Grazing abandonment results in decline of zoochoric species – an evidence from dark diversity analysis in Central European grasslands

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fundamental question

- is species composition of CE **semi-natural** grasslands **still influenced** by change of feeding (and keeping) productive lifestock

history of CE semi-n

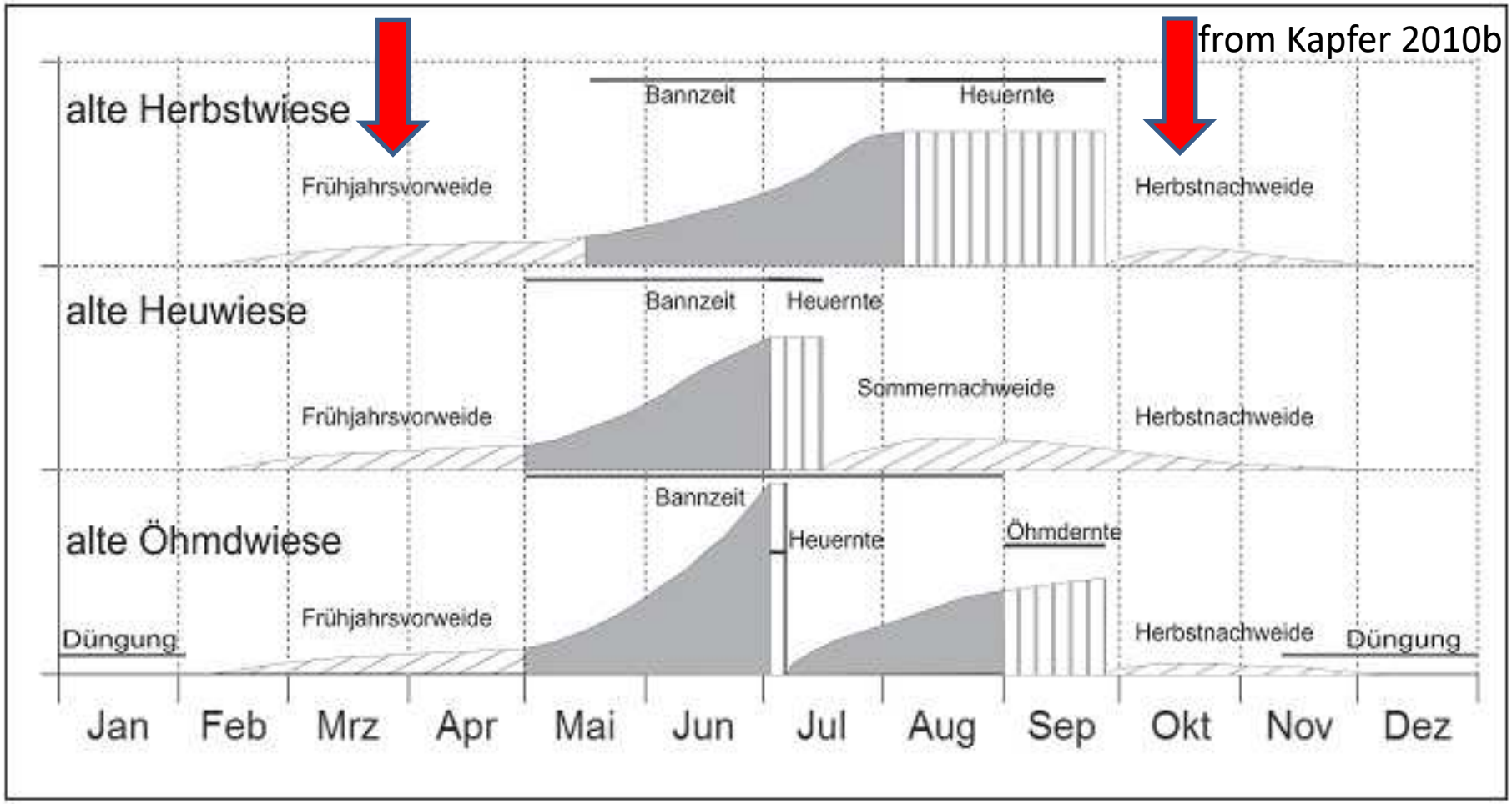


Abb. 4: Bewirtschaftungsschema der drei wichtigsten Wiesentypen der alten Dreizelgenwirtschaft.

