

Changing Environment 0

The basiphilous dry and semi-dry grasslands (*Festuco-Brometea*) in N and NE Europe: from a vegetation database to a consistent large-scale classification

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- 2. Working Group on Dry Grasslands in the Nordic and Baltic Region
- 3. Database
- 4. Preparation of the study data set
- 5. A priori selection
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Why are Nordic-Baltic dry grasslands relevant?

- Dry grassland communities reach their northern range margin in the region
- Nevertheless they have some of their largest, best-developed and most intensively studied stands in the region



- Most of the communities belong to priority habitats of the European Union, e.g. Type 6280 ("Nordic alvar and precambrian calcareous flatrocks")
- Various communities in the Nordic-Baltic region are significantly more species rich on small scales than similar types further south

Dengler, J., Löbel, S. (2006): Phytocoenologia 36: 343–391. Löbel, S., Dengler, J., Hobohm, C. (2006): Folia Geobot. 41: 377–393. Dengler, J., Boch, S. (2008): Mitt. Arbeitsgem. Geobot. Schleswig-Holstein Hamb. 65: 257–286.



Why are Nordic-Baltic dry grasslands relevant?

- The communities in the Nordic-Baltic region have been shown to be floristically distinct from those further south
- Some regional attempts for classification

Hallberg, H. P. (1971): Acta Phytogeogr. Suec. 56: 1-136 S.
Krahulec, F., Rosén, E., Maarel, E. van der (1986): Nord. J. Bot. 6: 797–809.
Dengler, J., Löbel, S., Boch, S. (2006): Tuexenia 26: 159–190.
Dengler, J., Löbel, S. (2006): Phytocoenologia 36: 343–391.
Boch, S., Dengler, J. (2006): Arb. Inst. Landschaftsökol. Münster 15: 55–71.
Rūsiņa, S. (2007): Latv. Veģ. 12: 1-366.
Löbel, S., Dengler, J. (2008) ["2007"]: Acta Phytogeogr. Suec. 88: 13–32.
Dengler, J., Boch, S. (2008): Mitt. Arbeitsgem. Geobot. Schleswig-Holstein Hamb. 65: 257–286.
Dengler, J., Boch, S. (2008): Folia Geobot. 43: 289–304.

 But: a consistent supra-national classification of these vegetation types is still missing





Working group

Working Group on Dry Grasslands in the Nordic and Baltic Region

- Founded in 2005
- Aims at the establishment and analysis of a comprehensive vegetation database of dry grasslands and related communities (*Festuco-Brometea, Koelerio-Corynephoretea, Trifolio-Geranietea*)



- Members:
 - 52 members
 - 10 countries (DE, DK, NO, SE, FI, RU, EE, LV, LT, PL)

http://www.biologie.uni-hamburg.de/bzf/syst/wg_dry_grasslands_nordic/wg_dgnb1_eng.htm

2008:

- First European Dry Grassland Meeting jointly organised with the German Arbeitsgruppe Trockenrasen (participants from ten countries)
- Now a subgroup of the European Dry Grassland Group http://www.edgg.org



Nordic-Baltic database

- Presently handled with SORT but will be transformed to TURBOVEG soon
- According to our overview, approx. 19,700 relevés exist, of which 7,675 are already included in our database

Types of "publications":

48% published relevés
23% original relevés to published constancy tables
13% theses and reports ("grey literature")
16% unpublished relevés

Criteria for inclusion:

- Plot size available and between 1 and 100 m²
- Geographic localisation (at least at coarse scale)
- Focal classes and similar vegetation types



Nordic-Baltic database

- Problems:
 - 10 countries with strongly deviating plant nomenclature
 - wide range of different cover-abundance scales
 - standardisation of header data necessary
 - national vegetation databases inexistent

Present content (rough assignment):





Preparation of the study dataset

1 – A priori syntaxonomic delimitation

- As long as no comprehensive database & classification of all vegetation types is available for the study area, **ad-hoc methods** are necessary for the selection of which relevé belongs to the Festuco-Brometea
- Ad-hoc methods for the assignment of relevés:
 (1) original classification
 (2) cover of diagnostic species
 (3) new approach



New approach

Dengler, J, et al. (2006): Working group on dry grasslands in the Nordic and Baltic region – Outline of the project and first results for the class Festuco-Brometea. – Ann. Bot. N. S. 6: 1–28, Rome.

