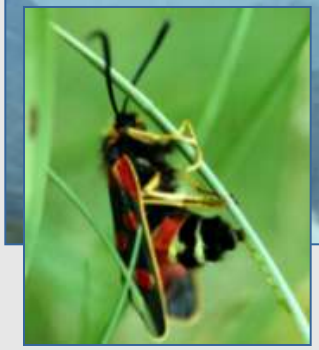
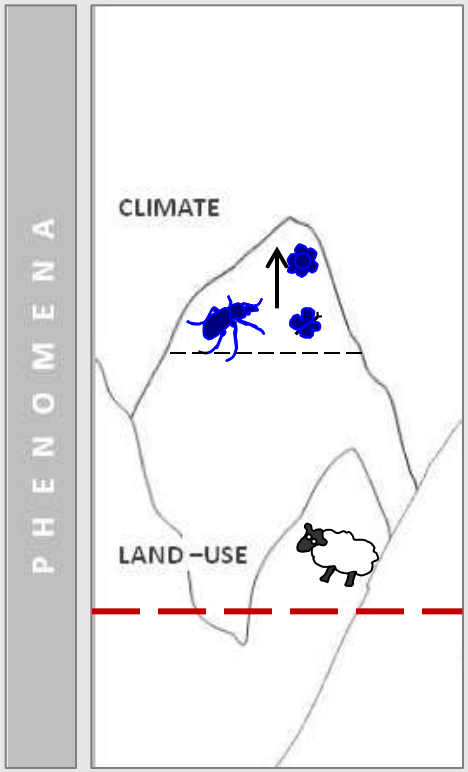
Westfälische Wilhelms-Universität Münster



Lessons for conservation biology under global change conditions:

a case study on two burnet moth species in the high altitudes of the Pyrenees

Petra Dieker, Claudia Drees, Henrik von Wehrden & Thorsten Assmann



Global change

- Climate change

  Altitudinal range shifts at upper range limits

- Climate + land-use change

  In case land-use is main driver for range shifts, conservation measures might preserve species' habitats

e.g. Gobbi et al. 2007, Pauli et al. 2007

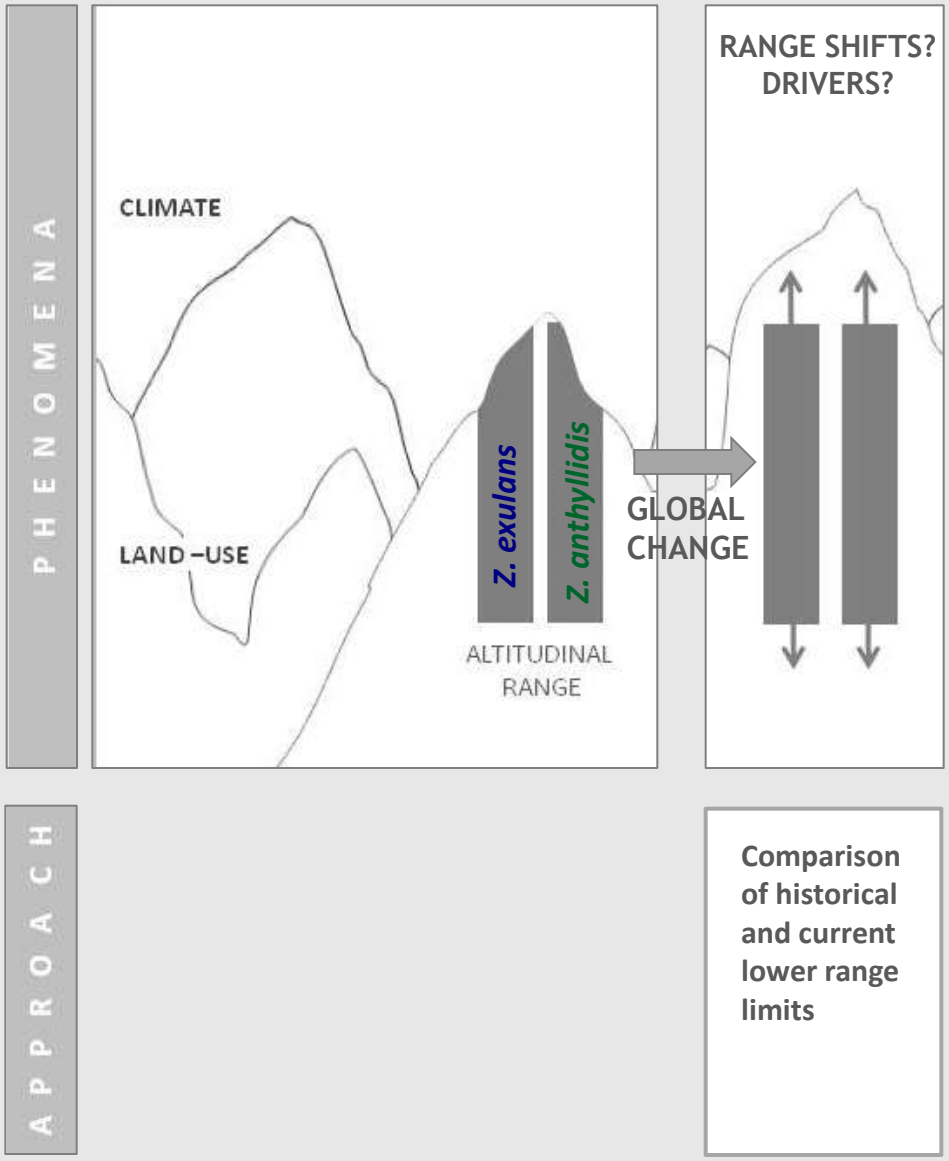
e.g. Vittoz et al. 2009, Forister et al. 2010

