

# Impact of atmospheric deposition on Baltic coastal dunes: the grass encroachment phenomena

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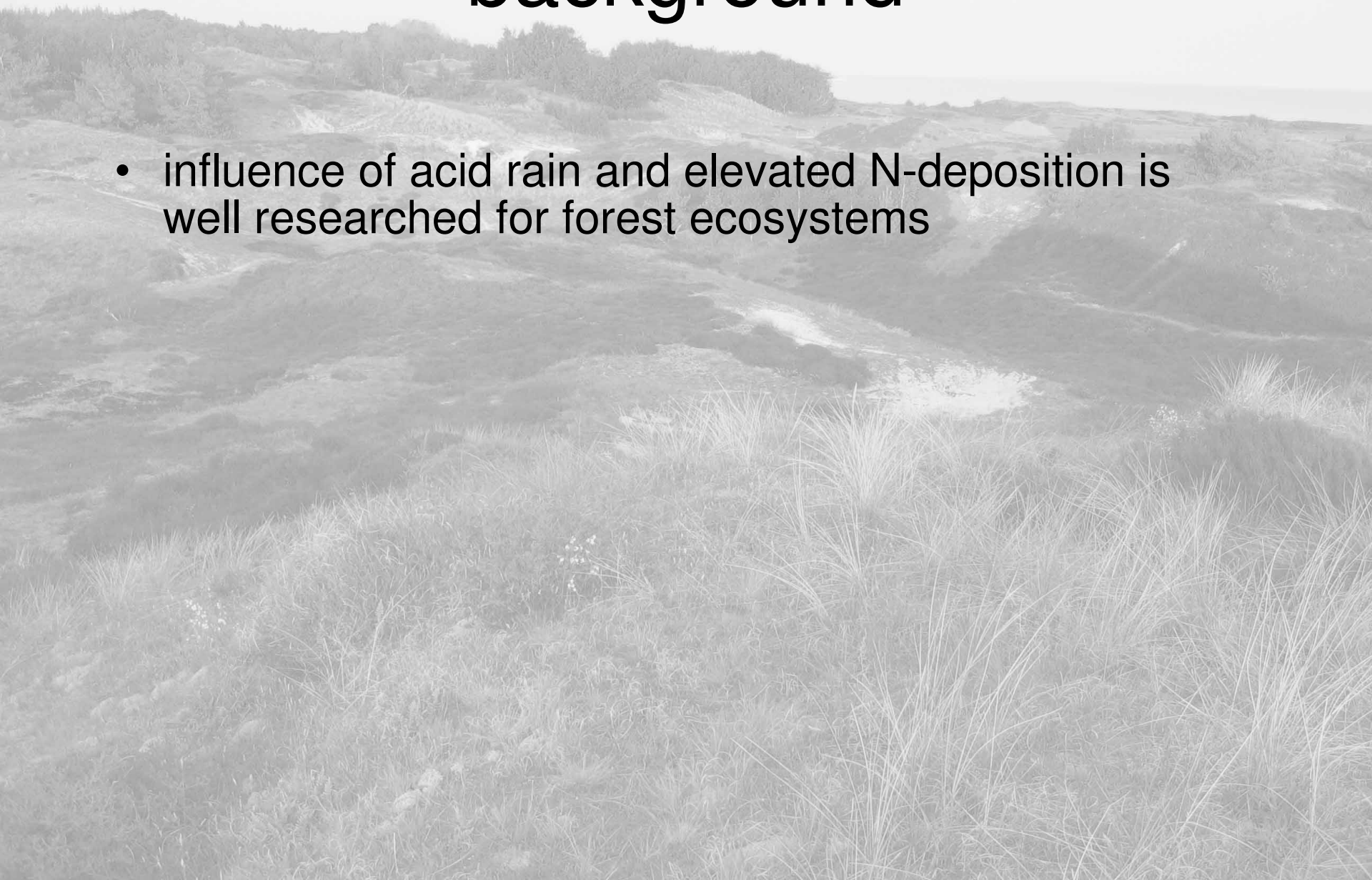
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Nijmegen, NL**





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- influence of acid rain and elevated N-deposition is well researched for forest ecosystems



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- impact on other ecosystems less e.g. coastal dunes
- research up to now mainly NW-Europe with very high deposition rates
- research focussed on less affected areas of comparable climate → Baltic Sea

# hypotheses

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- 2) Taller growing grasses such as *Ammophila arenaria*, *Carex arenaria* and *Calamagrostis epigejos* dominate the coastal dunes due to higher N-deposition.