Outline:

- For the studied syntaxon and "adjacent" syntaxa of equal rank, a priori (consensus) lists of diagnostic taxa are compiled from the literature (e.g. Mucina 1997, Berg et al. 2001, 2004)
- One species can be listed as diagnostic for more than one syntaxon
- For each relevé the sum of ordinal transform cover values (OTVs) of the diagnostic species of all syntaxa is calculated
- Each relevé is assigned to the syntaxon with the highest sum of OTVs



New approach

Advantages:

- Result does not depend on the specific data set
- Selection criteria are unambiguous and easily repeatable
- Because of the use of many species for syntaxon delimitation, the result is little influenced by the diagnostic value assigned to a certain species
- No relevé remains unassigned and none is assigned to more than one syntaxon
- Method is only little influenced by plot size because
 - ratios of species groups are used instead of single species groups
 - cover is used instead of presence

However:

 With this approach, the appropriateness of a specific class delimitation cannot be addressed

A comprehensive joint classification of all vegetation types in the Nordic-Baltic region is desirable for the future



2 – Other selection criteria

- Plot sizes have strong influences on ordination results and even stronger ones on classification and determination of diagnostic species
 - Otýpková, Z., Chytrý, M. (2006): Effects of plot size on the ordination of vegetation samples. J. Veg. Sci. 17: 465–472.
 Dengler, J., Löbel, S., Dolnik, C. (in press): Constancy values depend on plot size a problem for
 - Dengler, J., Löbel, S., Dolnik, C. (in press): Constancy values depend on plot size a problem for vegetation classification and how it can be solved. J. Veg. Sci.
 - Different plot sizes should not be combined in one an analysis
- Bryophytes and lichens are an important component of dry grasslands
 - Only relevés with treatment of non-vascular plants should be included



Results of the *a priori* selection

	A 11		Festuco-Brometea					
	relevés	Selection	< 4 m²	4-25 m²	> 25 m²	4-25 m ² with cryptogams		
DE - Germany	3467	552	18	468	66	395		
DK - Denmark	175	60	53	7	0	7		
EE - Estonia	1247	790	699	91	0	91		
FI - Finland	127	1	0	1	0	1		
LT - Lithuania	122	70	0	16	54	16		
LV - Latvia	614	289	8	277	4	171		
NO - Norway	335	82	57	25	0	25		
PL - Poland	417	318	0	112	206	112		
RU - Russia	111	42	42	0	0	0		
SE - Sweden	1060	493	82	309	2	223		
Total	7675	2697	959	1306	332	1041		



First results for within-classification

TWINSPAN: default settings



Group 1					
Denmark	0%				
Estonia	0%				
Finland	0%				
Germany	70%				
Latvia	9%				
Lithuania	0%				
Norway	0%				
Poland	93%				
Sweden	1%				

Group No.	Gro 4(up 1 00	Gro	Group 2 641	
Fidelity measure	С	phi	c	л. ph	
Festuca trachyphylla	63	62	4		
Salvia pratensis	45	53	1		
Centaurea rhenana ssp. rhenana	45	53	1		
Dianthus carthusianorum	39	48	1		
Euphorbia cyparissias	33	43	1		
Medicago sativa	56	43	15		
Stipa capillata	27	40	0		
Potentilla cinerea	44	39	10		
Brachypodium pinnatum ssp. pinnatum	28	38	1		
Falcaria vulgaris	25	37	1		
Peucedanum oreoselinum	26	35	2		
Phleum phleoides	48	33	17		
Sanguisorba minor	29	30	6		
Festuca ovina	1		46	54	
Briza media ssp. media	18		5 9	43	
Festuca rubra agg.	14		55	43	
Trifolium pratense	3		35	41	
Campanula rotundifolia	3		34	4(
Avenula pratensis ssp. pratensis	16		51	- 38	
Plantago lanceolata	35		71	36	
Luzula campestris	4		32	36	
Centaurea jacea agg.	6		34	36	
Vicia cracca	6		30	32	
Filipendula vulgaris	12		38	31	
Medicago lupulina	20		50	31	
Linum catharticum	16		44	30	
Lotus corniculatus	17		44	30	
Anthyllis wineraria	17		42	28	
Galium verum	38		65	27	
Ranunculus bulbosus ssp. bulbosus	12		34	26	



Group 2					
Denmark	100%				
Estonia	100%				
Finland	100%				
Germany	30%				
Latvia	91%				
Lithuania	100%				
Norway	100%				
Poland	7%				
Sweden	99%				



Clas

1.2.1

2.1.1

2.1.2

2.2.1

2.2.2

(Festucion vallesiacae)

transition to Koelerio-

(Cirsio-Brachypodion)