modified after De Freina & Witt 2001

Zygaena exulans

Zygaena anthyllidis

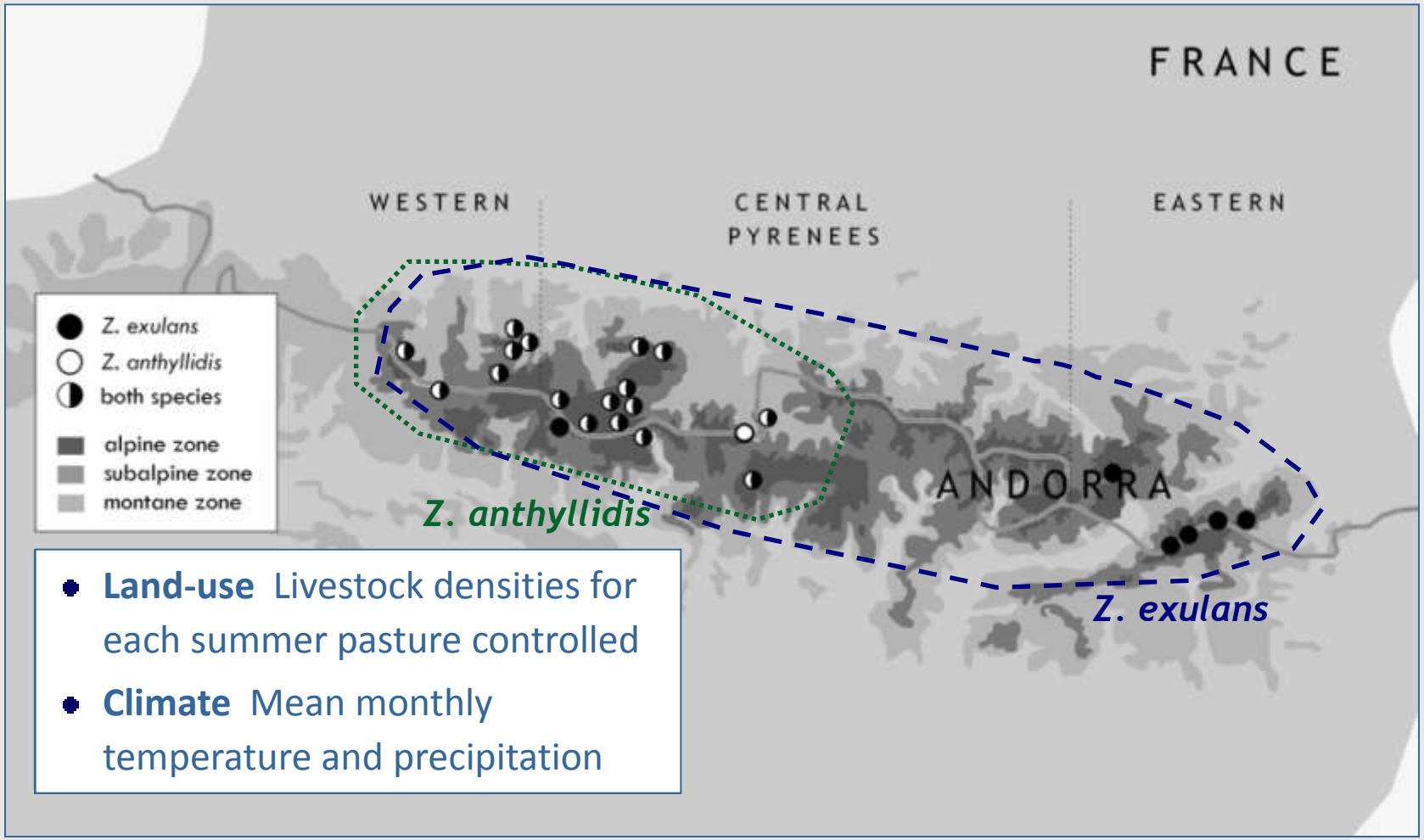
- Conspicuous appearance
- Occurrence in high densities
- Characteristic elements of subalpine and alpine grasslands
- Basic knowledge about the species' biology



