

“The Times They Are A-Changin’” – research trends and perspectives of reindeer pastoralism - a review using a text mining and topic analysis approach

Øystein Holand, Barbara Contiero, Marius W. Næss, Giulio Cozzi

Earthscan Studies in Natural Resource Management

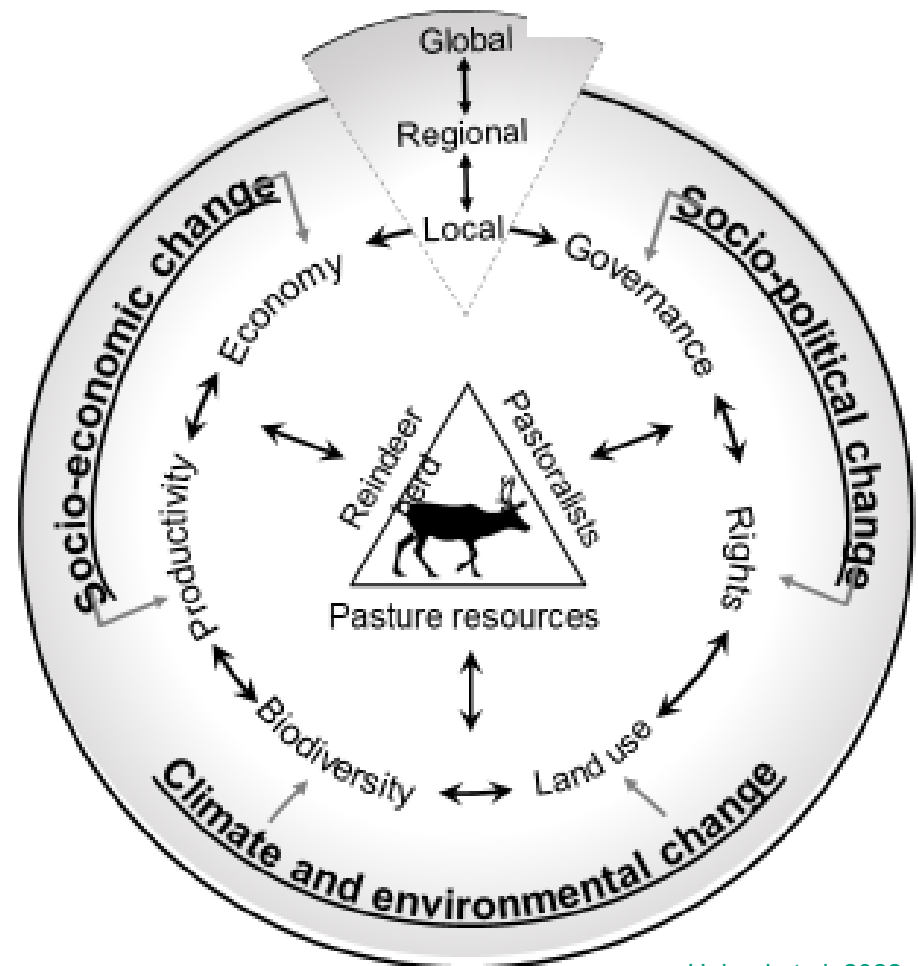
REINDEER HUSBANDRY AND GLOBAL ENVIRONMENTAL CHANGE

PASTORALISM IN FENNOSCANDIA

Edited by
Tim Horstkotte, Øystein Holand,
Jouko Kumpula and Jon Moen

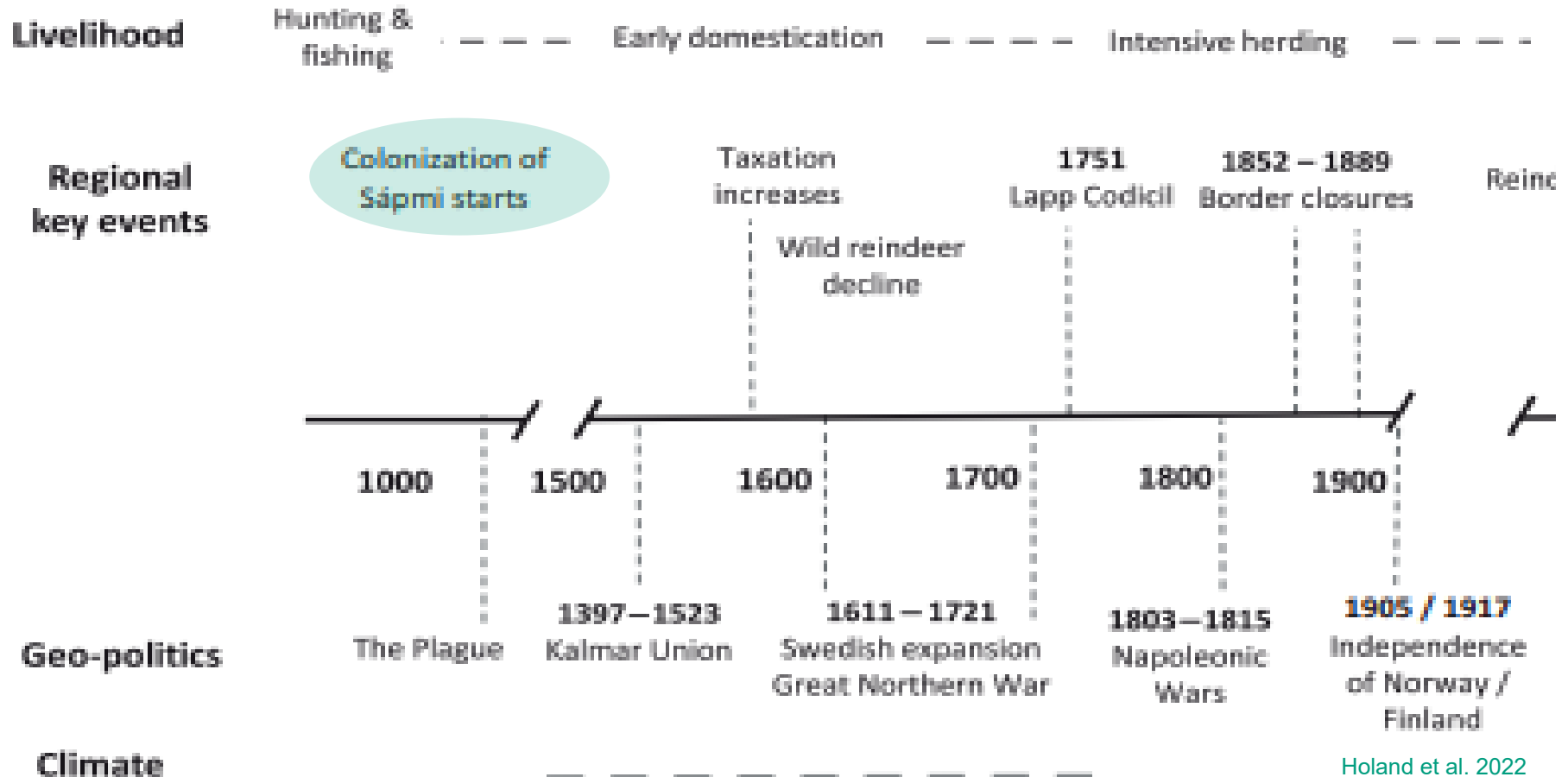
 **Routledge**
Taylor & Francis Group

[Reindeer Husbandry and Global
Environmental Change \(open.org\)](https://open.org)



