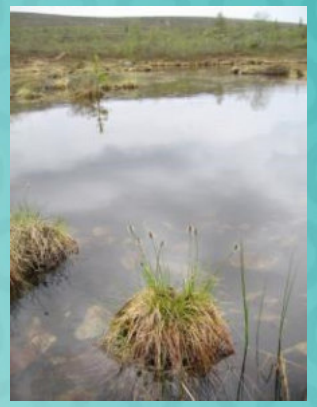
Circumpolar analysis of lake macrophyte communities for setting the baseline for future assessment



Seppo Hellsten, Patricia Chambers, Kirsten Christoffersen, Thora Hrafnsdóttir, Marit Mjelde, Jen Lento, Frauke Ecke, Janne Alahuhta, Jukka Ylikörkkö & Jani Heino

SYKE

Circumpolar Biodiversity Monitoring Program (CBMB)
Freshwater Group

CAFF
Conservation of Arctic Flora and Fauna

Content

- Are there aquatic macrophytes in arctic freshwaters?
- Are there spatial trends in diversity?
- Steps for macrophyte monitoring in future

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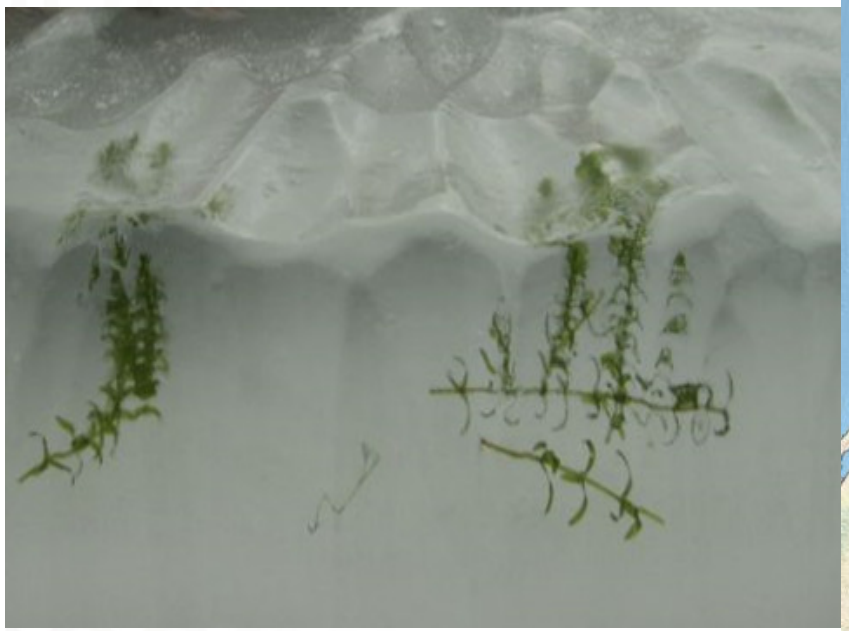
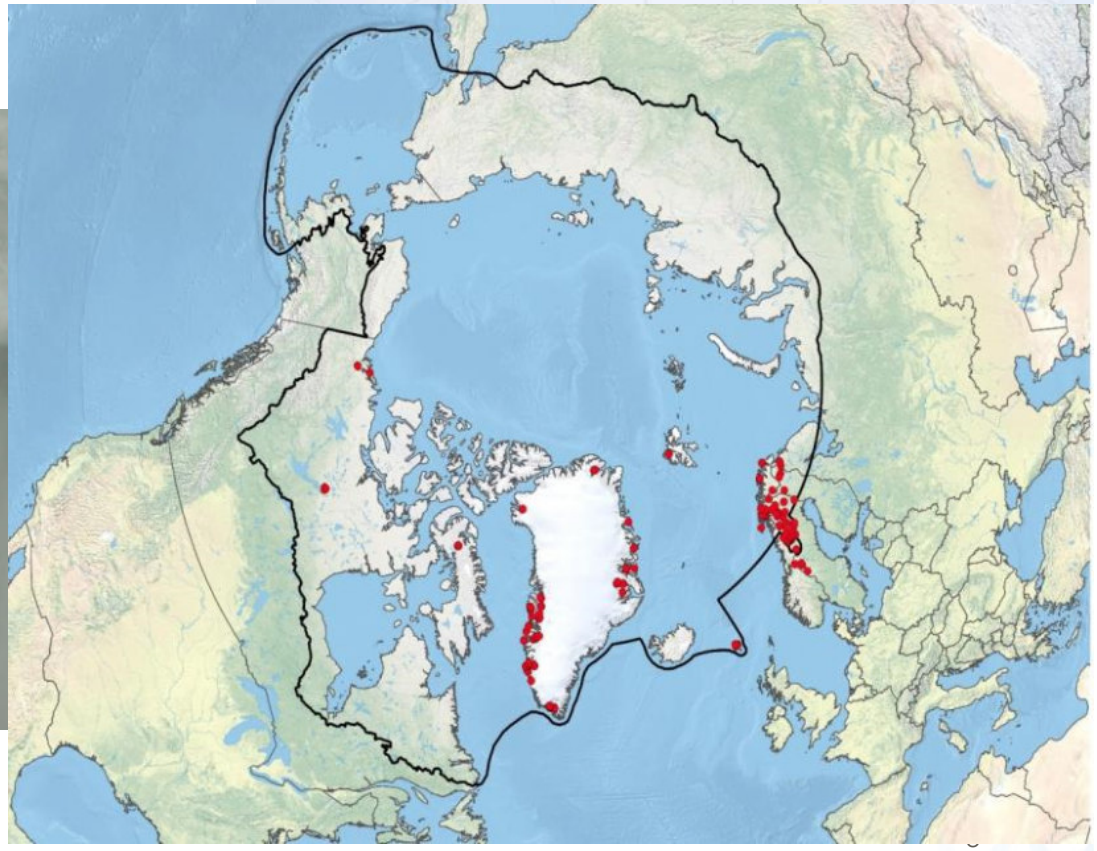
Macrophytes in arctic?