Questions

- Did *Z. exulans'* and *Z. anthyllidis'* ranges shift at their **lower** altitudinal range limits during the last five decades (1960–2009)?
- What are the main drivers for range shifts?

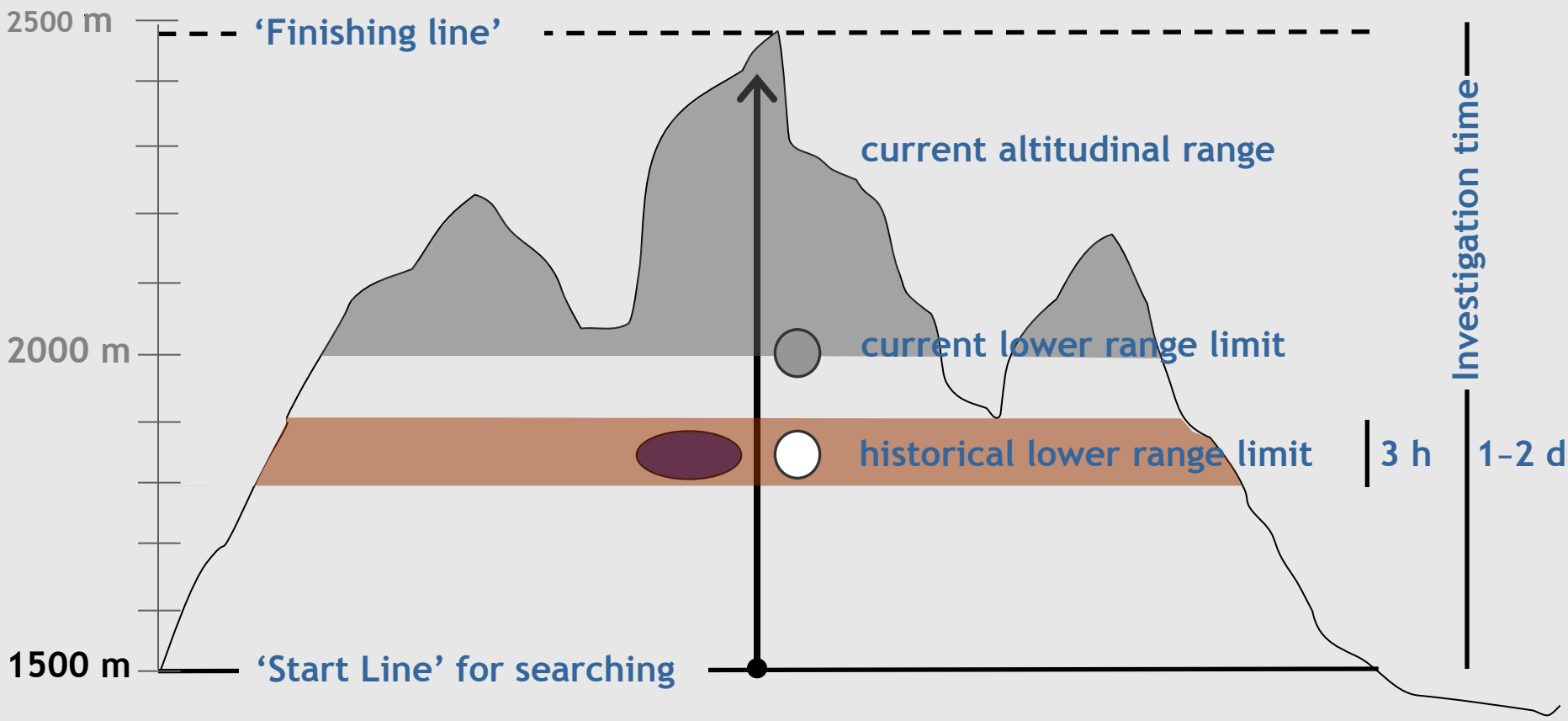
What have we done?