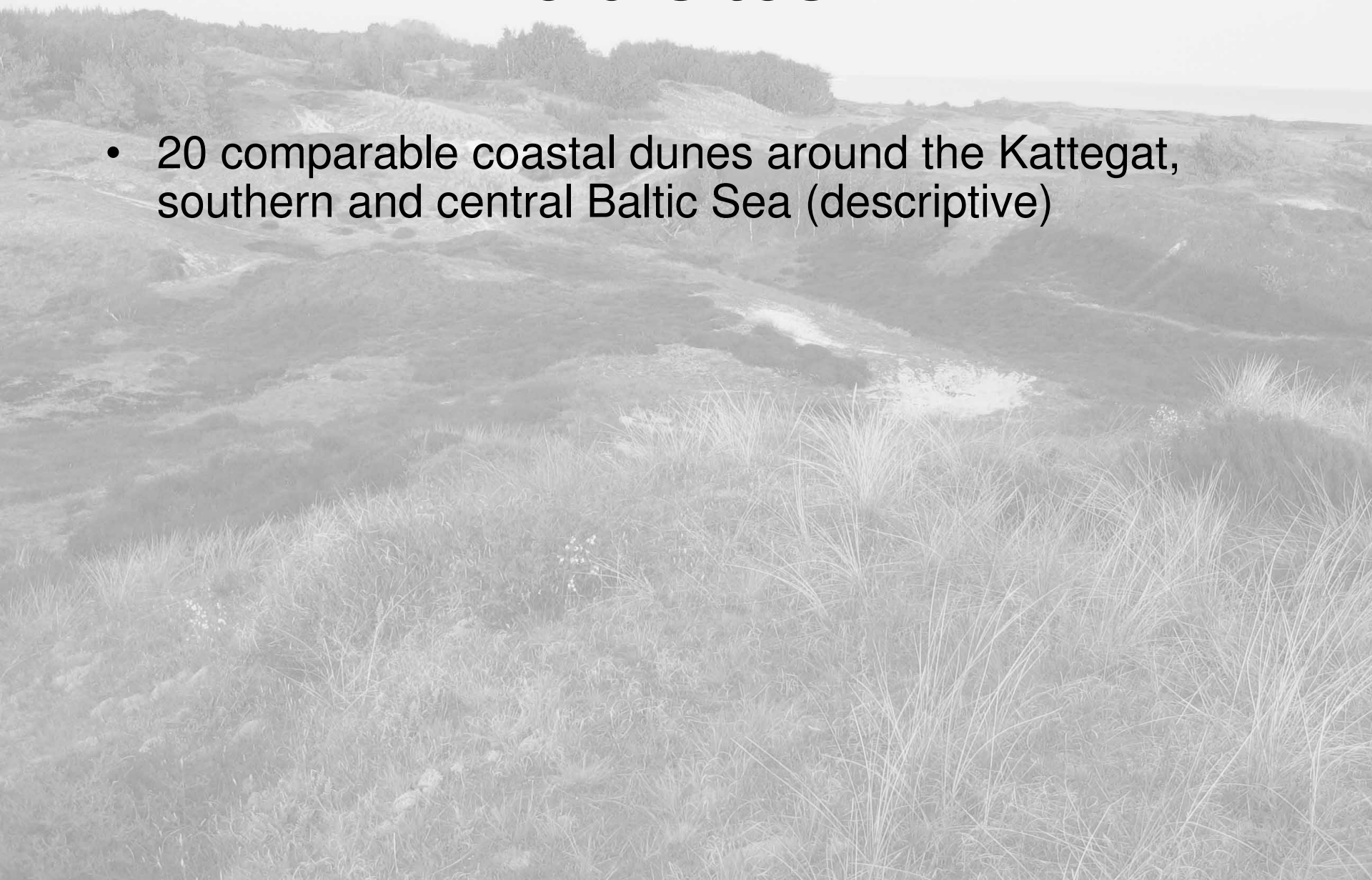
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- 2) Taller growing grasses such as *Ammophila arenaria*, *Carex arenaria* and *Calamagrostis epigejos* dominate the coastal dunes due to higher N-deposition.
- 3) Effects at the coastal ecosystem are visible in different process changes and at different ecosystem levels – focus of this research the vegetation-soil complex.