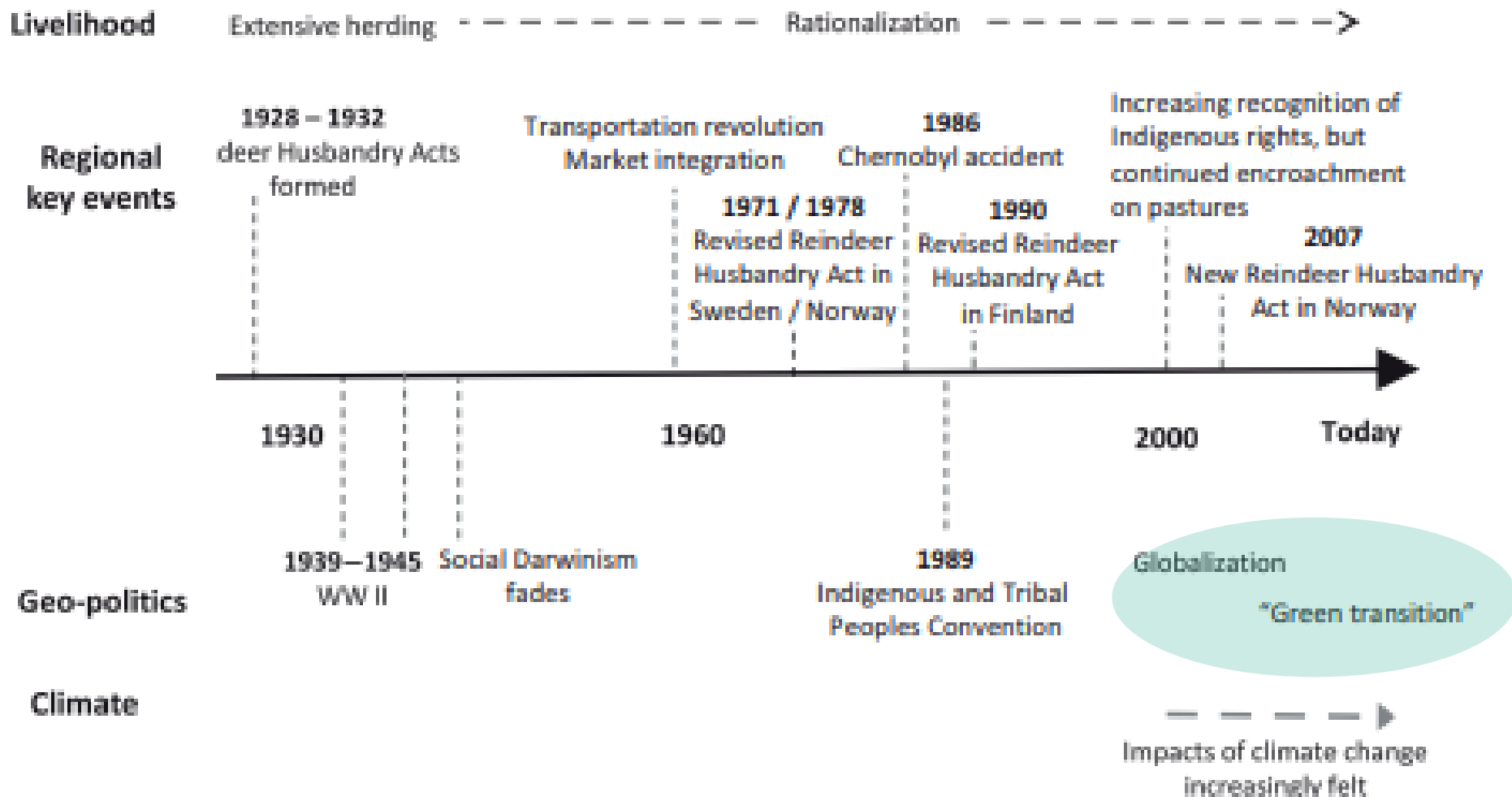
Holand et al. 2022

Historic timeline



Holand et al. 2022

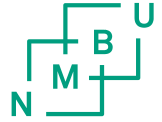
Historic timeline (continued)



“The Times They Are A-Changin’” – research trends and perspectives of reindeer pastoralism - a review using a text mining and topic analysis approach

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Starting point

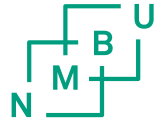


Danell (2000) argued that natural science, which then dominated the research arena had to integrate with social disciplines to respond to the emerging challenges reindeer pastoralism was facing.

Pape and Löffler (2012) proposed integrative and transdisciplinary research approaches, incorporating traditional knowledge, and focusing on the entire human-ecological production system revolving around sustainability and mitigation of land-use conflicts and climate change.

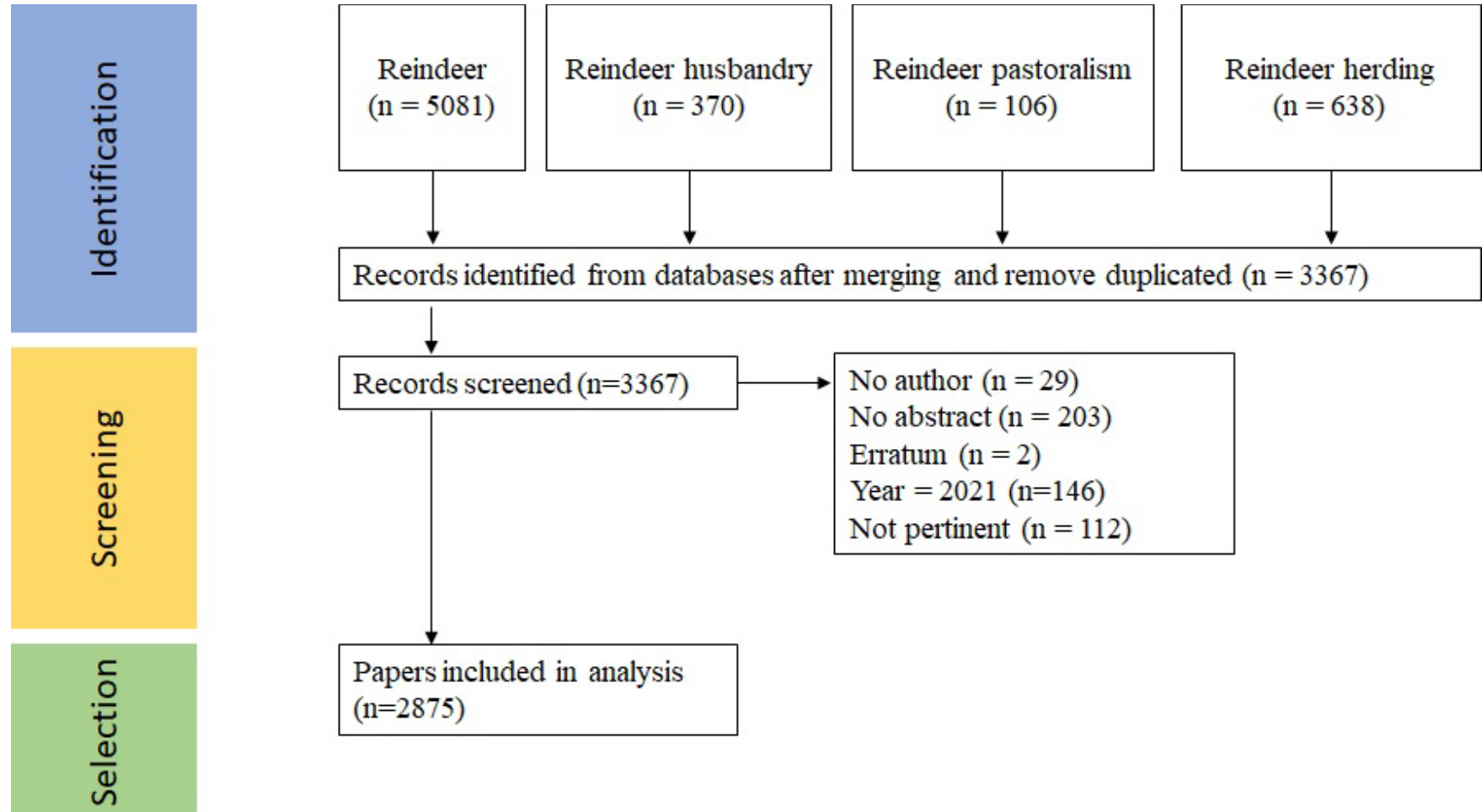
More than twenty years after Danell's argument, it is timely to evaluate his quest for more robust natural and social sciences integration.