- **Land-use** Livestock densities for each summer pasture controlled
- **Climate** Mean monthly temperature and precipitation

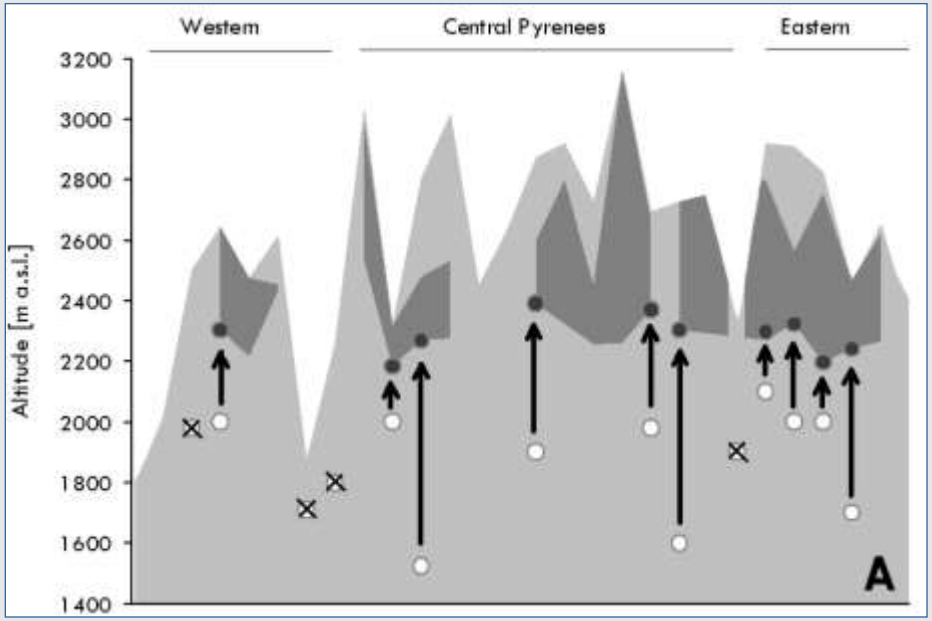
Z.anthyllidis

23.06.1963, Gourette (Pyrénées Atlantiques)
Lac d'Anglas, 1850 m



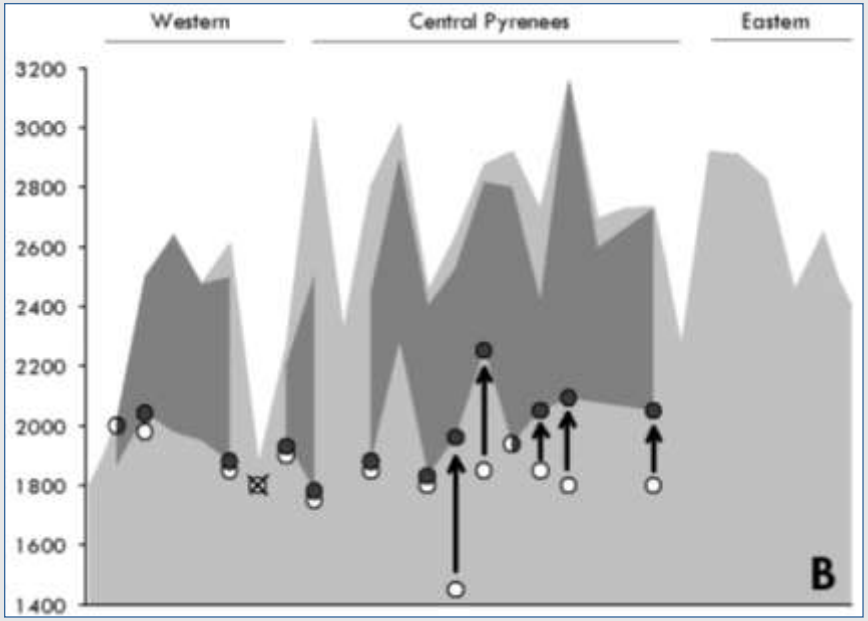
Uphill shifts at the lower altitudinal range limits