# field sites

- 20 comparable coastal dunes around the Kattegat, southern and central Baltic Sea (descriptive)



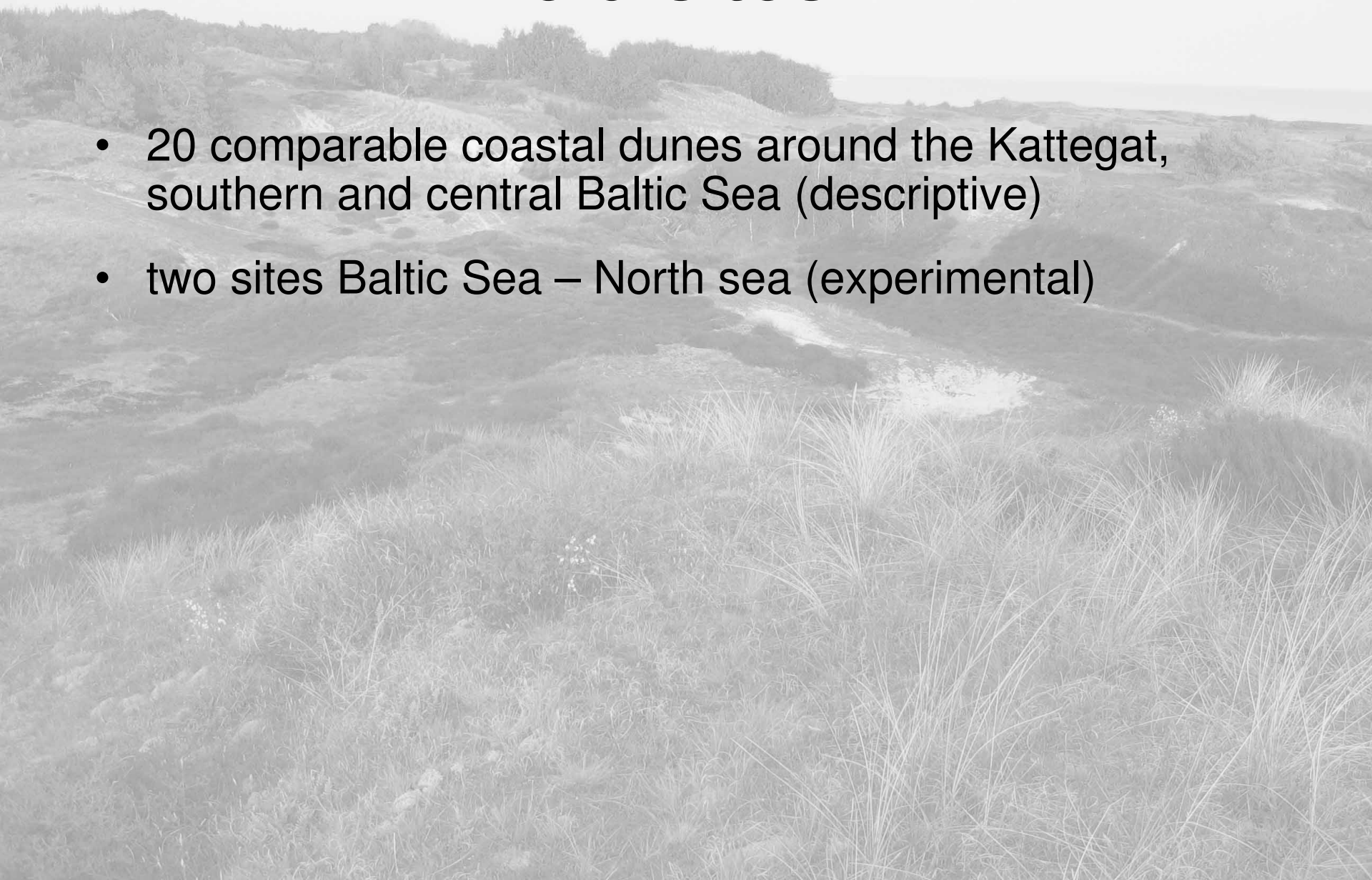
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# Terschelling