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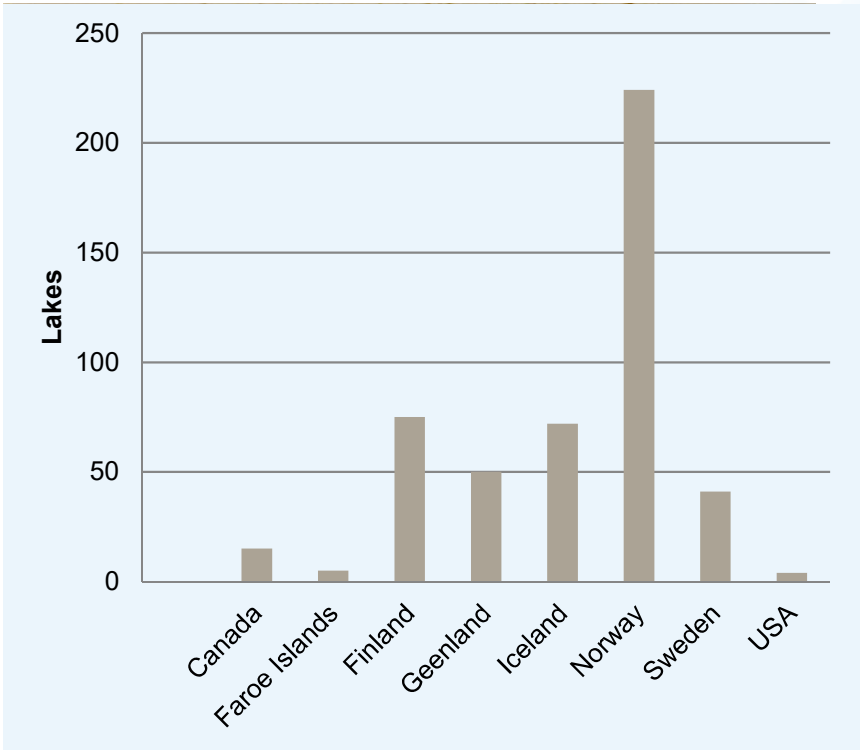
Field methods and macrophyte data

- Transects and whole lake surveys
- Includes data back to seventies
- Problems
  - Helophytes and bryophytes were not invented in all countries.



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Environmental data

- Latitude and longitude
- Climatological data (temp.,)
- Geographical data (watershed area, bedrock, etc.)
- Altitude and lake area was partly missing
- Water quality data not available for all lakes

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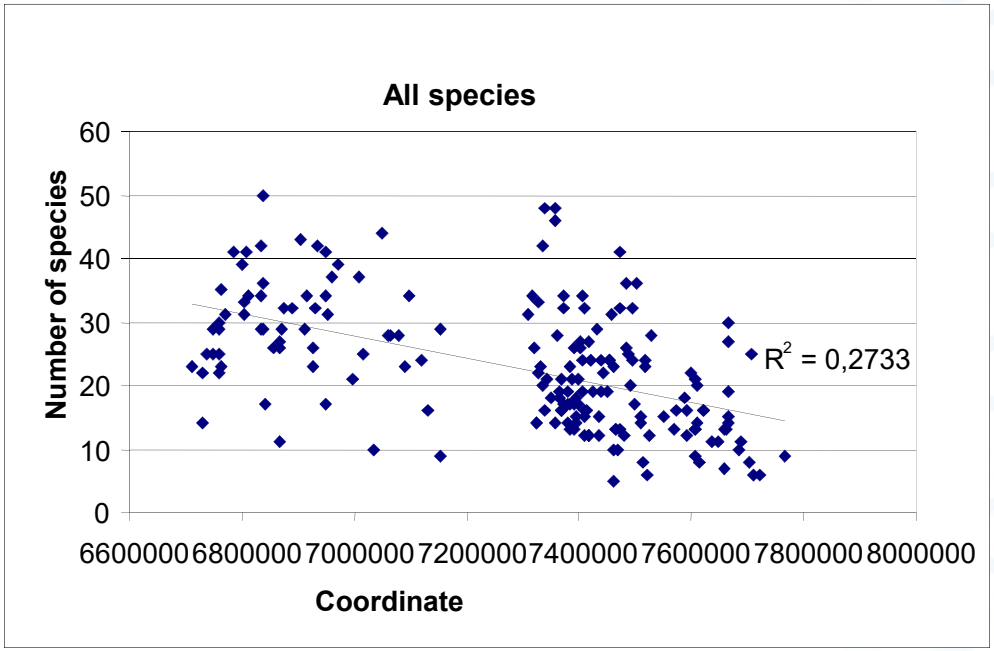
General diversity patterns