Zygaena exulans (n = 14)



Uphill shift (1958–1986): 430 m ± SD 210 m (148 m ± SD 87 m/decade)

Zygaena anthyllidis (n = 14)



Uphill shift (1958–1986): 150 m ± SD 180 m (60 m ± SD 74 m/decade)

Impact of climate and land-use change on uphill shifts

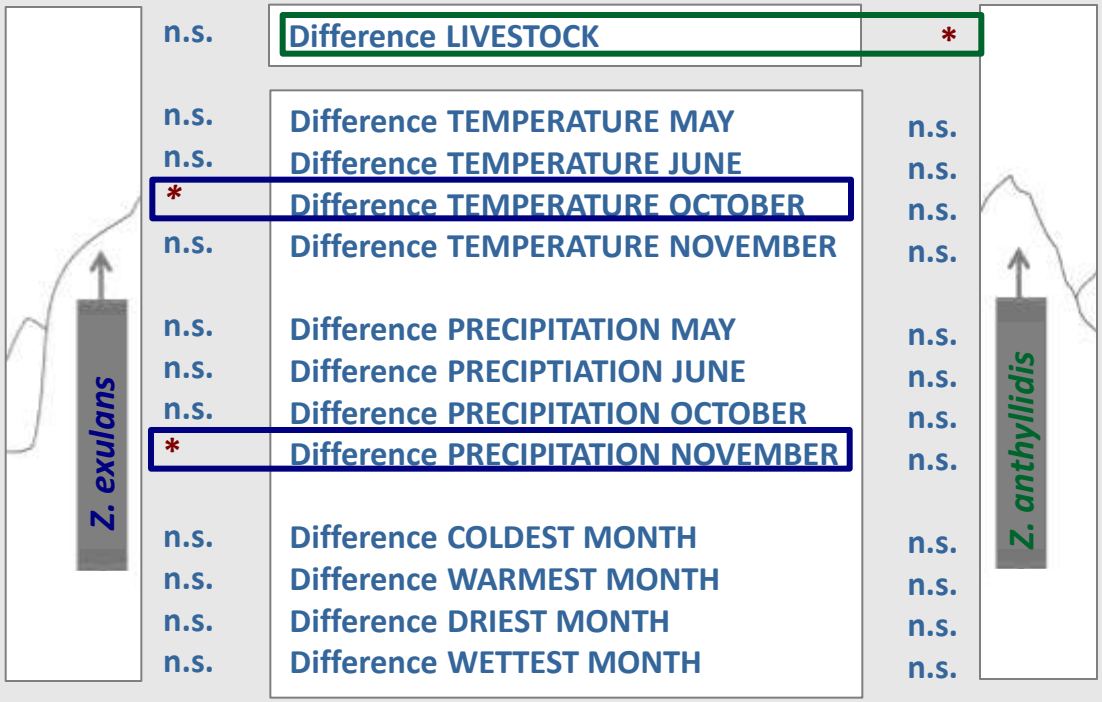
Z. exulans

Z. anthyllidis

Increasing October temperatures

CLIMATE CHANGE