... and Hiddensee





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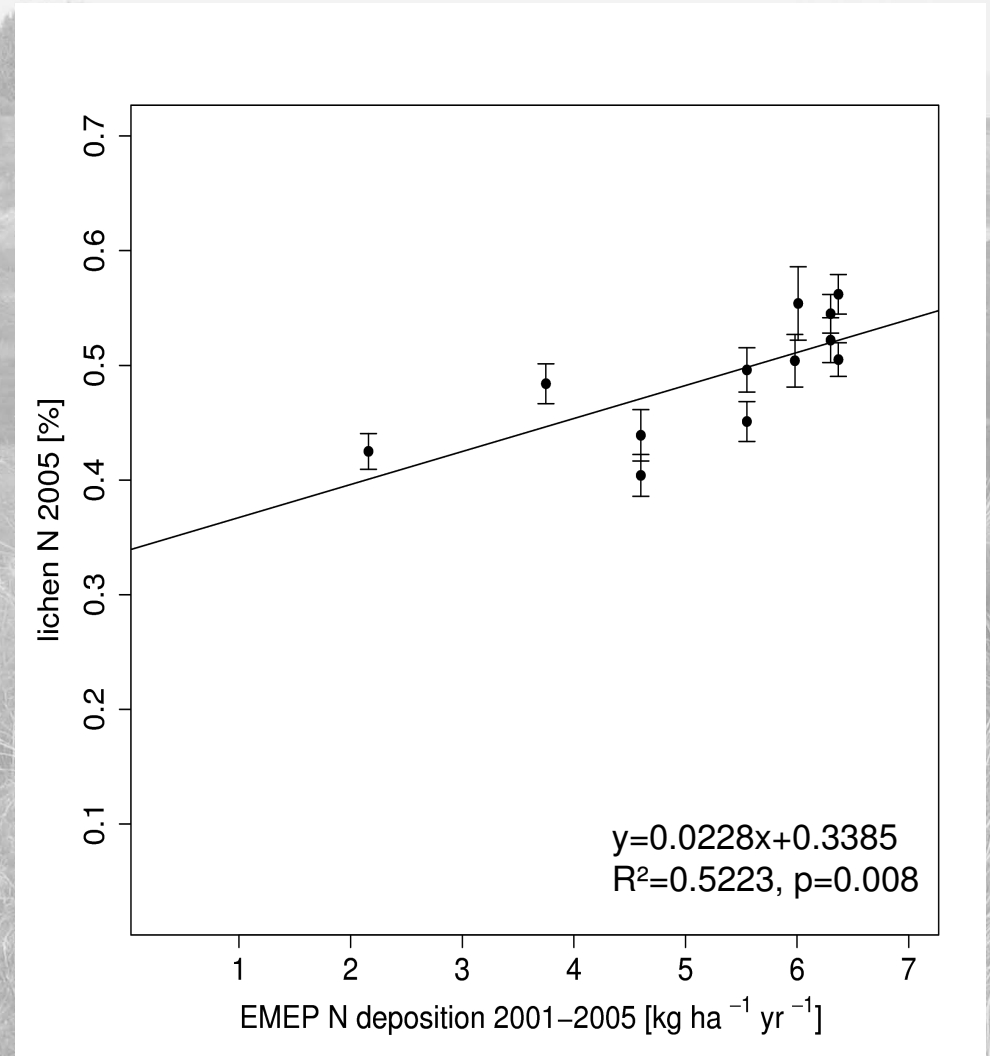
- 20 comparable coastal dunes around the Kattegat, southern and central Baltic Sea (descriptive)
- two sites Baltic Sea – North sea (experimental)
- focus on succession: short grasslands → taller growing grasses





# atmospheric N-deposition

- biomonitor N-content correlates significant with EMEP\* measurements
- low-moderate deposition loads

