Grazing & Biodiversity: *From selective foraging to wildlife habitats*

Michiel Wallis De Vries
Pâturage & Biodiversité: du butinage sélectif à l’habitat de la faune sauvage
Between large and small herbivores
Coexistence can be challenging...
Insects and Biodiversity

- Insects: over 1 million described species
- Lepidoptera: 174,000 species
- Vertebrates: 58,000 species...
• Vulnerability to grazing also greater in arthropods
  (Van Klink et al., 2015; Biol. Rev.)
Scales in Large Herbivore Foraging

- From bite formation to landscapes and regions

<table>
<thead>
<tr>
<th>Spatial scale</th>
<th>dm²</th>
<th>m²</th>
<th>ha</th>
<th>km²</th>
<th>$10^2$-$10^3$ km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large herbivore</td>
<td>bite</td>
<td>feeding station</td>
<td>feeding site</td>
<td>home range</td>
<td>viable population</td>
</tr>
</tbody>
</table>
Forage depletion at feeding stations

Trade-off between gains of staying and moving on...

WallisDeVries et al. (1998)
Appl Anim Behav Sci, 60:301–315
Intake-Travel dilemma generates heterogeneity

Prins (1996)
Large-scale grazing systems: transhumance

Fig. 3. Transhumance shepherding routes in southwest Germany during the first half of this century; summer pastures in the Swabian Alb, winter pastures in the Lake Constance basin or the Rhine Valley (from Homberger, 1959).
Grazing from a Butterfly Perspective
Life Cycle

- Climate
- Nitrogen
- Land use

Pupa → Adult

Larva

Egg

Hostplant

Natural enemies

Nectar

Microclimate
Scales in Butterfly Habitats

• From egg to population

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<td>Egg-laying</td>
<td>larval micro-habitat</td>
<td>local population</td>
<td>viable (meta)-population</td>
<td>Local adaptation</td>
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Butterfly Egg-laying larval micro-habitat local population viable (meta)-population Local adaptation
## Spatial Scales & Grazing Impact

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<th>Impact</th>
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<tr>
<td>Bite</td>
<td>Mortality</td>
<td>Oviposition</td>
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<td>Feeding Station</td>
<td>Structural heterogeneity</td>
<td>Larval Microhabitat</td>
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<td>Patchiness</td>
<td>Local Population</td>
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<td>Home Range</td>
<td>Successional dynamics</td>
<td>Viable (Meta)population</td>
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<td></td>
<td>Species Range</td>
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Pathways of Herbivore Impact

- Direct
  - Predation
  - Dung

- Indirect
  - Vegetation
  - Microclimate
  - Nutrient cycling

- Species-specific variation
  - Trait-based approach

Highest species richness in Wood Pastures

(after Bink, 1992)
Changing Land Use

- Both Intensification AND Abandonment
- Re-invent low-intensity grazing systems
Managing Successional Mosaics

Targeting Grazing Impact

Managing Grazing Impact

Herbivore Characteristics:
- Species
- Breed & genotype
- Social experience

Grazing Management:
- Stocking rate
- Grazing season & period
- Fencing / Rotation
- Cutting, burning & fertilising
- Water & mineral placement
- Herding
- Transhumance

Grazing Herbivores → Vegetation → Butterflies
How should I graze?
Grazing Impact in Dry & Wet Heathlands
Grazing intensity & Species Richness

- Early successional species: high grazing intensity / Dry
- Late "": low "" / Wet

WallisDeVries et al. (2016) AGEE
Experiments with Rotational Grazing
Grazing and Biodiversity can go together, simple enough, but achieving this in modern grazing systems has become one of the hardest things there is...
Questions?...