



Herbage selection and landscape utilisation by beef cows on a mountain heterogeneous pasture

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Introduction

- Decline of the use of mountain pastures
- *Alnus viridis* develops quickly in many regions of the subalpine belt
- Various social demands (landscape, products with high added value, biodiversity)
- Within this context, we tested a new (farming) system with a dual-purpose: production of meat and upkeep of landscape
- Upkeep of species-rich grasslands colonised by *Alnus viridis*: how effective is grazing (respectively browsing) by beef cows?





Objectives

- (i) Describe the herbaceous plant selection by the cows**
- (ii) Assess the effects of repeated browsing on *A. viridis***
- (iii) Define the relations between vegetation types and the spatial occupation pattern of cattle**



Experimental site and animals

- ✓ Summer pasture in the southwestern part of Switzerland
- ✓ Rotational system with two or three grazing periods (depending on year)
- ✓ Herd: 9 dry cows and 9 lactating cows with their calf (local breed)
- ✓ Observations: in two paddocks of 2.5 ha each, located at 1'800 m on the northern slope



Material and method – Herbage selection

- ✓ Botanical analyses along sixteen transects
- ✓ At each contact point, the present species were recorded as ‘grazed’ or ‘not grazed’
- ✓ The observations were made few days after the animals began to graze
- ✓ Determination of the selection index (SI)



SI – Example

L. hispidus accounts for 3.0% of all grazed plants (= relative contribution to all defoliated plants)

L. hispidus represents 1.5% of all recorded species (= specific contribution, % in the herbage)

→ Selection index = $3.0:1.5 = 2.0$



Browsing of *Alnus viridis*

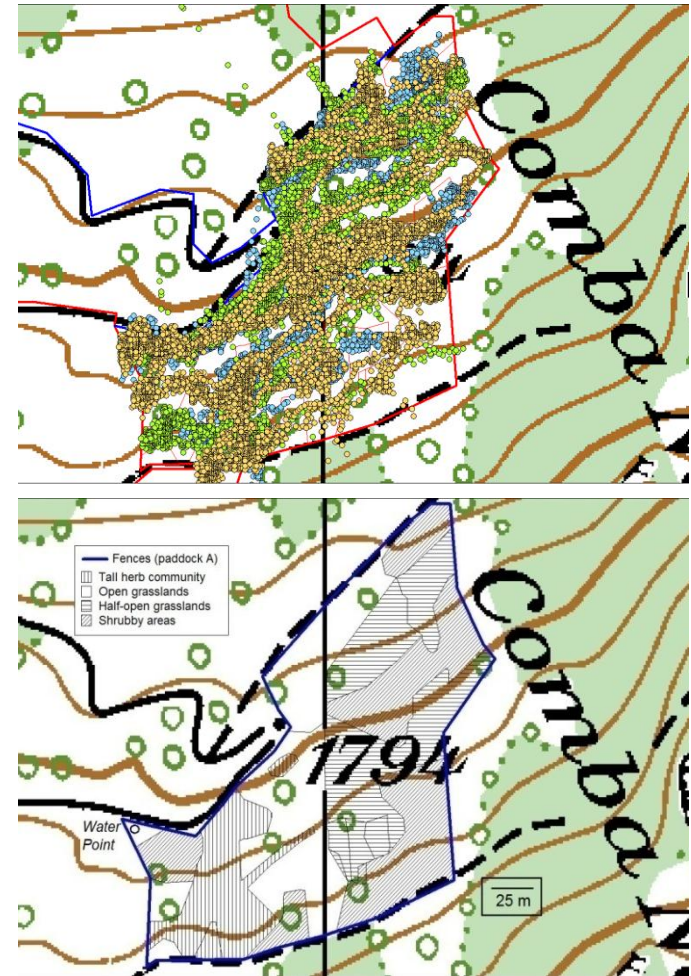
- ✓ **Monitoring of thirty nine plants (0.5 to 2.0 m height) in two distinct zones**
- ✓ **Plant height and canopy area were measured over a three year period (in September)**
- ✓ **ANOVA with repeated measurements**





Monitoring by Differential Global Positioning System (DGPS)