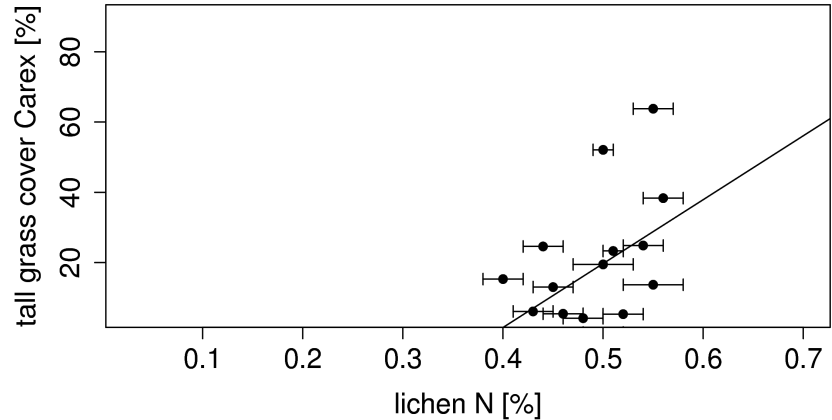
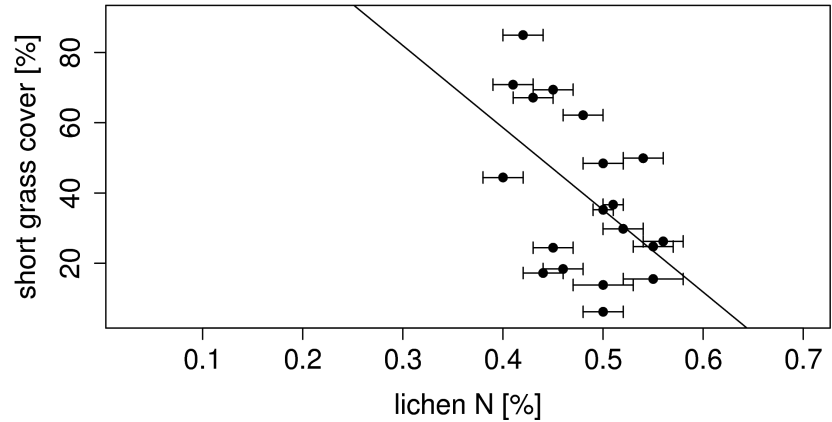


\* EMEP = European Monitoring and Evaluation Programme

# grass encroachment

In the same way lichen-rich, dry short grasslands disappear, ...

... a vegetation dominated by *Carex arenaria* increases.