Decreasing November precipitations

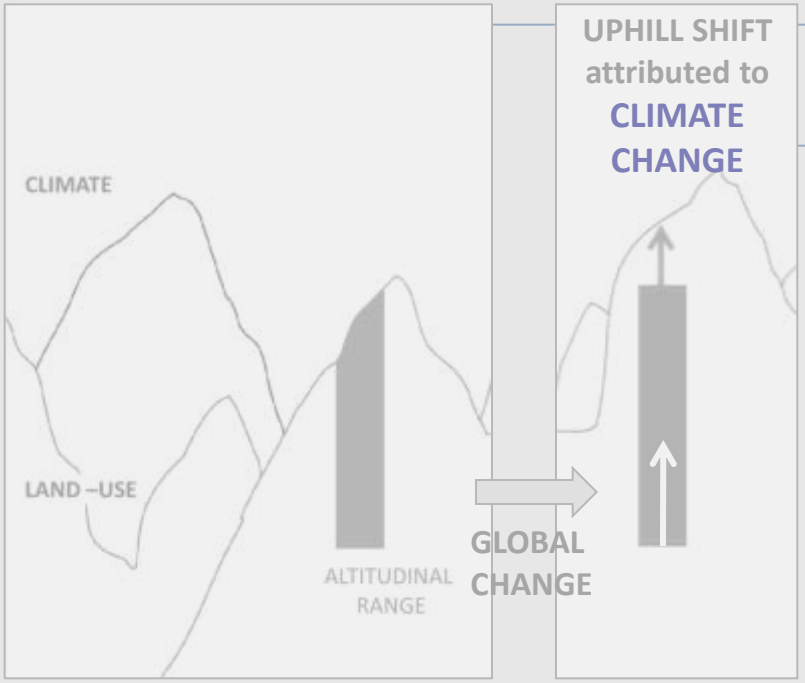


LAND-USE CHANGE

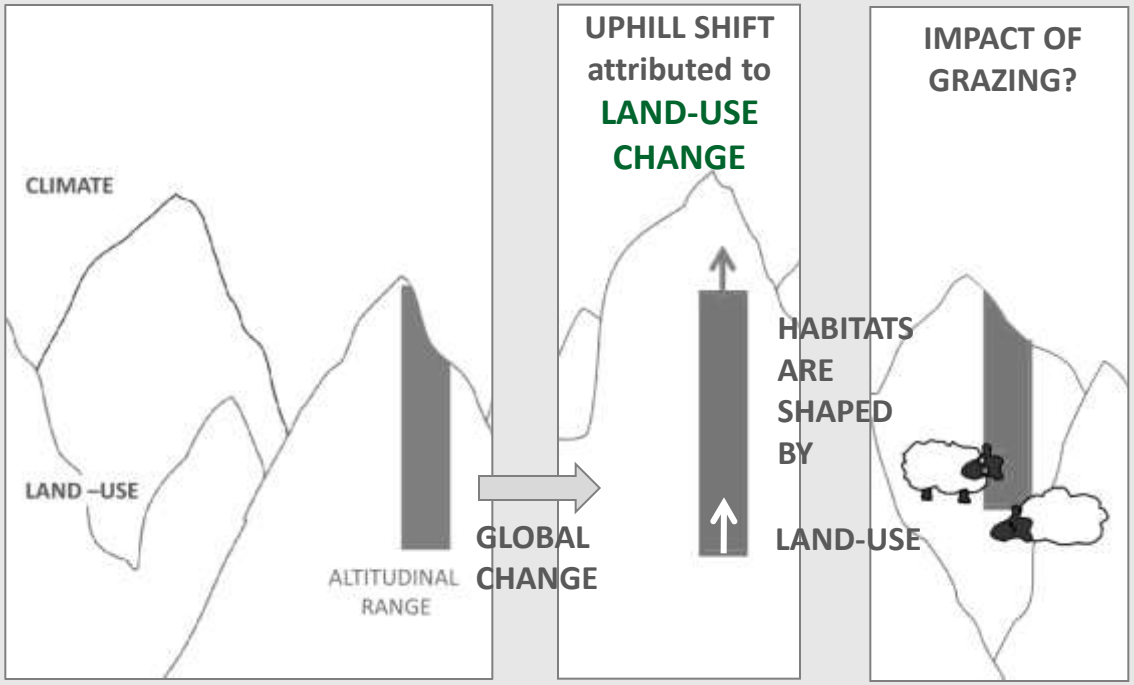
Increasing grazing intensity

Lower range limits remained stable under low grazing pressure ($0.2–0.4\ LU^{-ha}$)

Z. exulans



Z. anthyllidis



Question

Which grazing intensities favour the presence of *Z. anthyllidis*?