Text mining – topic modelling



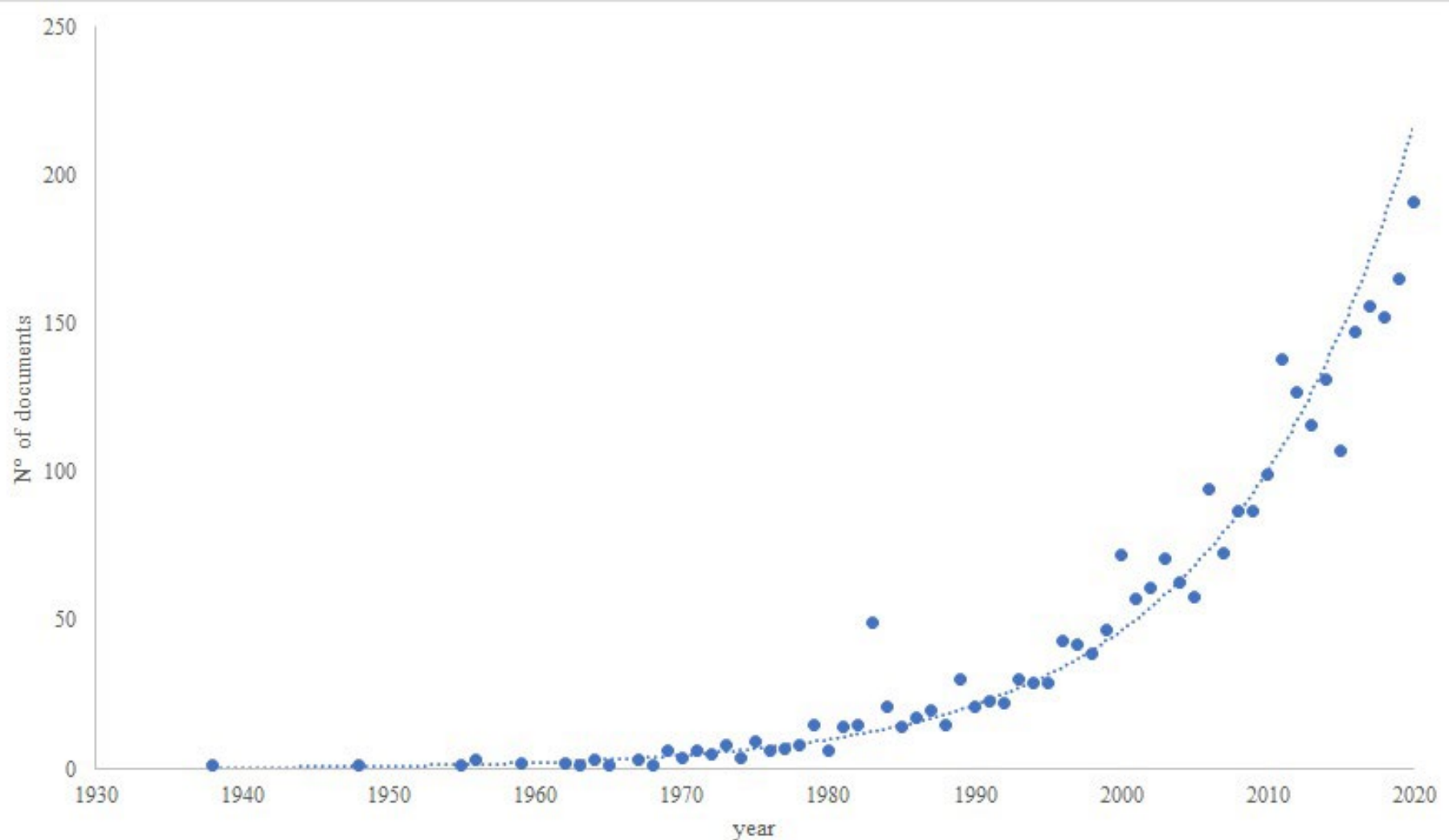
- Computer-aided analysis way to sort and order a large set of documents
 - has to be scrutinized and interpreted and put into context
- Does tell the whole story
 - only scientific papers indexed in Scopus (1650 journals)
 - english abstracts
 - tons of reports (grey literature) not included

The process – Scopus data base

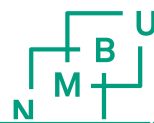


The scientific explosion within the field

U
B
M
N



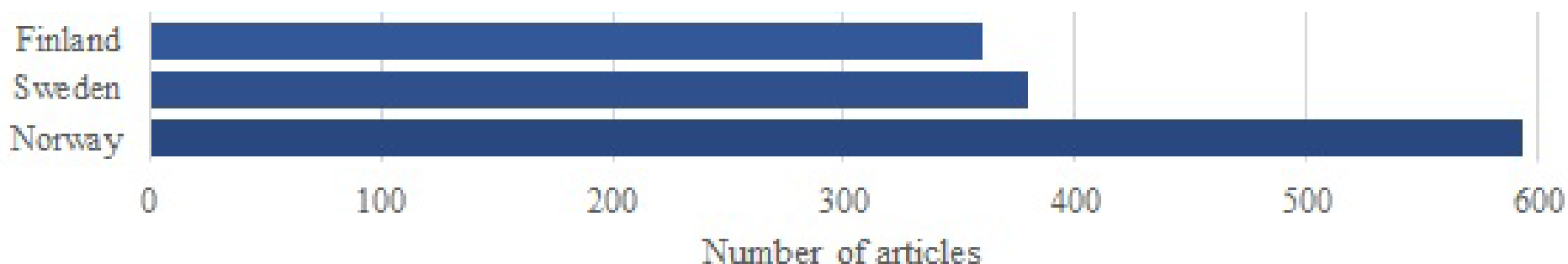
Scientific journals with more than 25 papers



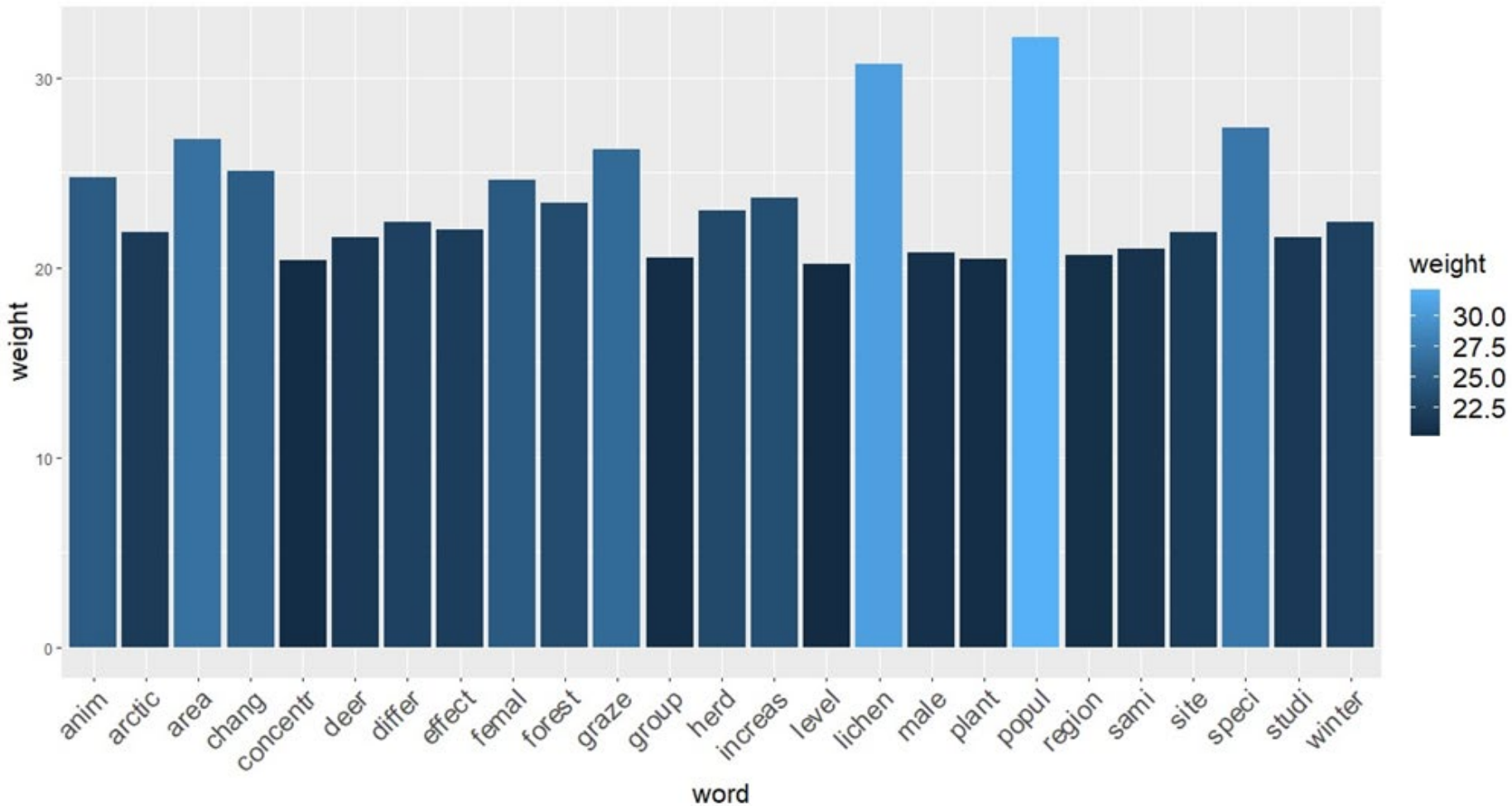
Journal	Doc
Journal of Wildlife Diseases	65
PLoS ONE	56
Health Physics	37
Int. J. of Circumpl. Health	36
Polar Biology	36
Acta Borealia	35
Canadian J.of Zoology	34
J.of Animal Ecology	34
Oecologia	34
Arctic	33
Oikos	33
Sci. of the Tot. Environm.	32
Acta Zoologica Fennica	31