- In generally number of macrophyte species reduces towards north =>



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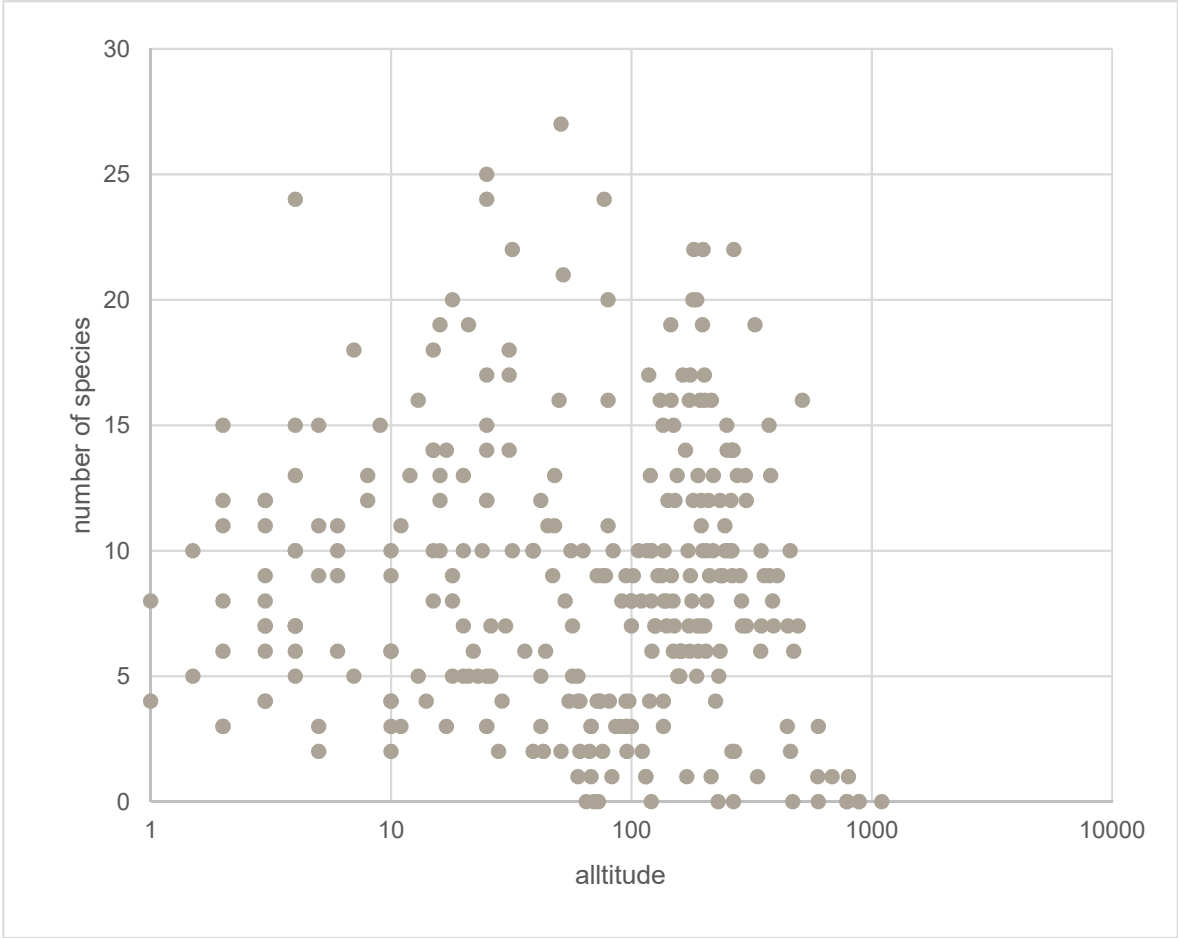
Sum of aquatic macrophytes (excluding helophytes, mosses and algae)



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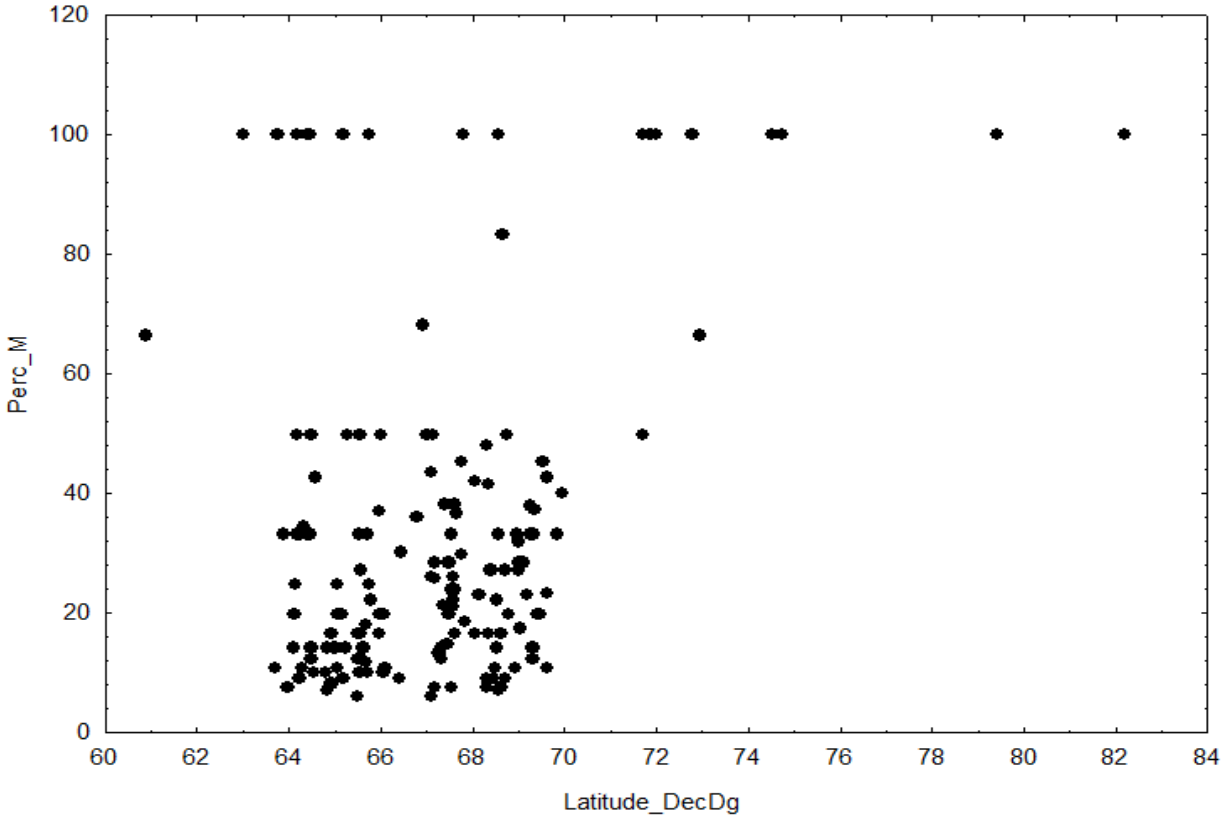
Contribution of mosses to the species pool