effects of grazing livestock

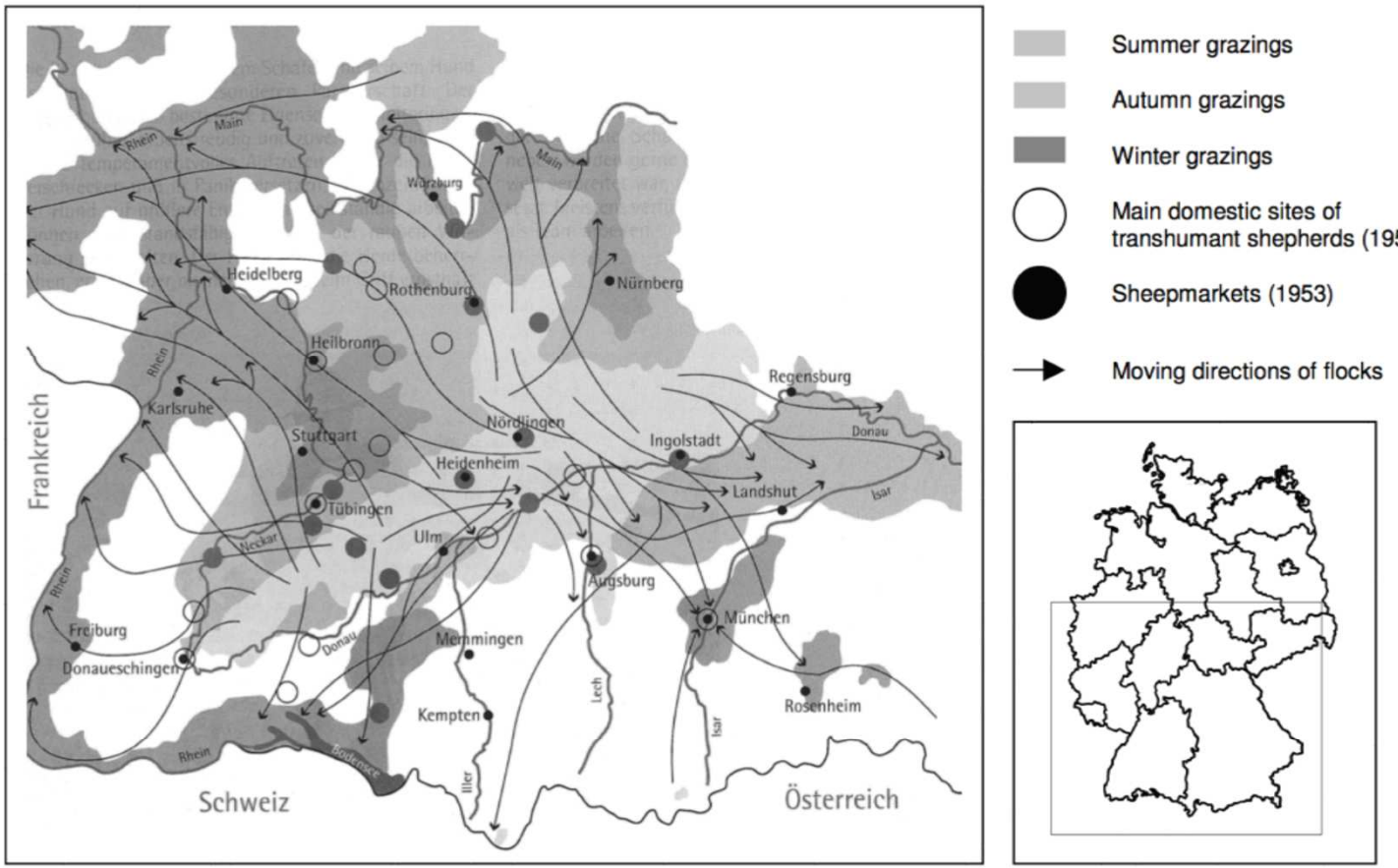