Fidelity measure	C F	bhi	C phi	C phi	C phi	C phi	C phi	C phi	C phi	
Festuca trachyphylla	76 3	35 4	55 18	59 21	58 20	10	5	1		
Salva pratensis Dianthus carthusianorum	72 4 58 S	18 37 :	10 36 16	66 42 36 16	17 21		1	i		
Euphorbia cyparissias	55 3	19 :	27 11	26 10	17	1	2	·	5	
Falcaria vulgaris	34 2	25	45 10 11	79 37 32 23	40 6 18 7	5	22	15		eelande
Peucedanum oreoselinum	25	12 3	23 10	38 26	20 7	2	3	1		issianus
Arrhenatherum elatius	68 3 31 6	3	49 17 30	40 12	36 58 27	3 26	20	23		
Coronilla varia	23 2	22	8	23 22	6	1	1			
Echium vulgare Stachvs recta ssp. recta	36 27	24 3	29 16 3	15 11	25 12 12 8	8	2	6		
Aster linosyris	27 3	35	1	13 11	5			1		
Galium x pomeranicum Anthemis tinctoria ssp. tinctoria	20 1	4	10 26 22	21 22 5	14 12 16 9	1	1	1		
Centaurea rhenana ssp. rhenana	77 6	50 1	59 34	17	21		2			
Potentilla cinerea	71 4	н	47 19	39 13	13	2	4	20	·	
Artemisia campestris ssp. campestris Silene otites ssp. otites	59 t 23 a	14 1	90 39 19 22	12	43 2 2	11	28	23	57 13	
Koeleria macrantha	31 3	30 ·	19 14	17 11	3		1			
Camelina microcarpa Medicado minima	18 2	25	15 19 8 0	·	3					
Sedum acre	33 8	3 (58 40	:	15	i	20	21	29	
Conyza canadensis	14 1	7	16 22	÷	5	1				
Anchusa officinalis	12 1	8	14 17 11 16	1	2	1	1	1		
Alyssum alyssoides	8 1	10 ·	15 25	· ···	3					
Oxytropis pilosa	12 .		7 10	2	1		·	·		
Bromus inermis	40 4	7	7	6	3		4			
Anthericum liliago	20 4	1						1		
Chondrilla jun	23 3	34		2	4	:				
Sedum sexangulare	21 3	34		2	:		1	1		
Carex supina	20 3	25		3	2		5			
Asperula cynanchica	6 2	24								
Silene chlorantha	6 2							·	·	
Convolvulus arvensis	11 -		32 28	÷	12	3	11	i		
Scabiosa ochroleuca		1 📕	11 28	1	1		· ···			
Astragalus arenarius	з		8 27 8 27	1	· · · · ·	:	a			
Koeleria glauca	1 -	۱	8 25	· · · · ·	:		:	:		Filin
viola arvensis Vicia lathyroides	2	1	8 21 7 20		1 2	:	1	1		
Thymus pulegioides	15		22	72 39	46 17	30	26	1		
Potentilla berti juu	2	- \		24 23	23 21	7	5			
Senguisorba minor Scabiosa columbaria sen, columbaria	23 6		8	49 32 42 20	30 12 23 0	23 6 32 19	3			Ηομ
Brachypodium pinpatum ssp. pinpatum	16 -		5	81 71	10	2	2	1		
Koeleria pyramidata	2 .		5	55 53	12	14 4	1			
Prunella grandiflora ssp. grandiflora Viola hirta	2		1 -	28 42 32 39	ė	6	1	9 7		
Vicia tenuifolia	3 -	1	I	18 33	1	1		1		
Seseli annuum ssp. annuum Thesium linophyllon	5 £			17 30 9 29	3	•				
Ononis spinosa	5 .			19 28	3	· · · ·	1	2		
Anthericum ramosum	2 -		3	14 26	2			1		
Briza media ssp. media	2 -		1	5	15	72 29 49 27	58 19 13	57 17 43 22	19	
Plantago la colata	11	:	37	36	62	73 18	67 14	76 21	29	
Luzi campestris			1		15	22	28 15 36 17	43 31 36 17	5	
Anthoxanthum odoratum				2	6	18	24 15	37 32		
Linum catharticum	6 -		· ···	42 8	23	78 37 66 27	19	45 10 43 8	52 57 20	
Cerastium fontanum ssp. vulgare	- I		4	2	8	21 12	20 11	24 16	10	
Prunella vulgaris Agrostis capillaris	5			2 3	11 12	39 27 36 19	13 28 11	16 27 10	33 21 10	
Carex flacca ssp. flacca	1.		1	13	4	39 32	9	27 18		
Ranunculus bulbosus ssp. bulbosus Danthonia decumbens	4 -		8	15	23	45 23 18 20	23	41 19 24 29	5	
Stellaria graminea						1	17 24	14 20		
Poa pratensis			1	2		24 28	8	13 12		
Festuca rubra agg. Trifolium pratense	2 -	'		24 ···· 5 ····	7	61 44	35 19	29	5	
Medicago lupulina	4 -	3	21	20	41	76 35			14	
Festuca pratensis ssp. pratensis Leucanthemum vulgare	1 .		3 4	13	12	30 24 52 33	27 20 30 11	4	14	
Equisetum arvense			8	1	7	21 17	24 22	4		
Fragaria vesca Primula veris ssp. veris	1 -		1	3	3	28 24	13 5 30 19	4	24 10	
Plantago media	3 -		8	49 23	13	42 17	45 19	20	10	
Taraxacum officinale agg.	1 -		1		5	47 40	7	10	24	
Alchemilla glaucescens Tussilago farfara					1	27 40 14 33		9		
Agrostis gigantea ssp. gigantea						12 32			-	
Salix caprea			·			10 29	· ···			
Geum rivale			:			11 29		1		
Leontodon autumnalis Comus sanguinea sso, sanguinea			1	2	1	18 28 10 27	6	3	:	
Vicia cracca			· · · · ·	8	2	25	38 42 52 37	13	14	
Ranunculus polyanthemos			3			5	26 35	9		
veronica chamaedrys Rumex acetosa ssp. acetosa	1 -		3 5	4	13	8 8	33 31 26 30	10		
Lathyrus pratensis				3		5	16 26	3		
Festuca ovina	: -		3		2	32	14	82 47	86 50	
Antennaria dioica	1.1		a	a		6	\checkmark	24 18	43 43	
Anthyllis vulneraria	5 -	'	11	27	26	50 15	23 2	53	62 2	1
Potentilla tabernaemontani	1 -		3	·	3	4	3	40 50	· /	Trans
Avenula pratensis ssp. pratensis	7			33	9	18	36	32 46 86 45	43	
Filipendula vulgaris	12		4	26	3	2	27	69 41	43	
Asperula tinctoria	14 - 5 -		1	2	2	7	2	50 41 34 41	5	
Galium boreale	2 -		5	4	1	3	17	40 37	10	Gera
Potentilla x subarenaria Helianthemum nummularium	÷ .		10	13	1 3	1	1	15 33 30 31	:	
Galium verum	56	;	32	42	16	60	47	86 27	62	
Carex pilulifera ssp. pilulifera Taraxacum erythrospermum and				:	i	1 3	3 -	12 27 13 26	:	
Juniperus communis ssp. communis			5			1	4	18 26	5	
Oxytropis campestris ssp. campestris Orchis mascula ssp. maecula						· ···	· · · · ·	7 26		
Arabis hirsuta	2		4	2	5	8	3	27 25	19	
Geranium sanguineum	2		4	4		2	4	9 💋	86 79	
Polygonatum odoratum Carex digitata				:	:	i	1		33 55 33 53	
Melica nutans						3	1	1 -	29 46	
Cotoneaster integerrimus Allium oleraceum	16	2 .	12	 13	 10	i	÷	3	19 41 52 41	
Gymnadenia conopsea			· ···		·	1	1		19 38	
Poa alpina Galium aparine	1.1			:	:	:		1 1	14 34 10 29	
Viola riviniana				·				·	10 29	
Asplenium ruta-muraria ssp. ruta-muraria	1.1							1 IIN	10 29	
Hieracium cymosum							1		10	