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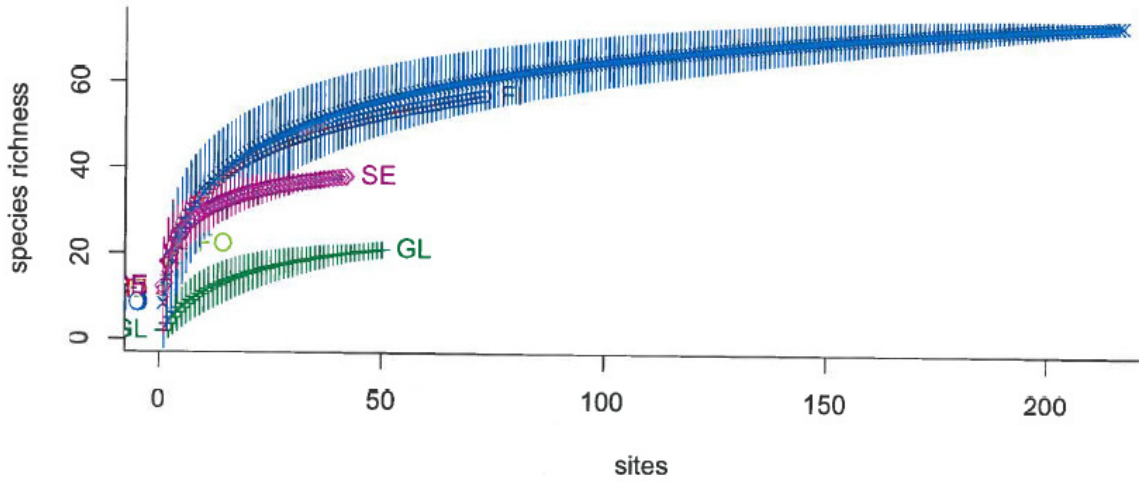
Average diversity

	Mean	Min	Max	SD	CV
North America	7.90	2	22	5.74	0.73
Fennoscandia	10.49	2	28	5.61	0.53
Faroes	10.40	8	13	2.41	0.23
Iceland	6.68	2	16	3.01	0.45
Greenland	2.63	2	7	1.21	0.46



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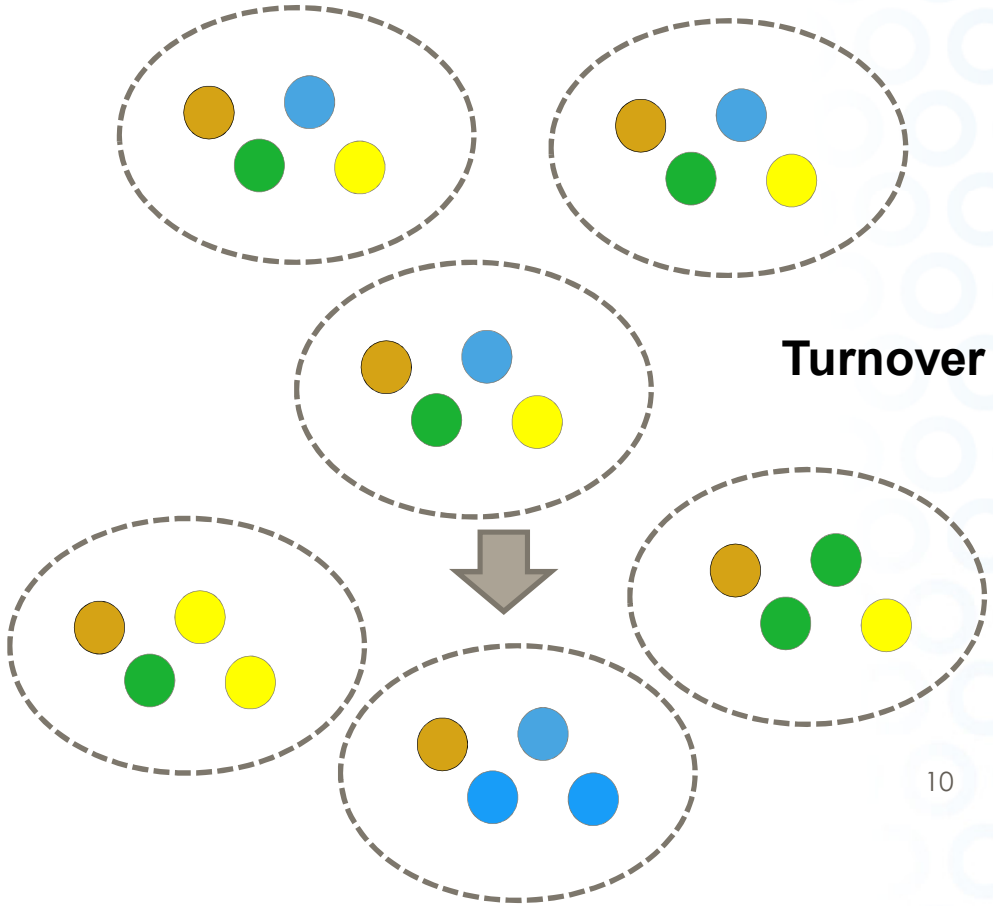
Too descriptive, what next?