J. of Envir. Radioactivity	31
Polar Research	31
Ecography	29
Polar Record	29
Zoologicheskii Zhurnal	28
Ambio	26
Wildlife Biology	26
J.of Archaeological Sci	24
Arctic Anthropology	23
Journal of Zoology	22
Arct. Antarctic. Alpine R	21
Bull de la Soc. Prehistorique Francaise	20
J. Wildlife Management	20

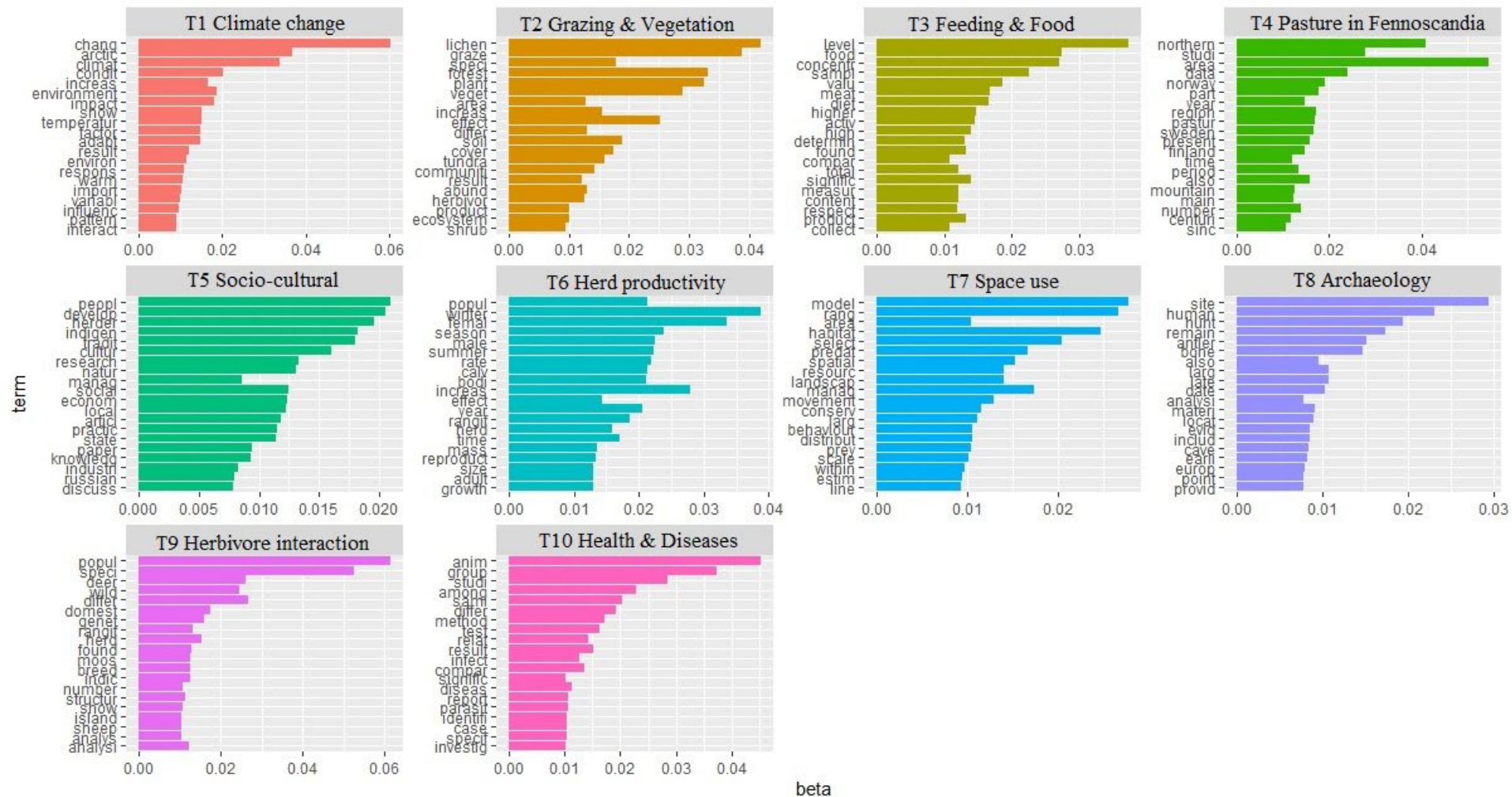
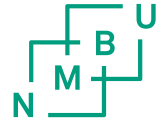
The top three