1.1.1

1.1.2

2.1.1

2.1.2

2.2.1

2.2.2

Within classification



Proposed classification scheme

Syntaxa	Distribution	Mean species richness (ca. 10 m²)						
Festucetalia valesiacae - xerophilous, steppic grassland	ls							
Festucion valesiacae Potentillo arenariae-Stipetum capillatae	DE (subcontinental), PL	29						
Brachypodietalia pinnati - meso-xerophilous basiphytic	grasslands							
Cirsio-Brachypodion pinnati - subcontinental Europe								
Adonido vernalis-Brachypodietum vernalis	DE (subcontinental), PL	33						
Filipendulo-Helictotrichion pratensis - Nordic-Baltic region								
Alchemillo glaucescentis-Festucetum	DE (coastal), DK, SE (BhG))	33						
Fragario viridis-Helictotrichetum pratensis	NO, SE (BhG, ÖI), FI, EE, LV, LT, PL	32						
Veronico spicatae-Avenetum pratensis	SE (Öl, Gtl, Upl), EE, LV	38						



Conclusions

- The approach was well applicable to a large and heterogeneous dataset and yielded ecologically and chorologically meaningful entities
- A distinct Nordic-Baltic alliance within the meso-xerophytic order Brachypodietalia pinnati could be confirmed

Outlook

- Further augmentation of the database (e.g. Russia and Finland)
- Improvement of the a priori selection
- Dealing with methodological problems, e.g. spatial clumping of relevés
- Formal publication of the units

Many thanks to

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and to you for your attention!