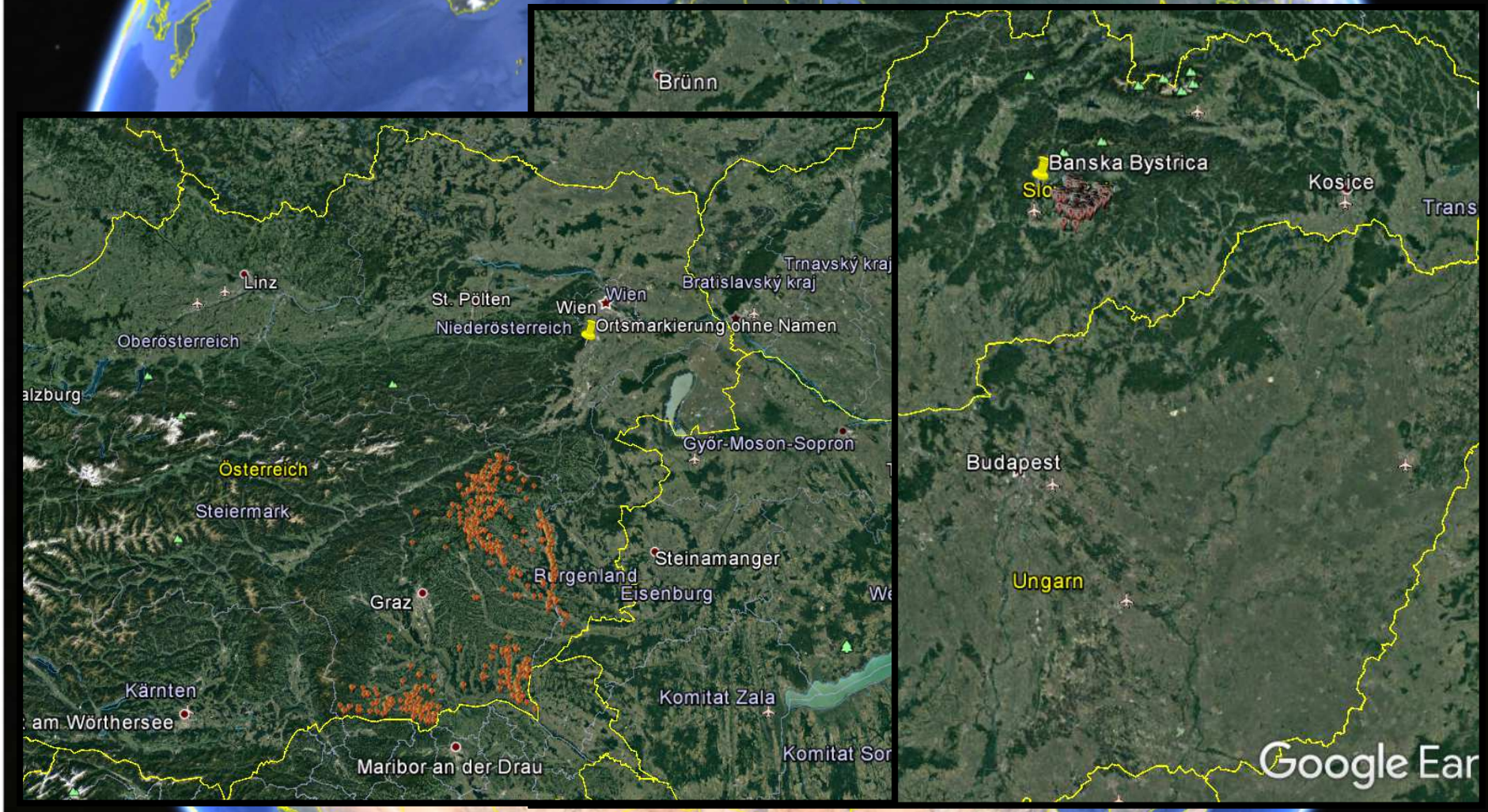