The 20 most common words -weighted

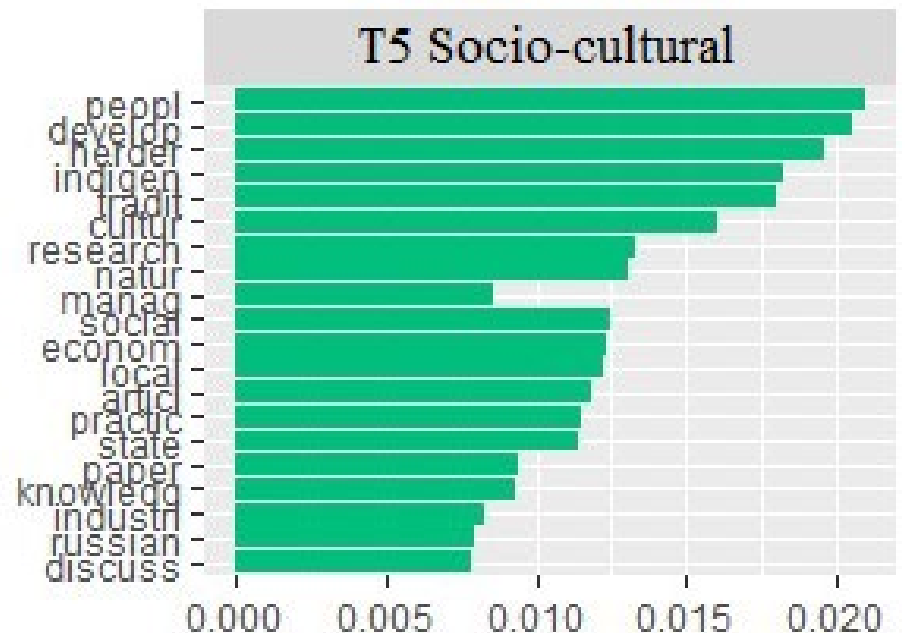
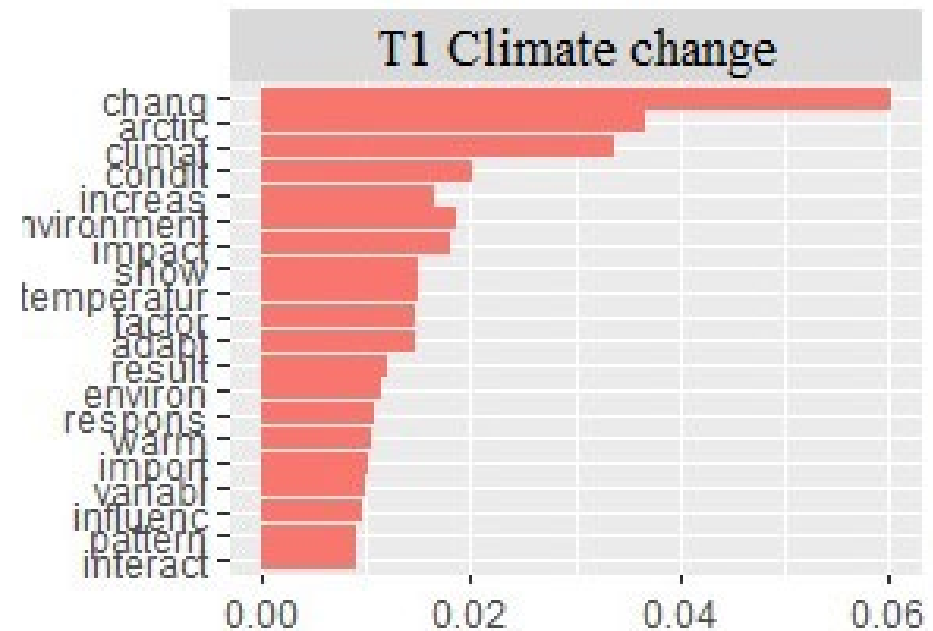
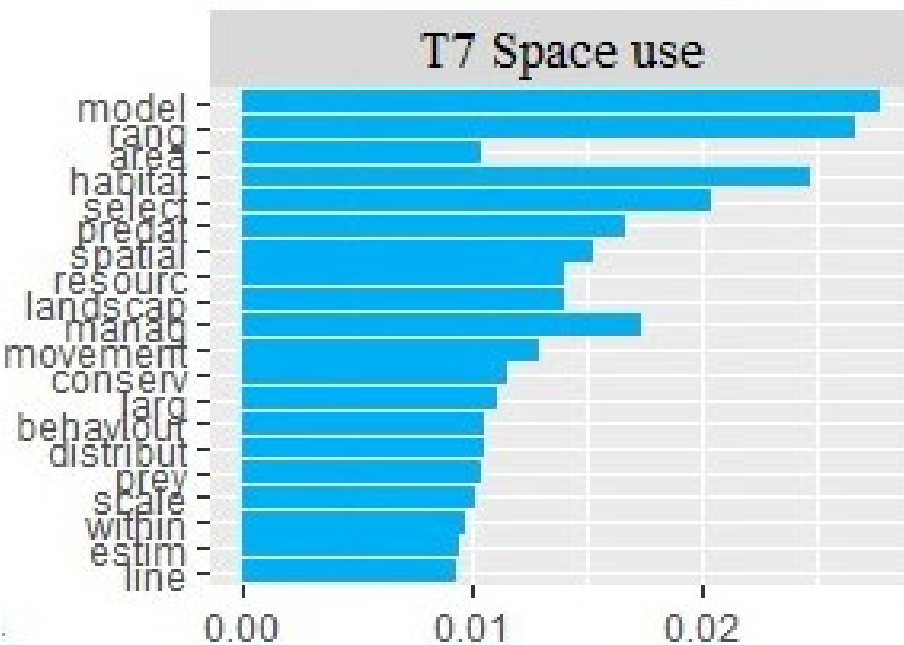


The ten topics – and the 20 terms



beta

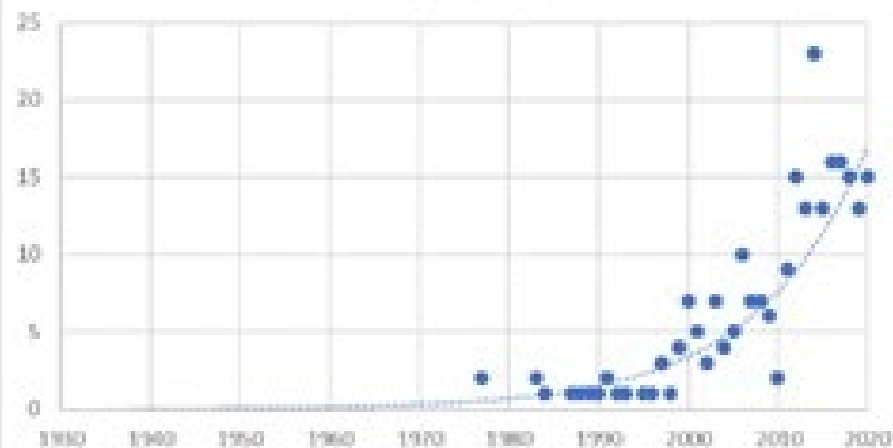
Close up



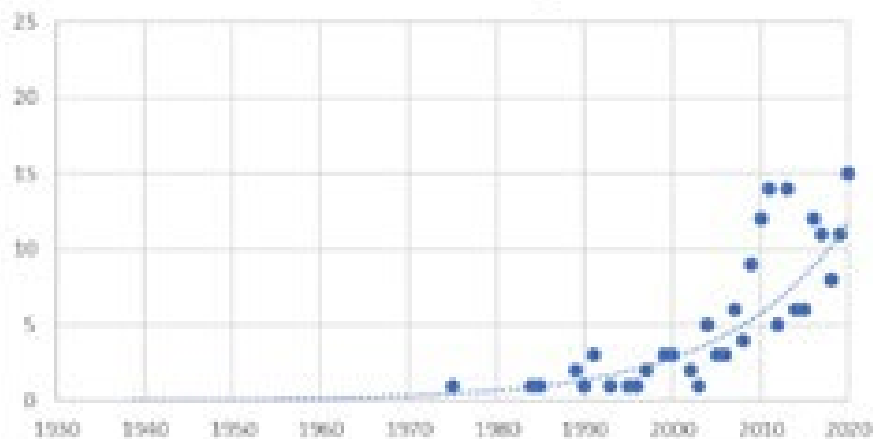
Name of topics, # of papers, trends

Topic	N° of papers	Exponential parameter	First year of publication
1: Climate change	167	0.071	1975
2: Grazing and Vegetation	318	0.065	1977
3: Feeding and Food	365	0.039	1963
4: Pasture in Fennoscandia	115	0.020	1948
5: Socio-cultural	619	0.072	1956
6: Herd productivity	299	0.042	1964
7: Space use	234	0.081	1977
8: Archaeology	312	0.046	1938
9: Herbivore interaction	231	0.051	1962
10: Health and Diseases	215	0.055	1970
Whole docs. corpus overall trend	2875	0.077	1938

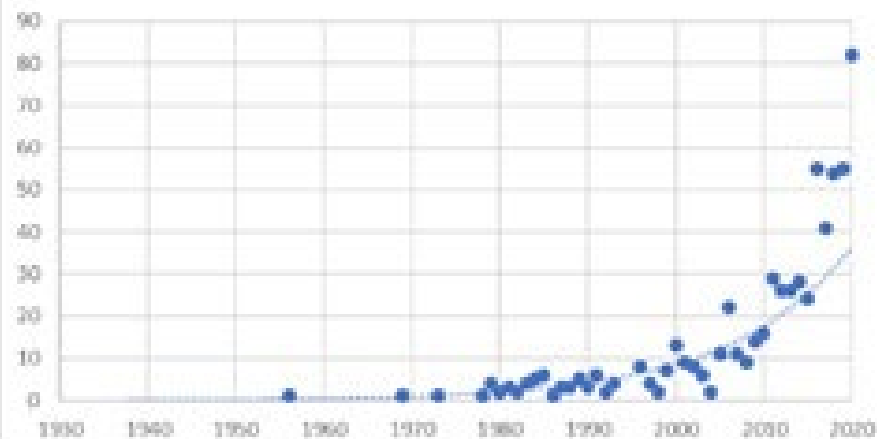
T7 Space use



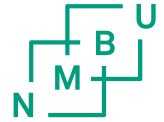
T1 Climate change



T5 Socio-cultural *














The countries' topic distr. > 25 publs.