Grazing experiment

- **Grazing experiment** based on manipulated grazing pressures
- **Three levels of grazing pressure (extensively grazed, intensively grazed, and ungrazed vegetation)** were tested with regard to females' oviposition preferences

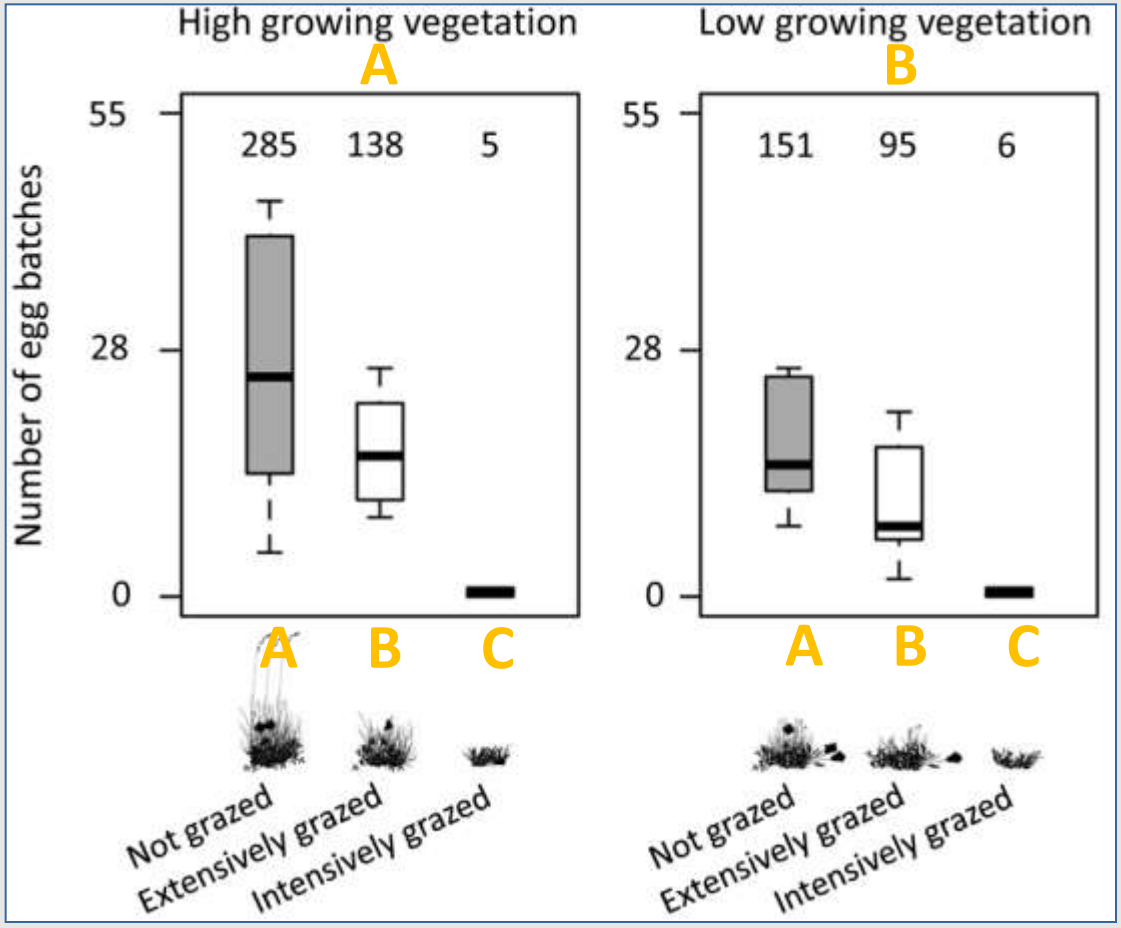
High growing vegetation

Low growing vegetation

- Females were offered simultaneously **two different vegetation structures** resulting from different grazing pressures
- **Three combinations**
- **Fourfold replication** of each combination/ vegetation type
- Combinations scattered across the valley
- **72 females**/ combination/vegetation type

[Before the flight period…]

Distribution of egg batches



Management recommendations

- Low grazing intensities (< 0.5 LU^{-ha})
- Rotating grazing system with varying grazing intensities at landscape scale

Conservation

- Standard monitoring programs should be extended to above-timberline habitats

Agri-environmental schemes

- Financial incentives
- Adaptation to any surviving regional traditional organisation of grazing systems