- Alphadiversity at local level
- Betadiversity component at spatial scale
  - Turnover > species replaced by other species
  - Nestedness > species gain or loss
- Gammadiversity over larger landscape



SYKE

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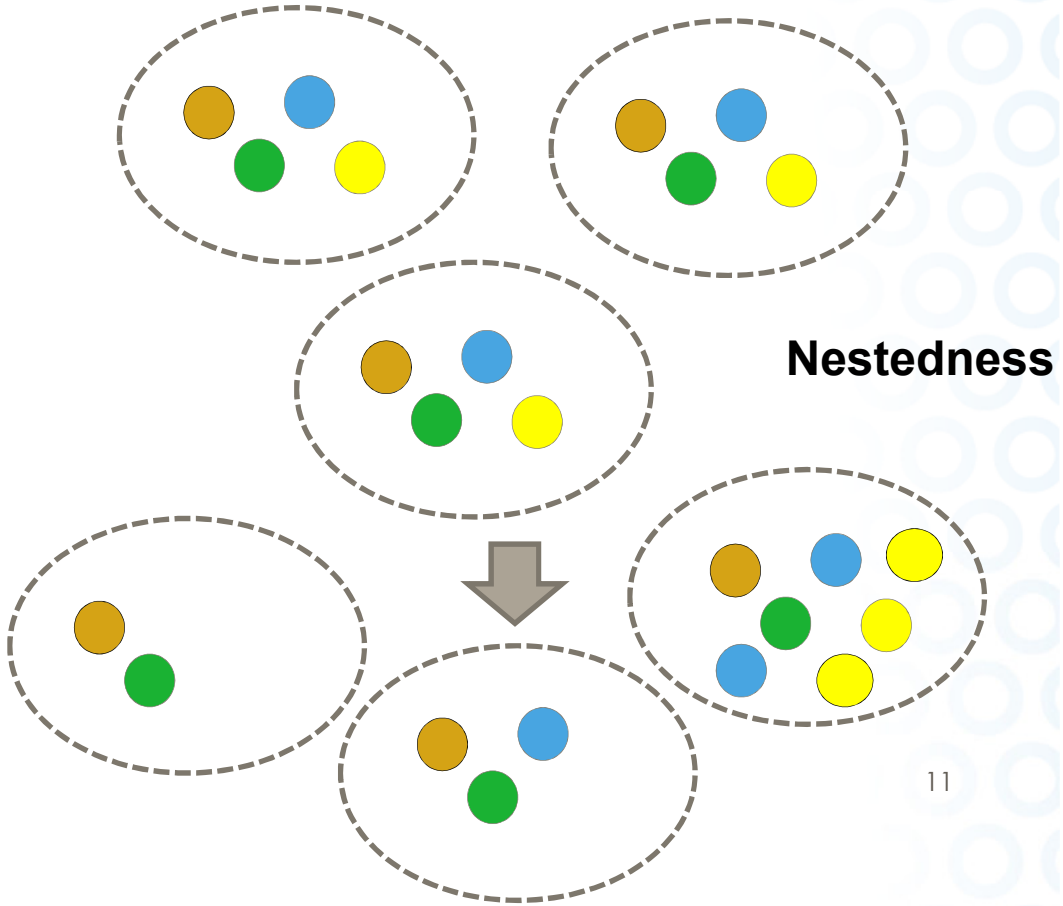