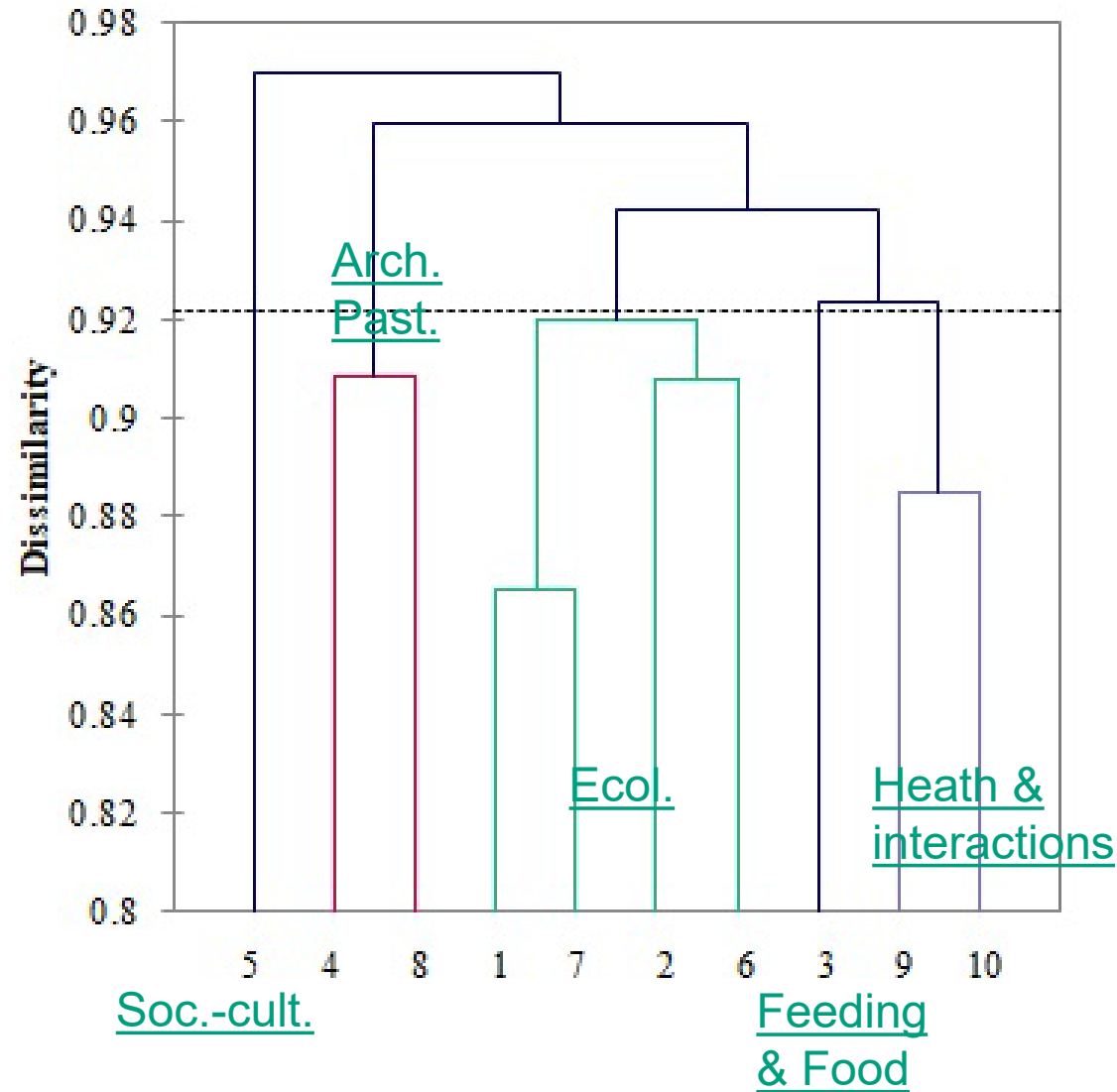
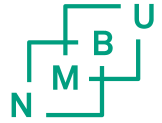


Country		Topic	No of articles
Finland		T1 Climate change	2
Norway		T1 Climate change	3
Sweden		T2 Grazing & Vegetation	5
Finland		T2 Grazing & Vegetation	5
Norway		T2 Grazing & Vegetation	4
Finland		T3 Feeding & Food	3
Norway		T3 Feeding & Food	4
Norway		T4 Pasture in Fennoscandia	2
Sweden		T4 Pasture in Fennoscandia	2
Finland		T5 Socio-cultural	4
Norway		T5 Socio-cultural	4
Sweden		T5 Socio-cultural	5

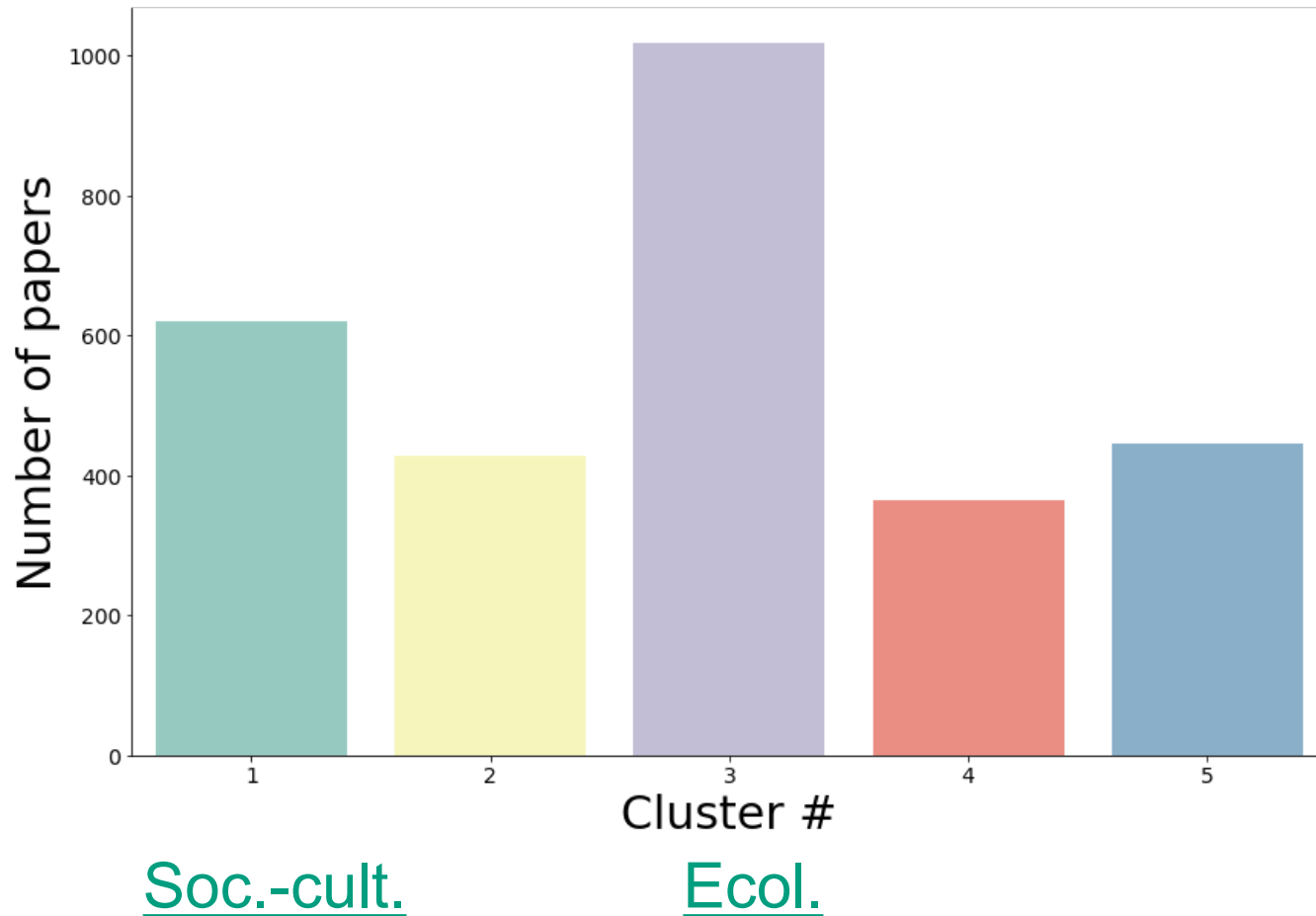
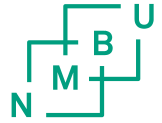
Countries' topic distr. > 25 publs. (cont.)