Fig. 2: In the second half of the 18th century a unique form of transhumance with sheep developed in the Southwest of Germany (today in the federal states of Baden-Württemberg and Bavaria). Typically, the flocks spent the summer on the uplands of Swabian-Fraconian Mountain Range and then in autumn they moved to winterings in the valleys of Rhine, Main and Danube, or in the Lake Constance Basin (illustration taken from MAYER 1999, after HORNBERGER 1959 & RIEGER 1966).

the memory of grasslands

investigation areas

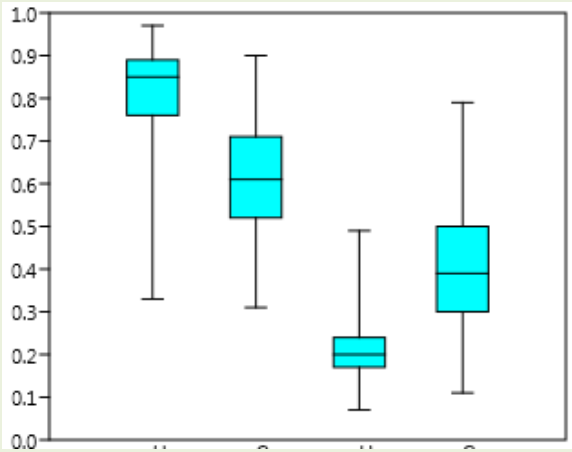


dataset

plot-data	number of historical datasets (period)	number of recent datasets (period)
Slovakia	673 (1968-2001)	86 (2015-2016)
Austria	671 (1980-1993)	99 (2007-2016)

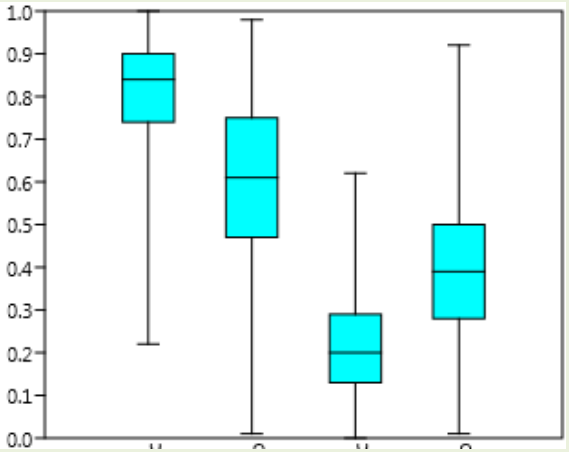
proportion of zoochoric species

AT, recent (N=99)



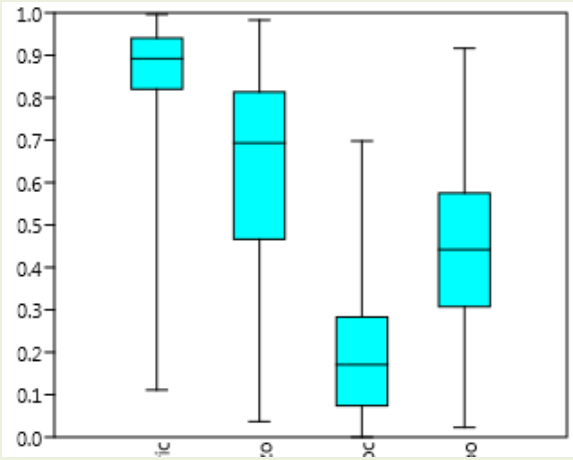
all zooch.
dom. zooch.
dom. epizooch.
dom. endozooch.

AT, historic (N=673)



all zooch.
dom. zooch.
dom. epizooch.
dom. endozooch.

SL, historic (N=671)



all zooch.
dom. zooch.
dom. epizooch.
dom. endozooch.