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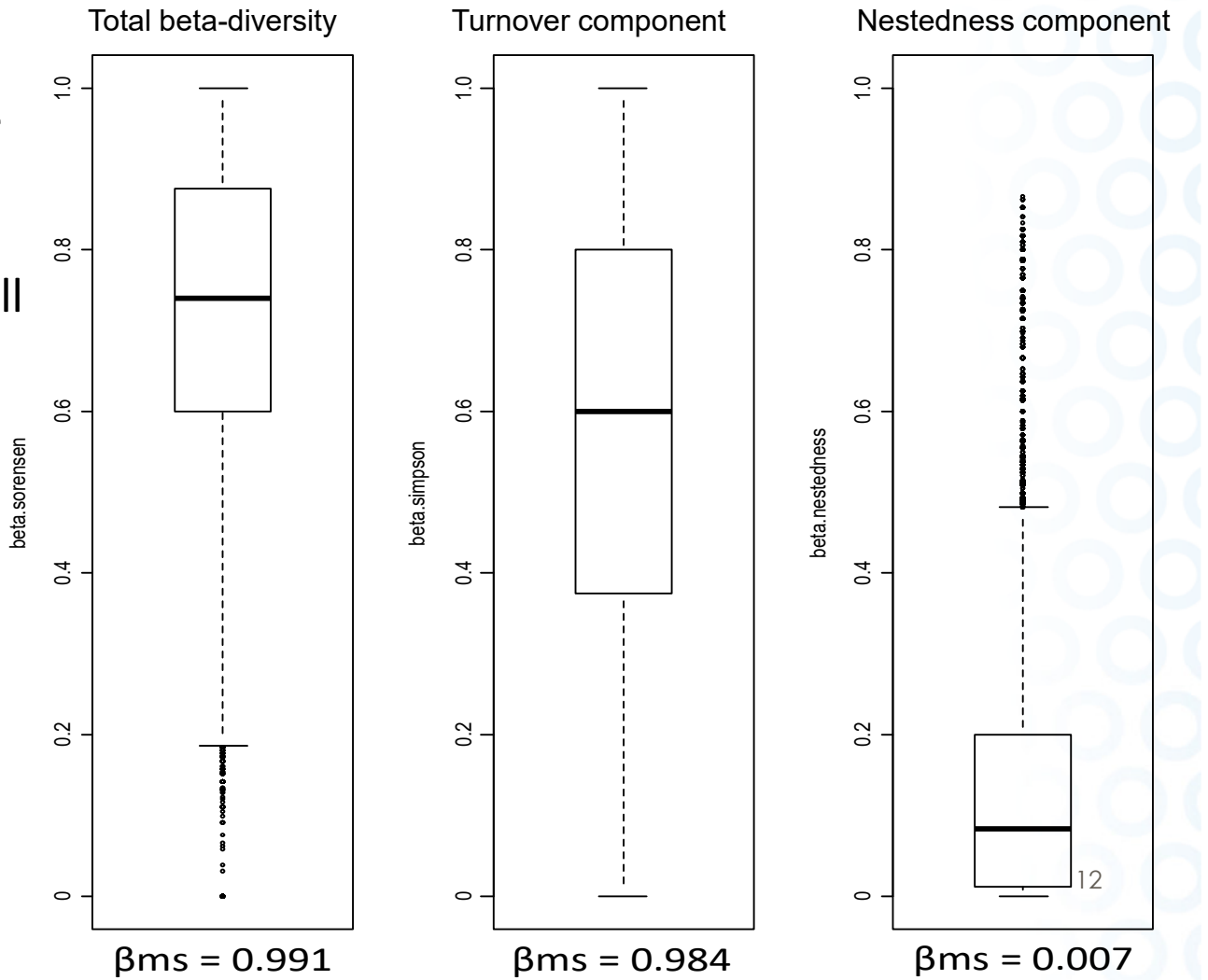
- Beta diversity driven by the turnover (Sörensen-dissimilarity)
  - Nestedness played a small role



- Principal coordinates analysis (PCoA) ordination
  - Based of Sörensen dissimilarity
  - Variation between regions

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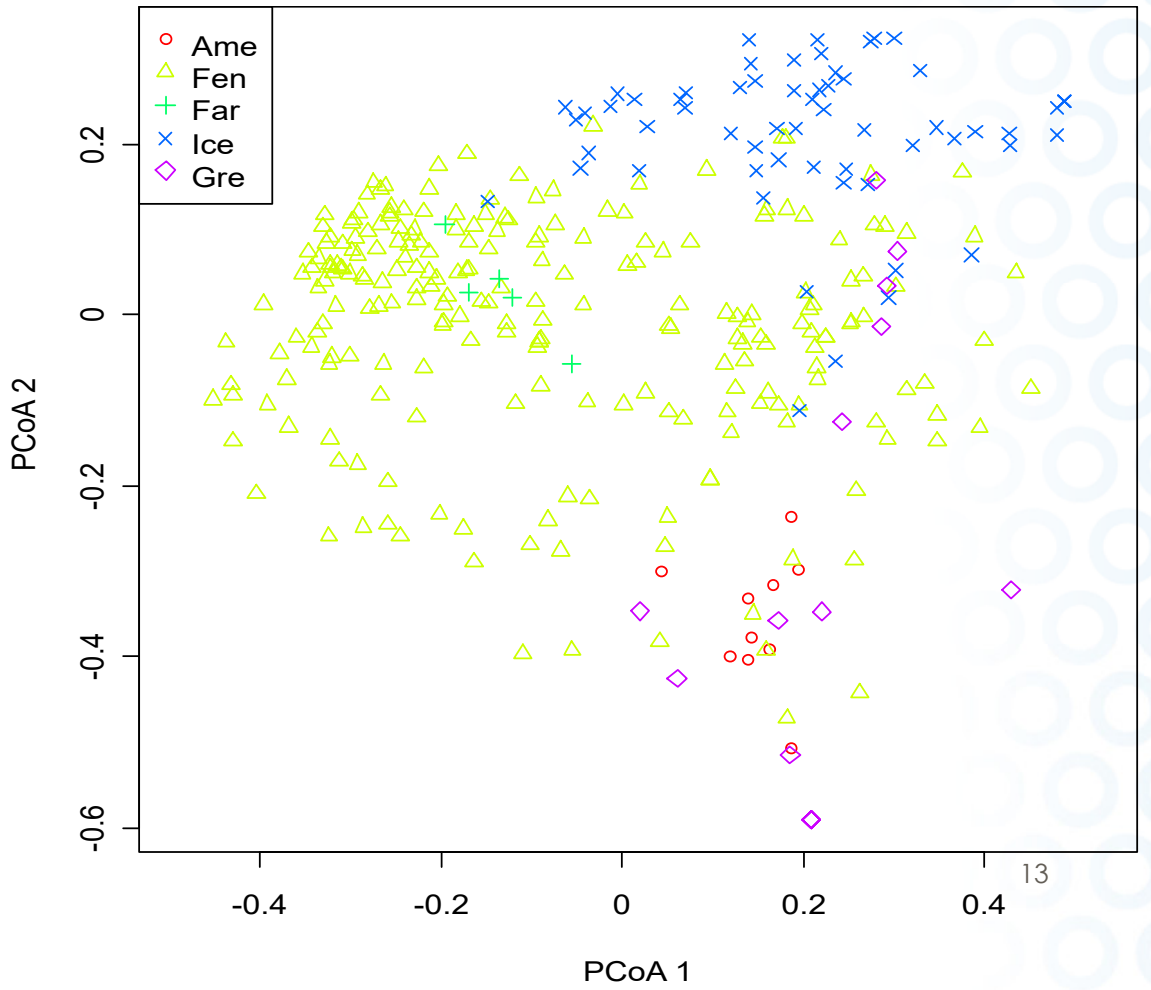