- ✓ Four cows fitted with a DGPS tracking harness
 - ✓ Three periods of measurements (corresponding to the three rotations)
 - ✓ Duration of each period: three to five days
 - ✓ Data correction using virtual reference stations (VRS)
 - ✓ GIS Overlay analysis
 - ✓ Calculation of the PI
Occupation time (%) in a vegetation unit divided by its surface (%)
- Statistical analysis: LME





Monitoring by Differential Global Positioning System (DGPS)

1



2



3



4



1. Tall herb community
2. Open pastures
3. Half-open pastures
4. Shrubby areas



Results



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Results – Herbage selection

Species name	Functional group	Occurrence	Defoliated (%)	Contribution (%)	Selection index
<i>Leontodon hispidus</i>	Forbs	51	5.6	2.9	1.9
<i>Agrostis capillaris</i>	Graminoids	123	10.0	6.9	1.4
<i>Festuca rubra</i>	Graminoids	314	25.1	17.7	1.4
<i>Luzula sylvatica</i>	Graminoids	125	9.4	7.0	1.3
<i>Anthoxanthum alpinum</i>	Graminoids	124	9.0	7.0	1.3
<i>Chaerophyllum villarsii</i>	Forbs	160	11.6	9.0	1.3
<i>Poa chaixii</i>	Graminoids	36	2.4	2.0	1.2
<i>Nardus stricta</i>	Graminoids	28	1.8	1.6	1.1
<i>Plantago alpina</i>	Forbs	68	3.8	3.8	1.0
<i>Trifolium pratense</i>	Legumes	84	4.2	4.7	0.9
<i>Potentilla aurea</i>	Forbs	68	3.4	3.8	0.9
<i>Pulsatilla alp. apiifolia</i>	Forbs	24	1.0	1.4	0.7
<i>Alchemilla monticola</i>	Forbs	76	2.8	4.3	0.7
<i>Trisetum flavescens</i>	Graminoids	26	0.8	1.5	0.5
<i>Soldanella alpina</i>	Forbs	21	0.6	1.2	0.5
<i>Geranium sylvaticum</i>	Forbs	36	1.0	2.0	0.5
<i>Trifolium repens</i>	Legumes	38	1.0	2.1	0.5
<i>Crocus ver. albiflorus</i>	Forbs	113	2.8	6.4	0.4
<i>Ranunculus acr. friesianus</i>	Forbs	85	2.0	4.8	0.4
<i>Vaccinium myrtillus</i>	Ligneous plant	65	1.0	3.7	0.3
<i>Trifolium pallescens</i>	Legumes	23	0.2	1.3	0.2
<i>Veratrum album</i>	Forbs	28	0.2	1.6	0.1
<i>Trollius europaeus</i>	Forbs	59	0.4	3.3	0.1
Total		1775	100	100	
	Graminoids (all)	776	59	44	1.3
	Forbs (all)	789	35	44	0.8
	Legumes (all)	145	5	8	0.7
	Ligneous plant	65	1	4	0.3



Browsing of *Alnus viridis*

	Year			Significance level		
	2005	2006	2007	Year	Zone	Y × Z
Height (cm)	122	119	109	***	ns	ns
Canopy area (m ²)	0,40	0,43	0,32	***	ns	ns

*** $P < 0,001$; ns = non significant.

Zone: the observations were made in two different zones of the paddock.