# Keibu - Estonia





# Tönnersa - Sweden

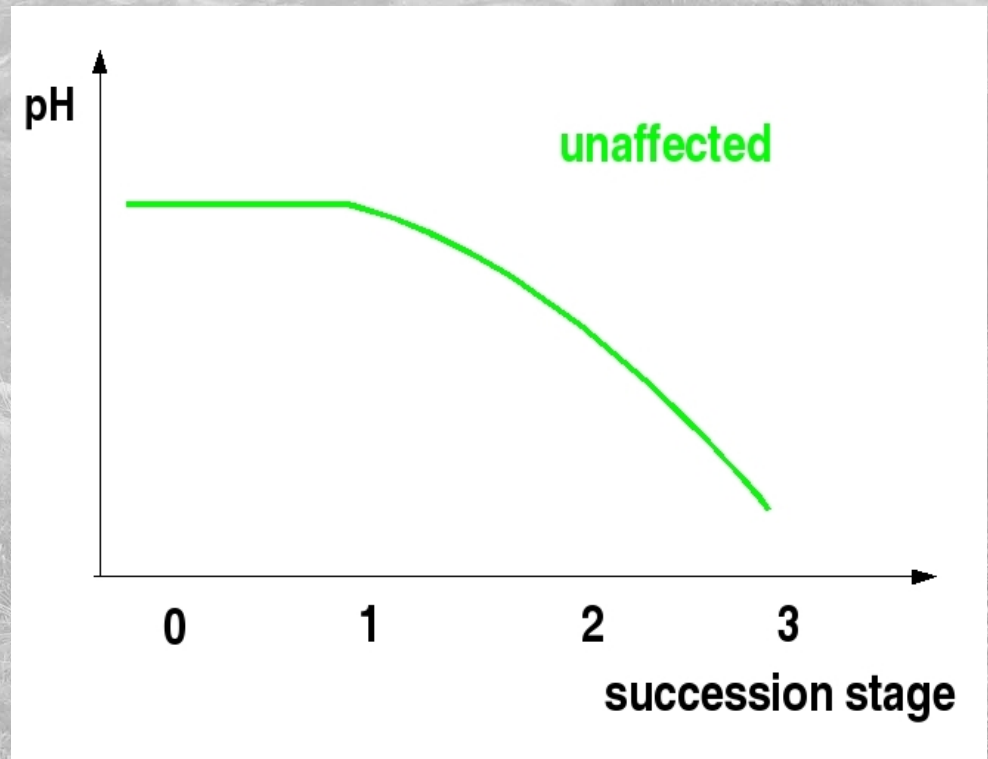




# soil

- acidification -

During ongoing succession the soil-pH usually drops.