„recent“ dark diversity based on historical datasets

Beals Smoothing (see Lewis & al. 2015)

Beal's probability index = $$P_{ij} = \frac{1}{S_i - I_{ij}} \sum_{k \neq j} \frac{N_{jk} I_{ik}}{N_k}$$

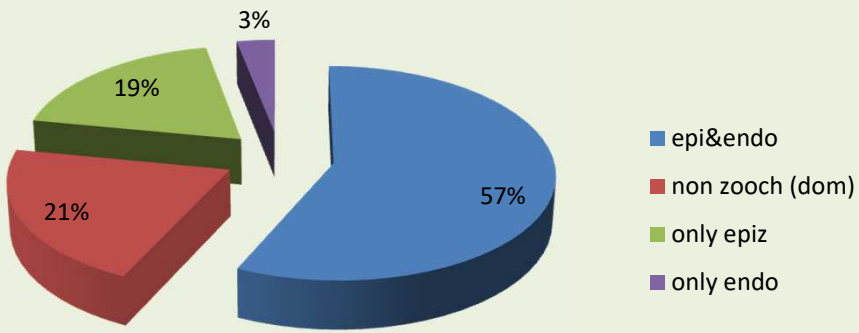
where: S_i = number of species at community i
I_{ij} = incidence (0, 1) of species j at community i
N_{jk} = number of joint occurrences of species j and k
I_{ik} = incidence (0, 1) of species k at community i
N_k = number of occurrences of species k

calculation of probability of co-occurence

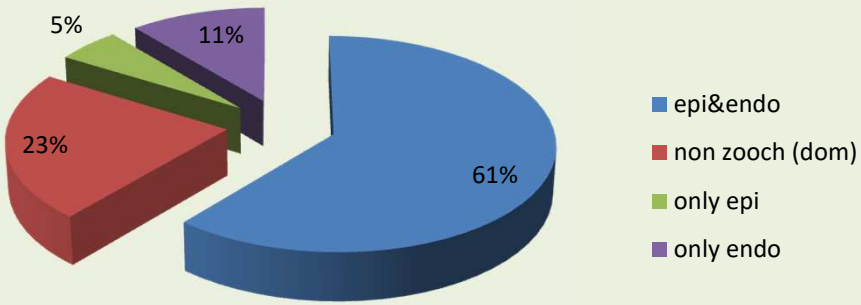
- in recent dataset, calculated with historical dataset
- high treshold (0,5) to avoid positive mismatches

results

AT



SL



conclusion

method

- easy effort for estimating change of important drivers of biodiversity on landscape scale
- avoiding problems of species turnover with directly plot based approaches
- not considering rare species


the end
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dd comparison AT SL

Austria

	Beals Smoothing				domestic		non-domestic/?	
	frequ.	mean	min	max	epiz.	endoz.	epiz.	endoz.
Tragopogon pratensis agg.	67	0.54	0.50	0.57	x		x	x
Leontodon hispidus	51	0.59	0.50	0.66	x		x	x
Cerastium holosteoides	49	0.62	0.51	0.70	x		x	x
Lotus corniculatus	48	0.71	0.55	0.84	x	x	x	
Ranunculus acris	44	0.66	0.58	0.77	x	x	x	x
Rumex acetosa	44	0.64	0.55	0.74	x	x	x	
Anthoxanthum odoratum	37	0.70	0.56	0.80	x	x		
Veronica chamaedrys agg.	37	0.54	0.50	0.60	x	x	x	x
Trifolium pratense	35	0.81	0.61	0.89	x	x	x	x
Briza media	32	0.57	0.50	0.67	x	x		
Vicia cracca agg.	30	0.51	0.50	0.53				x
Leucanthemum vulgare agg.	29	0.69	0.51	0.82	x	x	x	
Cruciata glabra	28	0.54	0.50	0.64			x	x
Trifolium repens	28	0.52	0.50	0.60	x	x	x	x
Ajuga reptans	26	0.53	0.50	0.60				
Luzula campestris	25	0.55	0.50	0.65		x		
Arrhenatherum elatius	23	0.54	0.50	0.59	x	x		x
Holcus lanatus	21	0.63	0.51	0.77	x	x	x	x
Achillea millefolium agg.	19	0.67	0.56	0.73	x		x	
Daucus carota	16	0.53	0.50	0.57	x	x	x	x
Trisetum flavescens	15	0.54	0.50	0.59	x		x	
Lathyrus pratensis	14	0.55	0.50	0.63	x	x		x
Dactylis glomerata	12	0.60	0.51	0.69	x	x	x	x
Plantago lanceolata	11	0.76	0.59	0.86	x	x	x	x
Lychnis flos-cuculi	10	0.53	0.50	0.59				
Betonica officinalis	8	0.54	0.50	0.58			x	
Campanula patula	8	0.52	0.52	0.54			x	
Centaurea jacea agg.	7	0.57	0.53	0.62	x	x	x	x
Thymus pulegioides	6	0.55	0.51	0.60	x	x	x	x
Festuca pratensis agg.	5	0.54	0.50	0.59			x	
Prunella vulgaris	5	0.51	0.50	0.51	x	x	x	x
Taraxacum sect. Ruderalia	4	0.52	0.51	0.53	x	x	x	x
Hieracium bauhinii	3	0.51	0.50	0.53				
Rhinanthus minor	2	0.54	0.54	0.54	x	x		x
Pimpinella saxifraga	2	0.51	0.50	0.52	x	x	x	x
Polygala comosa	2	0.50	0.50	0.51				
Festuca rubra agg.	1	0.52	0.52	0.52	x	x	x	x
Knautia arvensis	1	0.52	0.52	0.52			x	x
sum	805	0.60	0.50	0.89				
dd-cases	805							
non zoochoric	93							