Presence index (PI) in the vegetation units

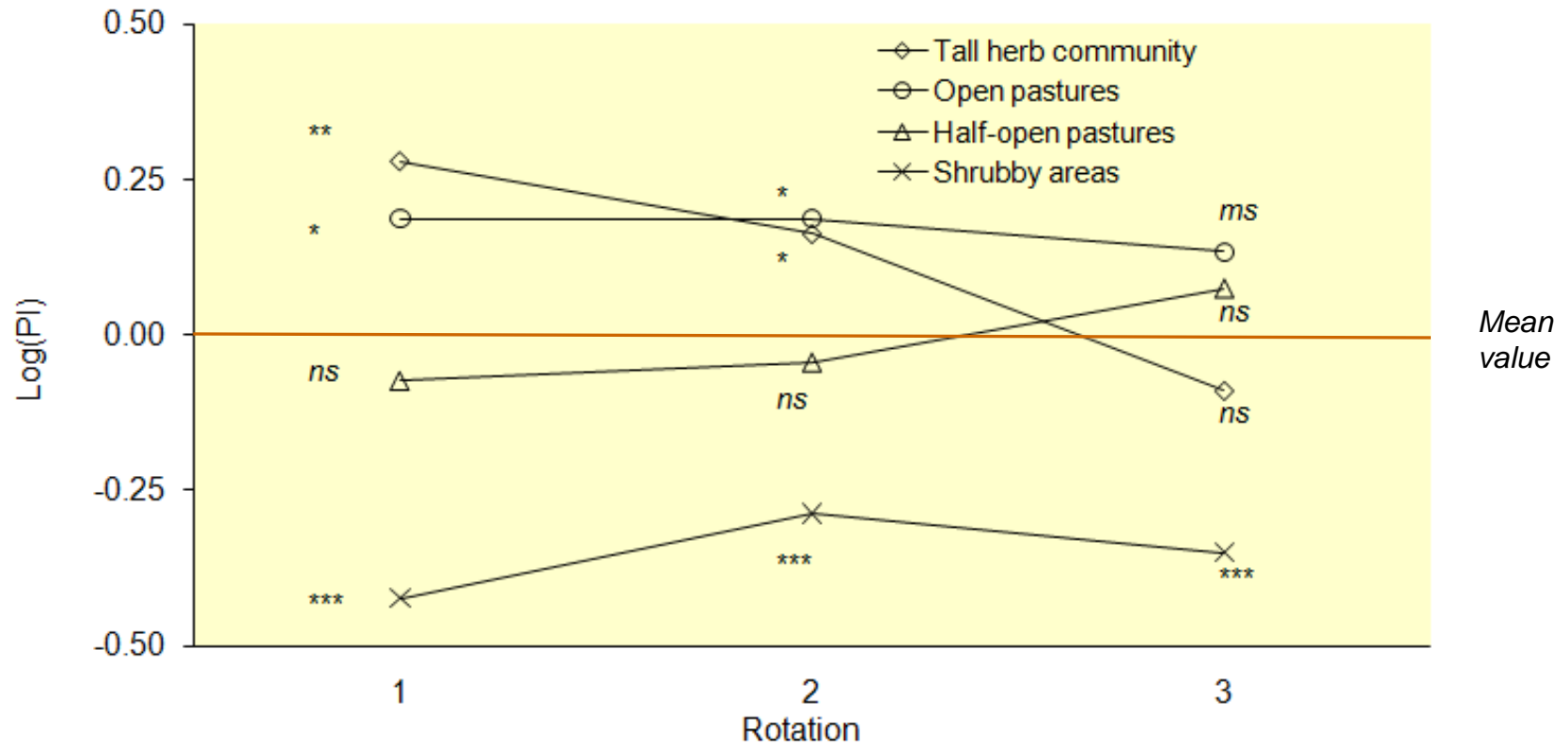
	Surface (%)	Occupation time (%)	PI (average of 3 rotations)
Tall herb community	13	18	1.41
Open pastures	20	31	1.54
Half-open pastures	36	36	1.01
Shrubby areas	31	14	0.46

- **It is difficult to infer grazing activity from occupation time with exactitude**
- **The results are influenced by the location of the water point and the uneven distribution of the resting places**
- **The animals roamed all areas of the plots**



Presence index (PI) in the vegetation units

Results of the statistical analysis; linear mixed-effects model (LME)



The data have been log-transformed. The zero value corresponds to the mean occupation time.
The values significantly different from zero are indicated on the graph; ns not significant; ms $0.05 < P < 0.1$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.



Conclusions

- **Cattle consume a large spectrum of herbaceous plants, as well as young twigs of *A. viridis***
 - **Selection process is important, even if the consumed plants reflect, to a certain extent, the abundance of the different species in the vegetation**
 - **Reforestation process can also be an opportunity for cattle feeding**
 - **A grazing intensity of 70 LU day ha⁻¹ proved to be sufficient to prevent shrub expansion... but the grazing only impacts the small shrubs**
- *Upkeep of species-rich grasslands partially colonised by *A. viridis* is effective, provided that the grazing pressure is sufficient and the canopy cover limited***



Thank you for your attention