Country		Topic	No of articles
Finland		T6 Herd productivity	
Norway		T6 Herd productivity	
Norway		T7 Space use	
Sweden		T7 Space use	
Norway		T9 Herbivore interaction	
Norway		T10 Health & Diseases	
Sweden		T10 Health & Diseases	
Finland		T10 Health & Diseases	

Clustering of the topics



Document - cluster distribution

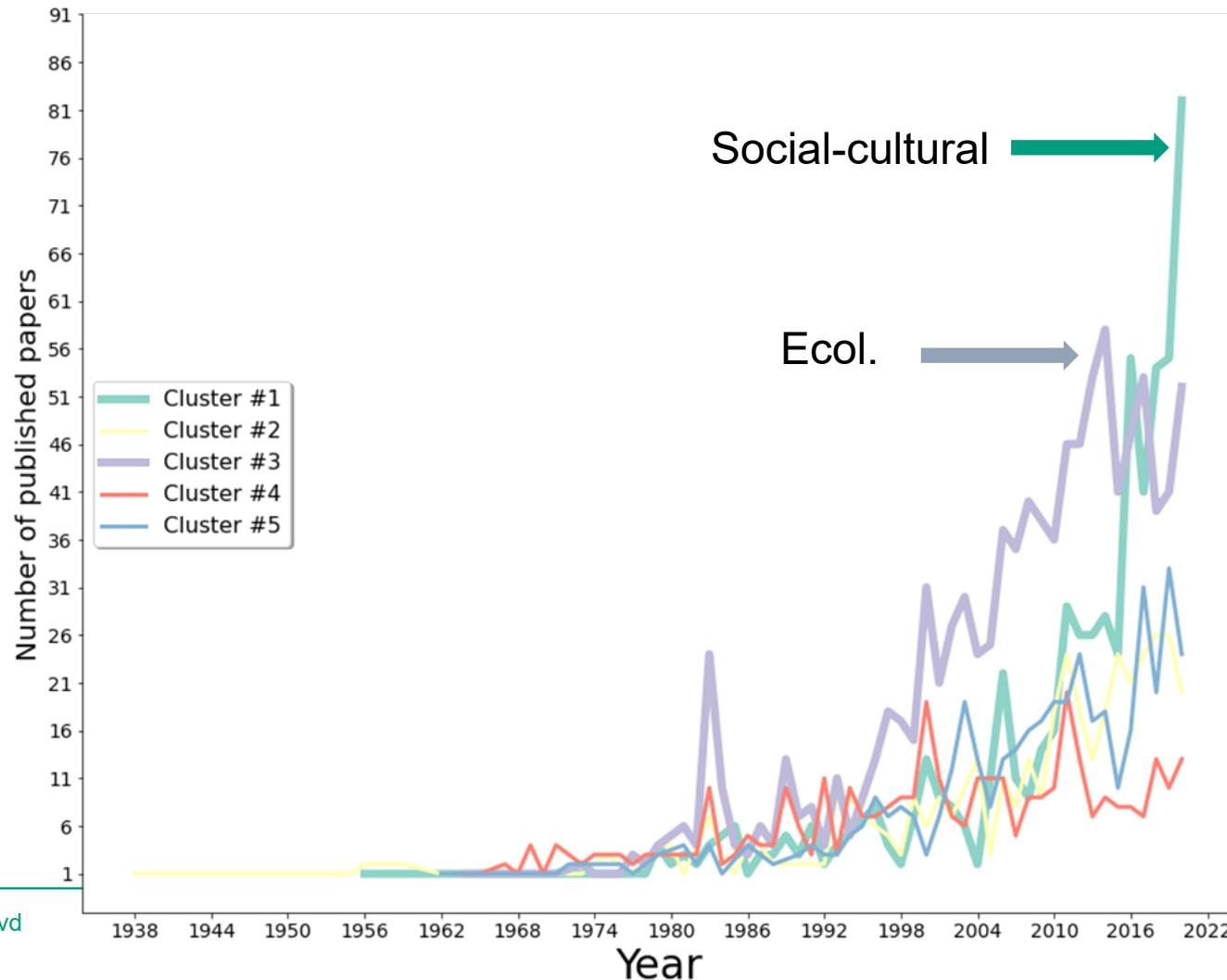


Proportional distribution (in percent) across the five clusters in Fennoscan.

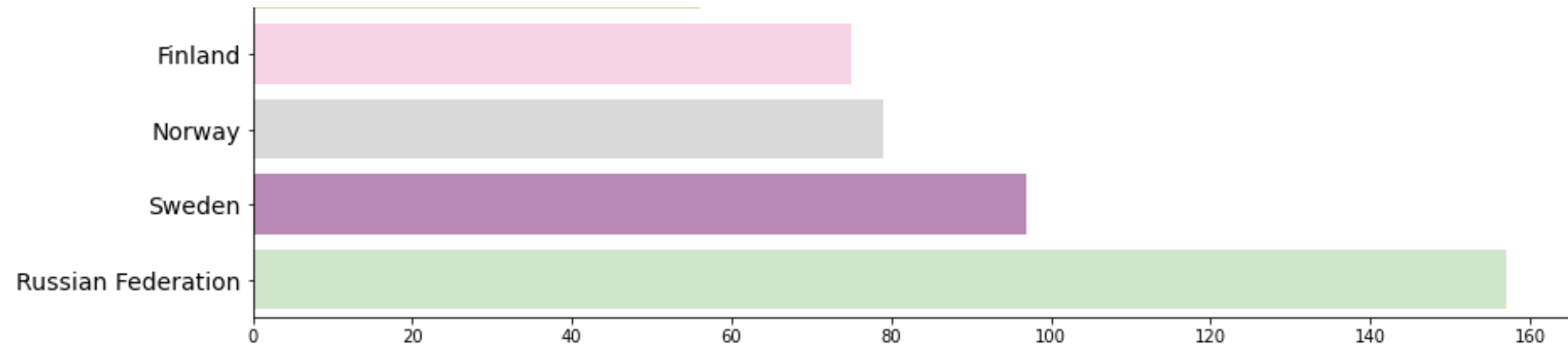
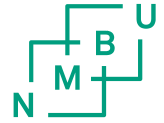
Country	Clust. 1	Clust. 2	Clust. 3	Clust. 4	Clust. 5
Finland	20.8	10.3	45.8	11.9	11.1
Norway	13.3	8.1	50.4	11.8	16.4
Sweden	25.6	9.5	38.3	12.9	13.7
The whole corp	21.5	14.9	35.4	12.7	15.5

Scientific explosion - cluster 1 (Soc- cultural), & cluster 3 (Ecol.)