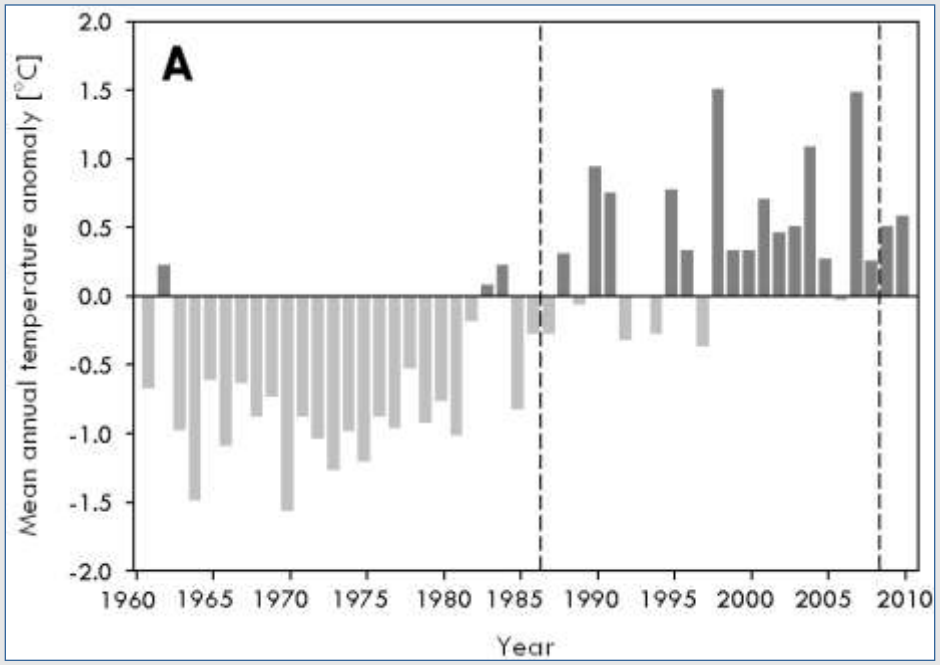
Thanks for financial support to

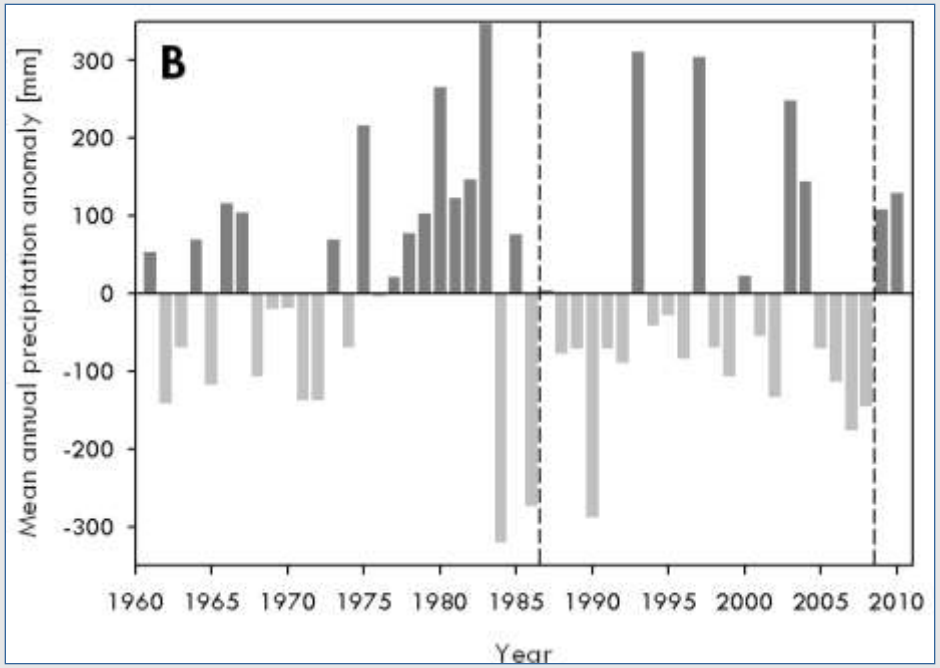
aides à la formation recherche

Fonds National de la Recherche Luxembourg

Thank you for your attention!

Climatic trends





Increase in temperature anomalies

No significant trend

Expected uphill shift: 347 m