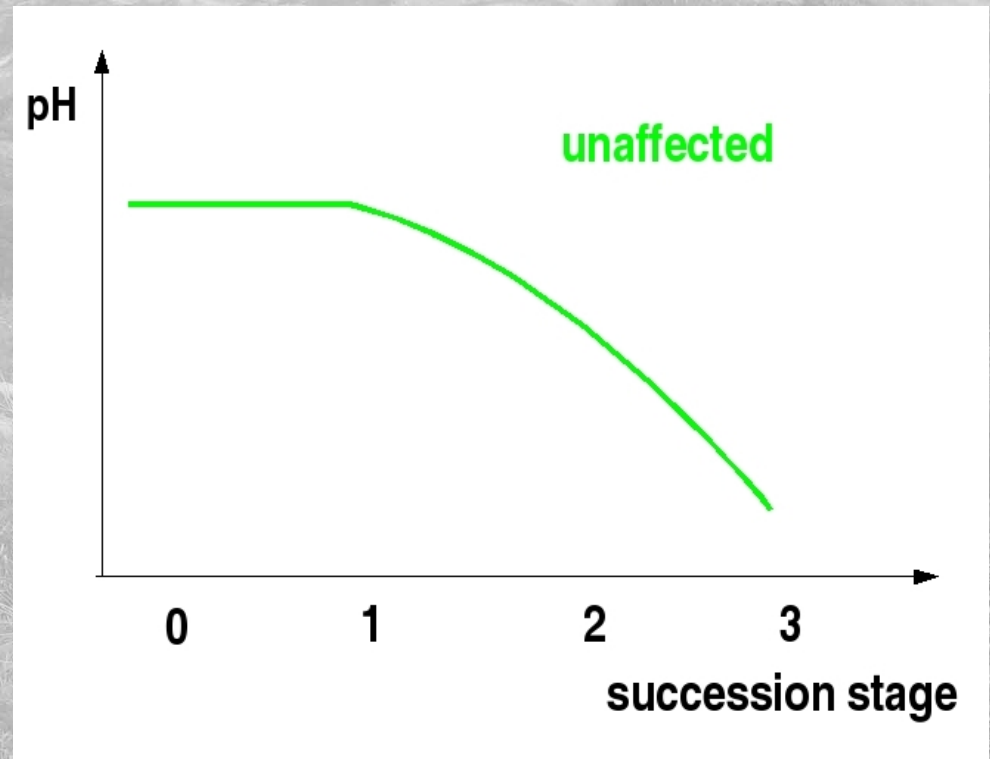


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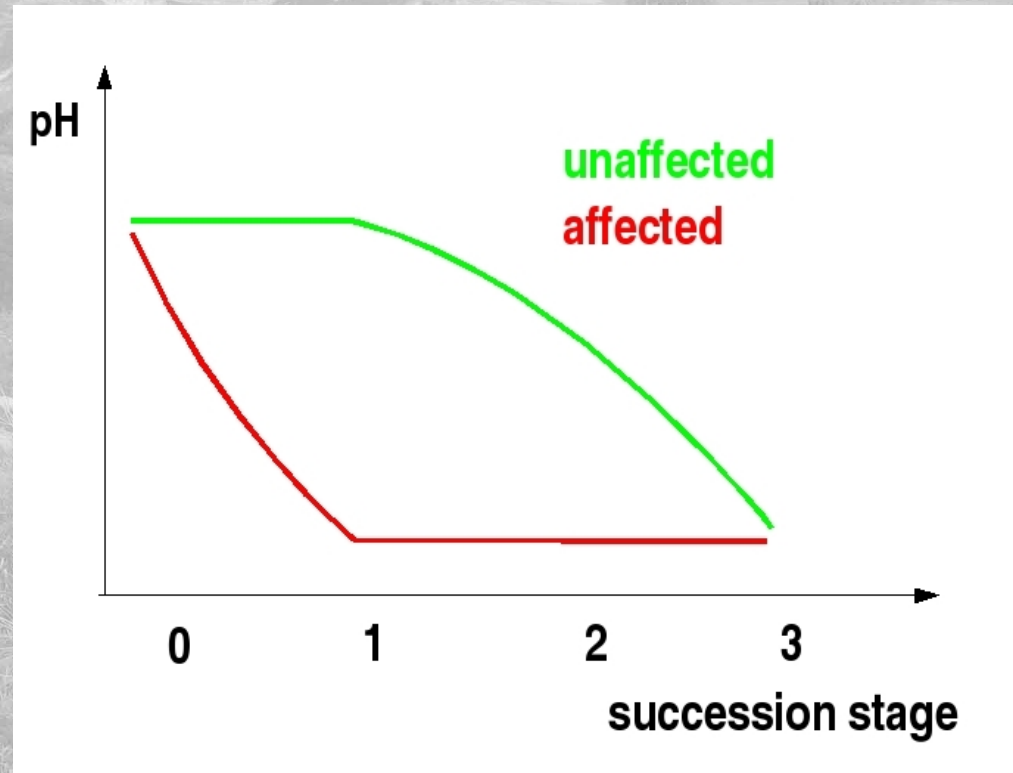
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→ initial stages are already acidified