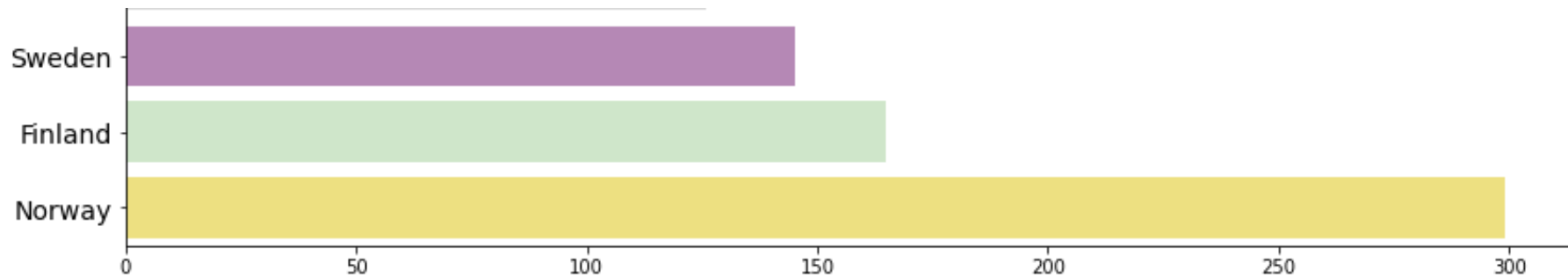
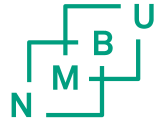
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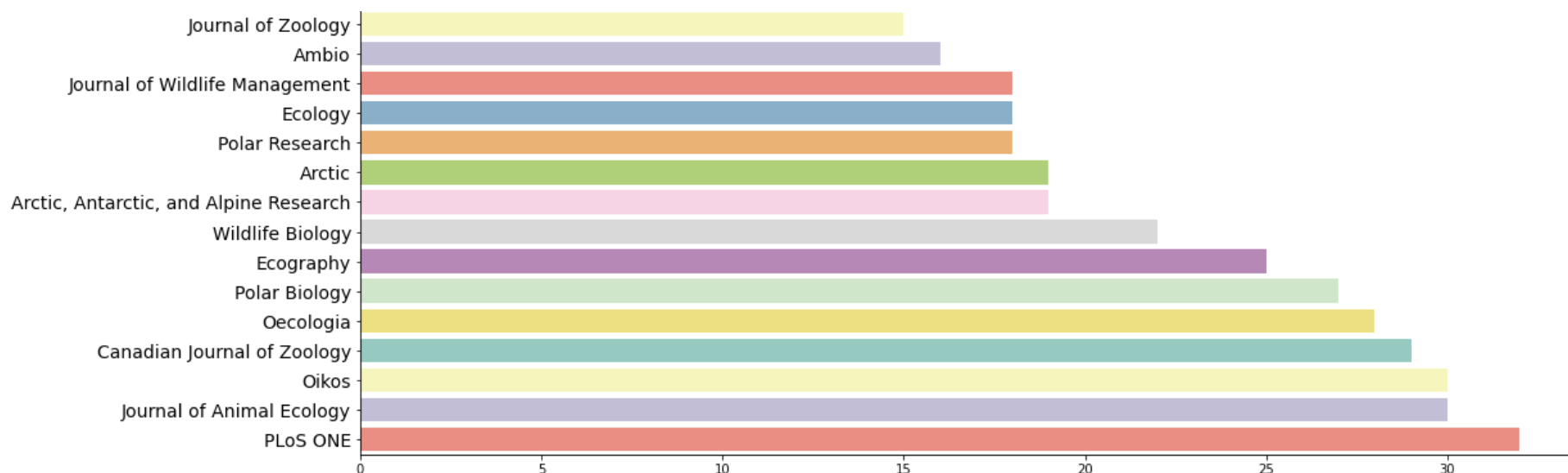
Cluster 1



Cluster 3



Journal-wise publ. cluster 3



Research across disciplines still in its infancy

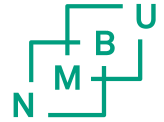


Inter-trans and multidisciplinary only in 26 abstracts

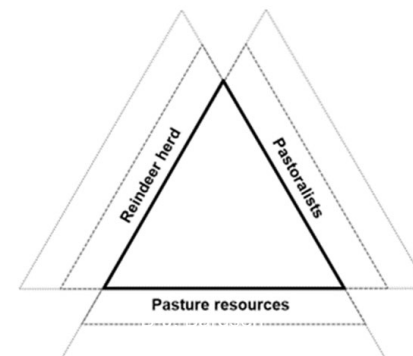
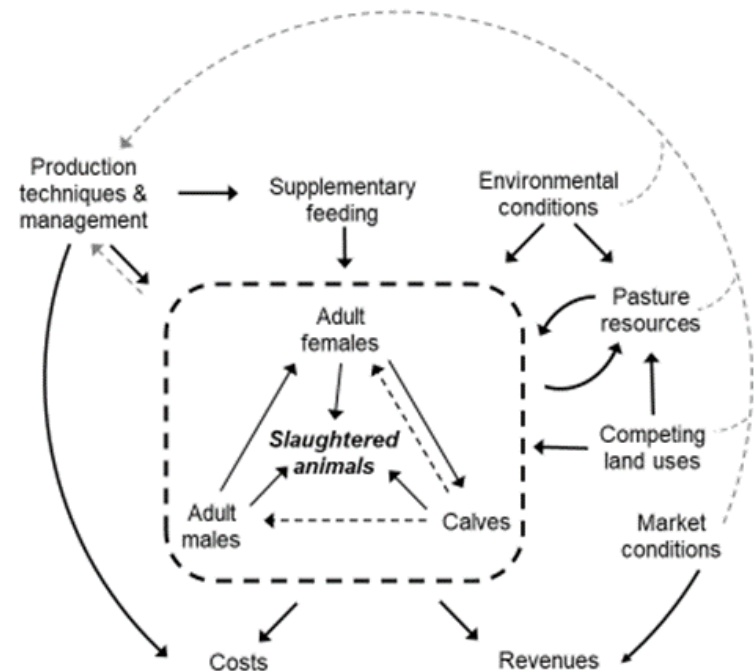
Climate in abstracts across topics

Topics	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total
Counts	101	65	6	7	36	29	11	23	10	4	292

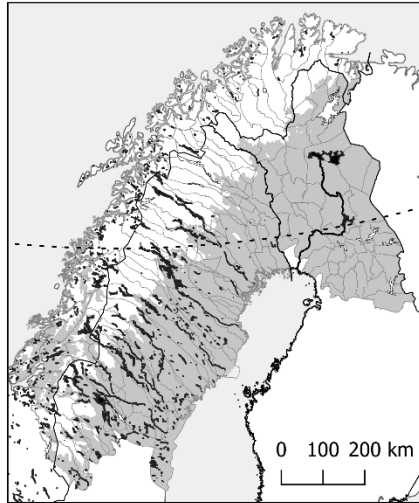
What is reindeer pastoralism?



A SES for what - for whom?
Meat production system
Livelihood
Way of life
Ecological services



The green shift – green colonialism?



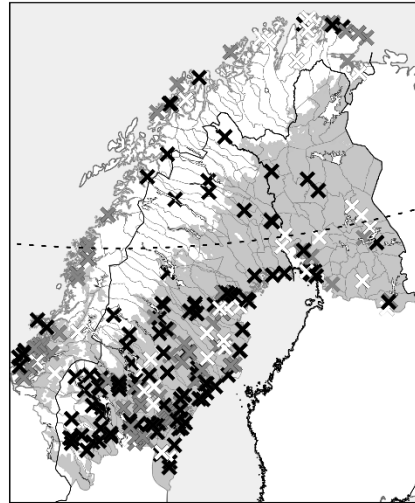
Hydropower

■ Dammed rivers and lakes

Vegetation zone

■ coniferous forest

□ mountain areas

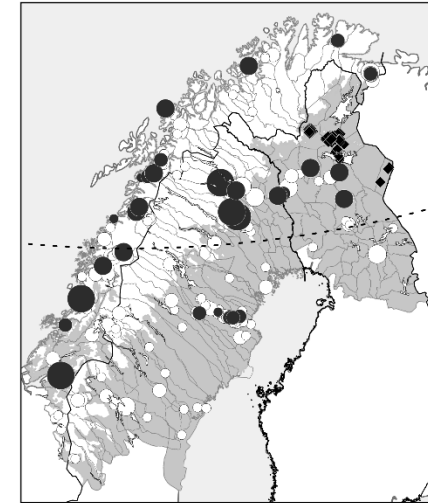


Wind power development

× in operation

× planning finalized

× under assessment



Mines

Mine size

● Active mine

○ Closed mine

◆ Gold panning
in Finland

○ < 5 Mt

○ 5 - 75 Mt

○ 75 - 1,300 Mt

○ > 1,300 Mt

Horstkotte et al. 2022

Indeed, `the times they are a-changin`

Come gather 'round people
Wherever you roam
And admit that the waters
Around you have grown
And accept it that soon
You'll be drenched to the bone
If your time to you is worth savin'
And you better start swimmin'
Or you'll sink like a stone
For the times they are a-changin'

(Dyland 1964)

Thanks!



M. Nieminen