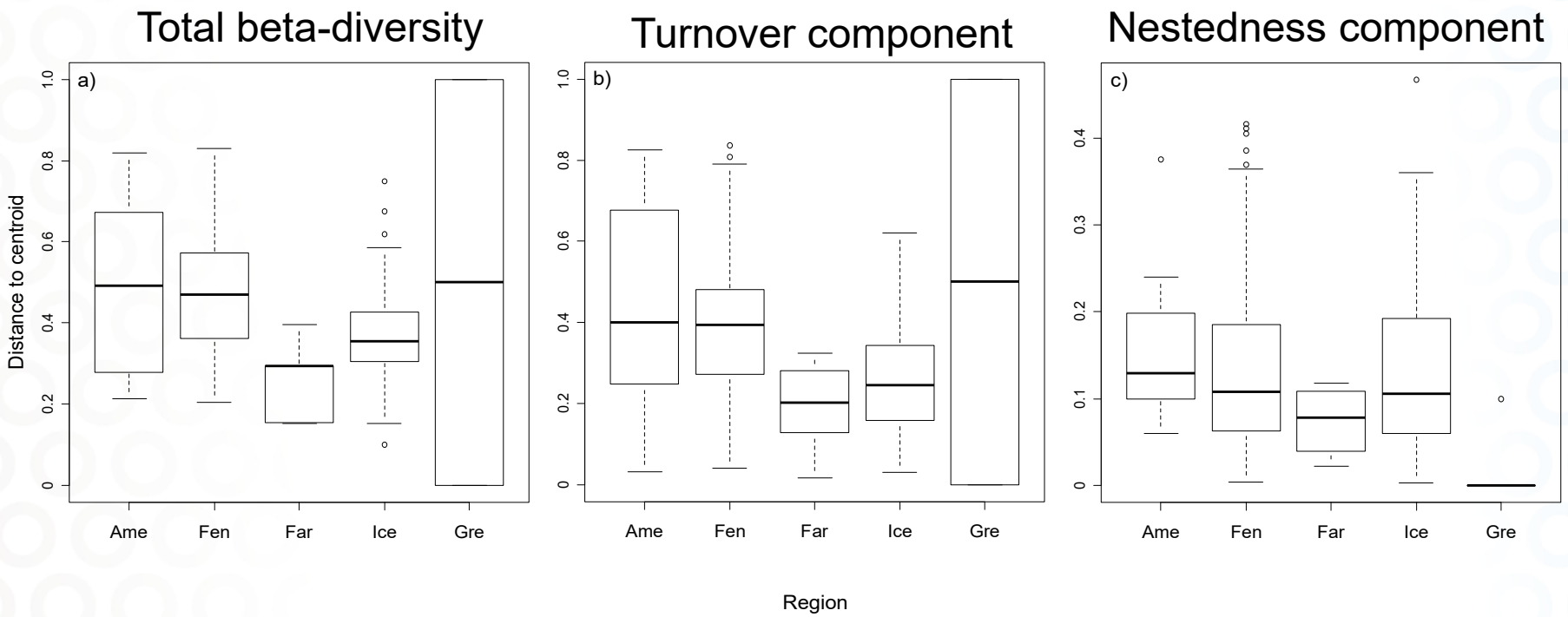

- Greenland, North America, Fennoscandinavia more variation in total beta diversity and turnover
  - More stable communities
- North America, Fennoscandinavia, Iceland in nestedness
  - More unstable communities