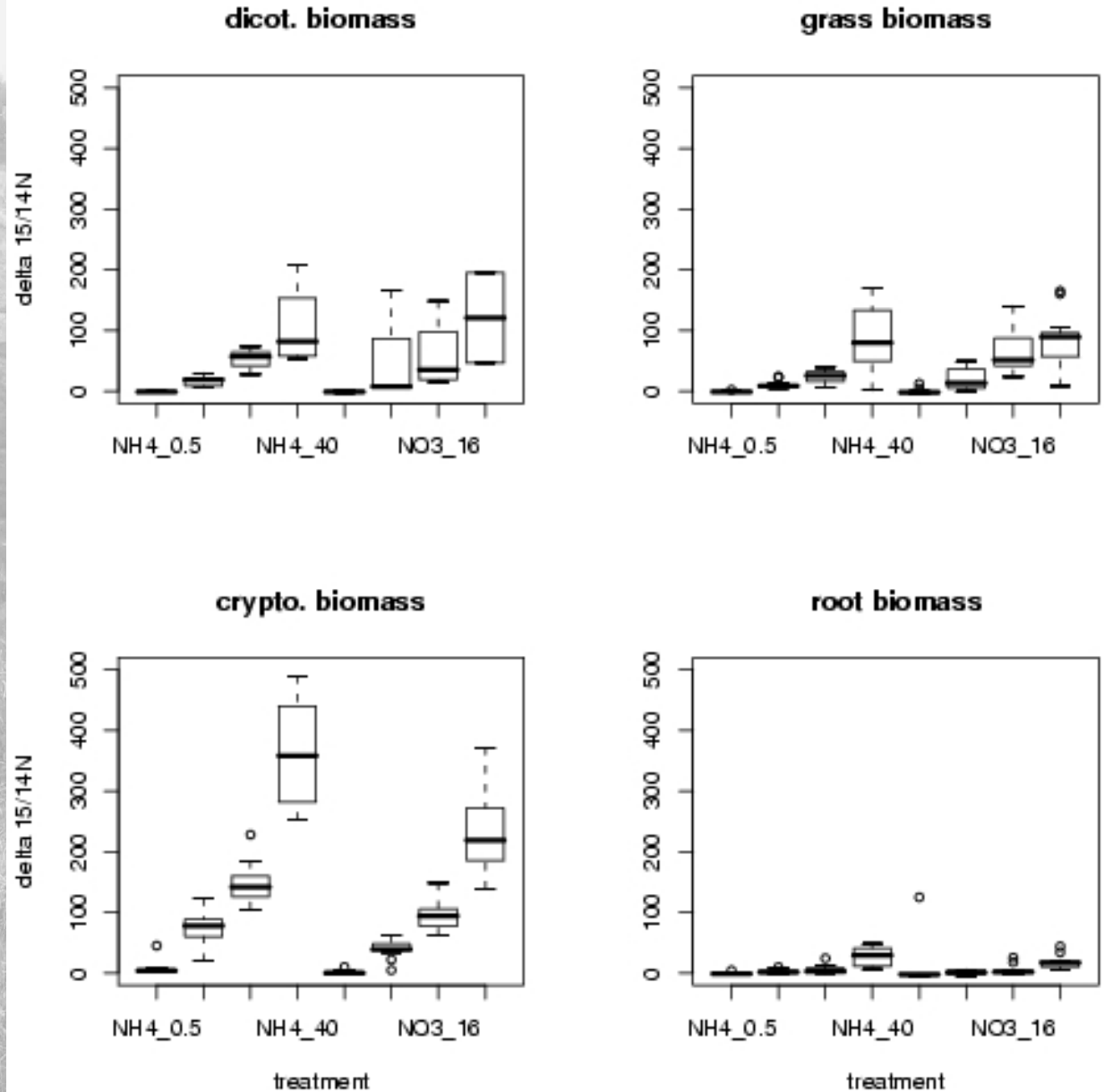
# biomass N-uptake

cryptogams take up...

... 3x more  $\text{NH}_4^+$

... 2x more  $\text{NO}_3^-$

than **herbs and grasses**



# conclusions

- there are no totally unaffected sites, but highest N-load is moderate in European comparison:  
8 kg N ha<sup>-1</sup> a<sup>-1</sup> → critical load level





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- decrease of species-rich short grasslands and increase in tall grasslands dominated by *Carex arenaria* with increasing N-deposition → species loss
- strong acidification at initial stages, increased N-availability in soil → pristine dune character
- cryptogams take up 2-3 times more N than herbs and grasses → early warning indicators and ecosystem engineer?

# Thanks to ...

Irmgard Blindow, Emiel Brouwer, Hans Esselink (†), Annemieke Kooijman,  
Jan Roelofs

Beata Bosiacka, Peter Friis Andersson, Gosia Braun, Ankie deVries-  
Brock, Tina D'Hertenfeldt, Daniel Giesen, Jurkus Egiolujus, Marju Erit, Ute  
Eulitz, Jelle Eygenstein, Lars-Ake Flodin, Karin Frobom, Palle Gravdal,  
Petra Gummelt, Tommy Hansen, Fleming Hendriksson, Irmantas  
Jasinkas, Maie Jeaser, Frede Jensen, Anders Johansson, Lutz Jürgens,  
Egidius Jurkus, Jan Kjærgaard, Erling Krabbe, Arvo Kullapere, Elge  
Kvietkiene, Albertas Kvietkus, Raimonda Kybranciene, Brigita Laime,  
Malgorzata Latalova, Eerik Leiback, Birgit Litterski, Elve Lode, Andris  
Maisiņš, Anne-Marlen Bandt, Dirk Michaelis, Ulrich Möbius, Darius Nicms,  
Tom Nielsen, Tiina Ojala, Søren Christian Oksen, Almigantas M.  
Olšauskas, Erlandas Paplauskis, Rein Perens, Kill Persson, Urve Ratas,  
Thomas Retsloff, Elle Roosaluuste, Gita Rudzite, Søren Schmidt, Daniela  
Schulte, Lothar Spengler, Henriette Subklew, Ramune Urboniene, Kadri  
Vilumaa, Bo Wallen, Åke Widgren, Andris Zalkalns, Jurate Zarankaite,  
Wolfgang Zenke, Mariusz Zielonka



Thanks for your attention!





