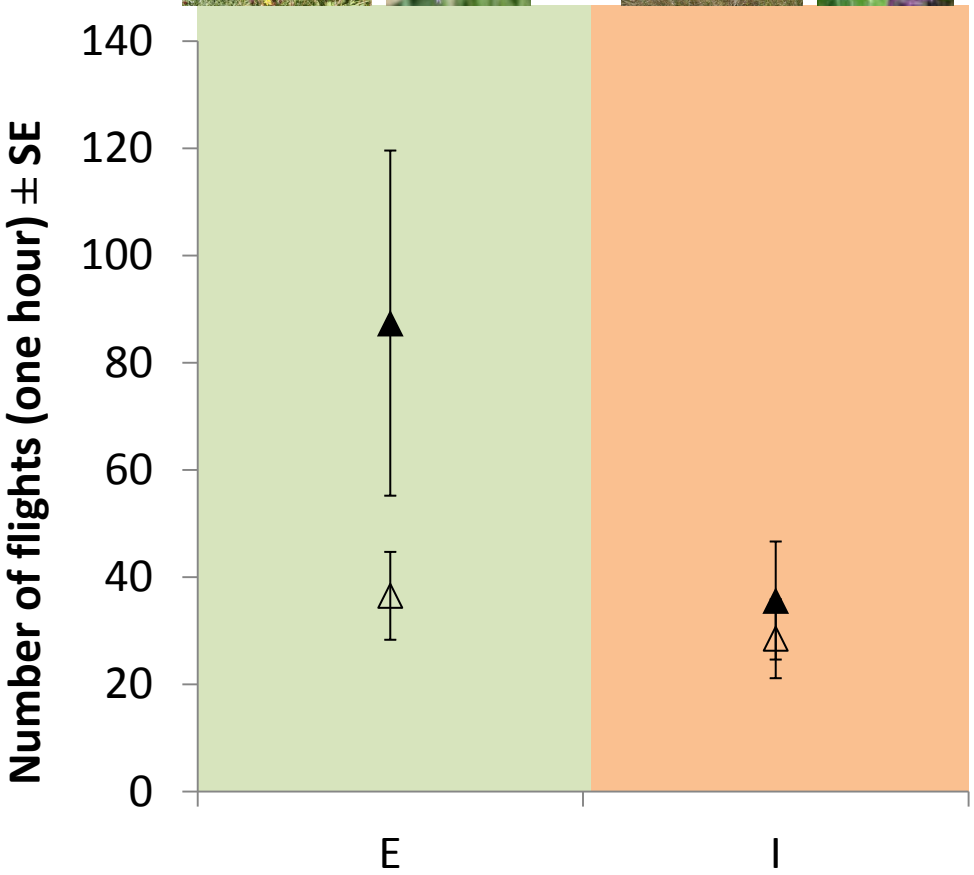



**Fixed effects tests**

| Effect | DDL Num. | DDL Res. | F | Pr > F |
|---|---|---|---|---|
| sex | 1 | 62.3 | 20.09 | <.0001 |
| treatment | 1 | 62.4 | 8.87 | 0.0041 |
| sex*trtmnt | 1 | 62.1 | 1.03 | 0.3141 |

# Activity: number of flights

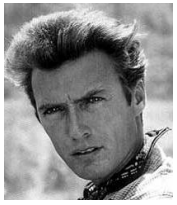


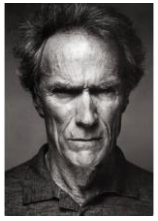



**Fixed effects tests**

| Effect | DDL Num. | DDL Res. | F | Pr > F |
|---|---|---|---|---|
| mean_temp | 1 | 25 | 7.04 | 0.0136 |
| mngmt | 1 | 25 | 4.65 | 0.0409 |
| day | 1 | 25 | 2.09 | 0.1603 |
| mngmt*day | 1 | 25 | 1.22 | 0.2800 |

# Summary





| + | - |
|---|---|
| + | - |
| + | - |
| + | - |

# Consequences

Poor nectar availability in intensive meadows

Poor physiological conditions

Impact on populations dynamics

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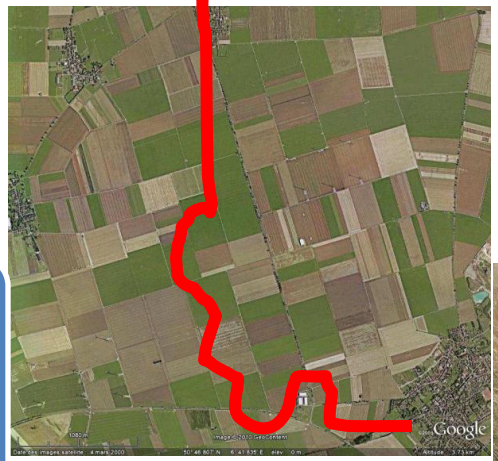
**Young / Old**




Young / Old

Öckinger, Ecographhy, 2007

# Consequences

Poor nectar availability in intensive meadows

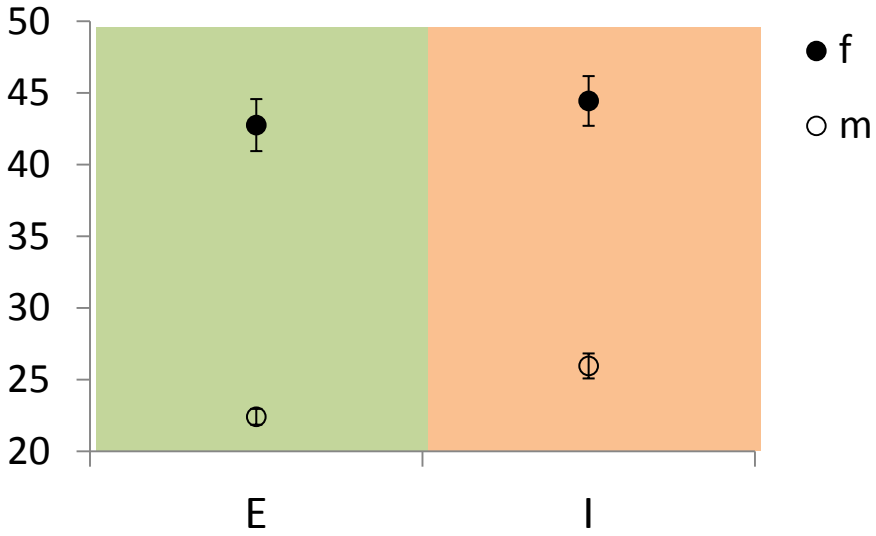
Adults rely less on nectar intake and more on resources from larval stage

Selection for « more capital » breeders in intensive landscapes

# Consequences

**Freshly emerged adults**

Preliminary analysis

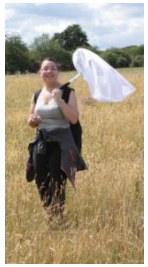



Poor nectar availability in intensive meadows

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

Selection for « more capital » breeders in intensive landscapes?

# Acknowledgements



Mr Alexandre, Mr Baudoin, Mr Paquay Marc Migon, Michel Pirnay, Christophe Pels
Céline Marchand
Murielle Chane, Morgan Dalmas

Behavioural Ecology & Conservation Group

Evolutionary Plant Ecology Group

UCL Université catholique de Louvain

EARTH & LIFE INSTITUTE

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## Acknowledgements

# Thank you for your attention