Slovakia

	Beals Smoothing				domestic		non-domestic/?	
	frequ.	mean	min	max	epiz.	endoz.	epiz.	endoz.
Leucanthemum vulgare agg.	43	0.64	0.50	0.69	x	x	x	
Campanula patula	33	0.65	0.55	0.69			x	
Luzula campestris s.lat.	29	0.72	0.55	0.80		x		
Festuca pratensis	29	0.56	0.51	0.62			x	
Ranunculus acris	27	0.74	0.66	0.80	x	x	x	x
Stellaria graminea	25	0.57	0.51	0.61	x	x		x
Thymus pulegioides	24	0.55	0.50	0.66	x	x	x	x
Festuca rubra agg.	23	0.78	0.57	0.85	x	x	x	x
Hypericum maculatum	23	0.55	0.50	0.62				
Leontodon hispidus	21	0.57	0.51	0.62	x		x	x
Anthoxanthum odoratum agg.	20	0.75	0.56	0.81	x	x		
Alchemilla vulgaris spec. div.	20	0.72	0.52	0.78		x		
Nardus stricta	19	0.54	0.50	0.60	x	x	x	
Briza media	17	0.67	0.59	0.72	x	x		
Poa pratensis agg.	16	0.68	0.64	0.74	x	x	x	x
Rumex acetosa	14	0.79	0.63	0.84	x	x	x	
Lotus corniculatus	13	0.69	0.58	0.81	x	x	x	
Plantago lanceolata	12	0.73	0.61	0.79	x	x	x	x
Pimpinella saxifraga	12	0.56	0.50	0.61	x	x	x	x
Viola canina	12	0.55	0.51	0.60				
Trifolium pratense	11	0.67	0.57	0.74	x	x	x	x
Cruciata glabra	10	0.66	0.58	0.72			x	x
Veronica chamaedrys	9	0.70	0.50	0.82	x	x	x	x
Trifolium repens	7	0.65	0.52	0.75	x	x	x	x
Carex caryophyllea	5	0.51	0.50	0.52				x
Agrostis capillaris	3	0.77	0.55	0.91	x	x		x
Achillea millefolium agg.	3	0.75	0.58	0.85	x		x	
Cardamine pratensis agg.	3	0.53	0.52	0.53		x	x	x
Potentilla erecta	3	0.51	0.50	0.53		x	x	
Taraxacum sect. Ruderalia	3	0.50	0.50	0.50	x	x	x	x
Plantago media	2	0.52	0.50	0.53	x	x	x	x
Prunella vulgaris	2	0.51	0.51	0.52	x	x	x	x
Cerastium holosteoides	2	0.51	0.50	0.51	x		x	x
Deschampsia cespitosa	1	0.55	0.55	0.55	x	x		x
Trisetum flavescens	1	0.52	0.52	0.52	x		x	
sum	497	0.65	0.50	0.91				
dd cases	497							
non zoochoric	112							