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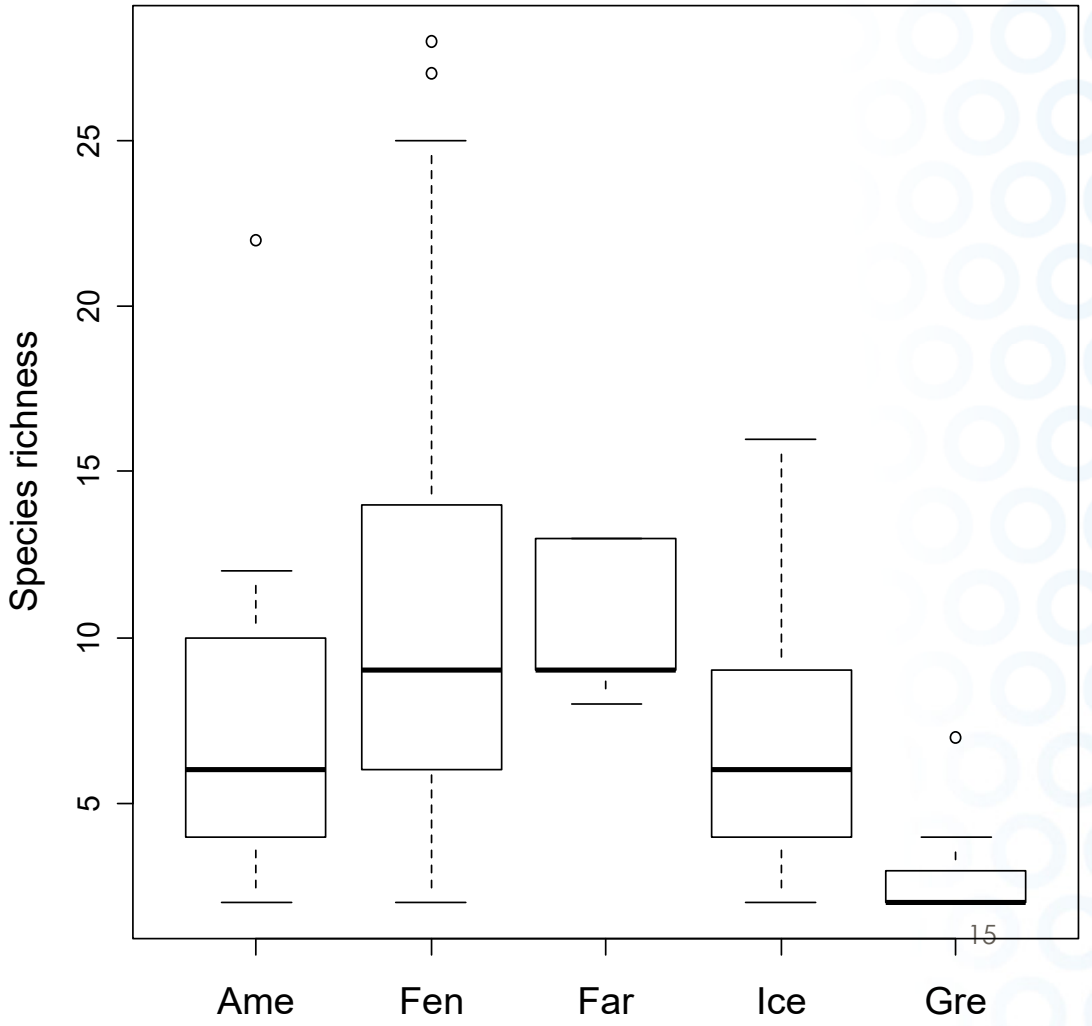
Species richness and environment

- Species richness varied between regions (ANOVA, P<0.001),
  - Greenland less species (Tukey test , P >0,001)



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Environmental variables

a) Community composition based on Sörensen dissimilarity

> No clear importance

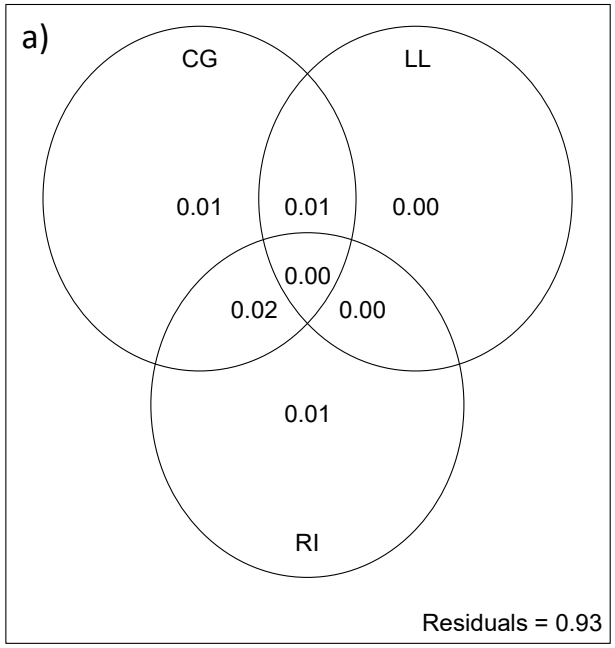
b) Species richness

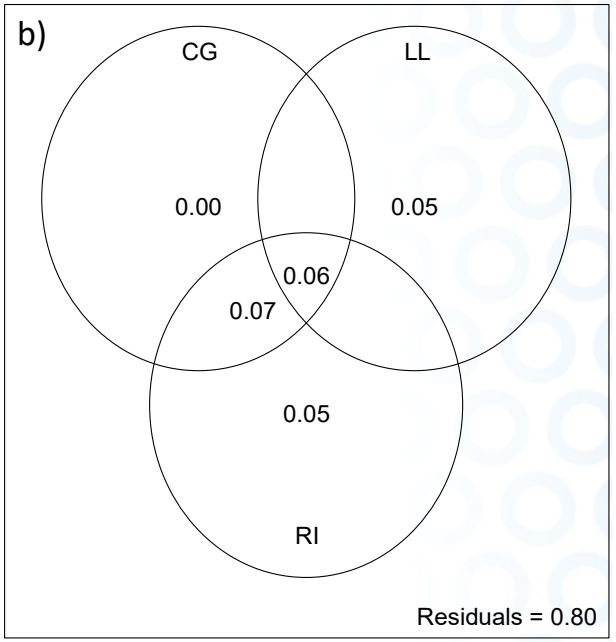
> LL and RI explained 20% variation

CG = Climate and geology

LL = Latitude and longitude

RI = Region identity





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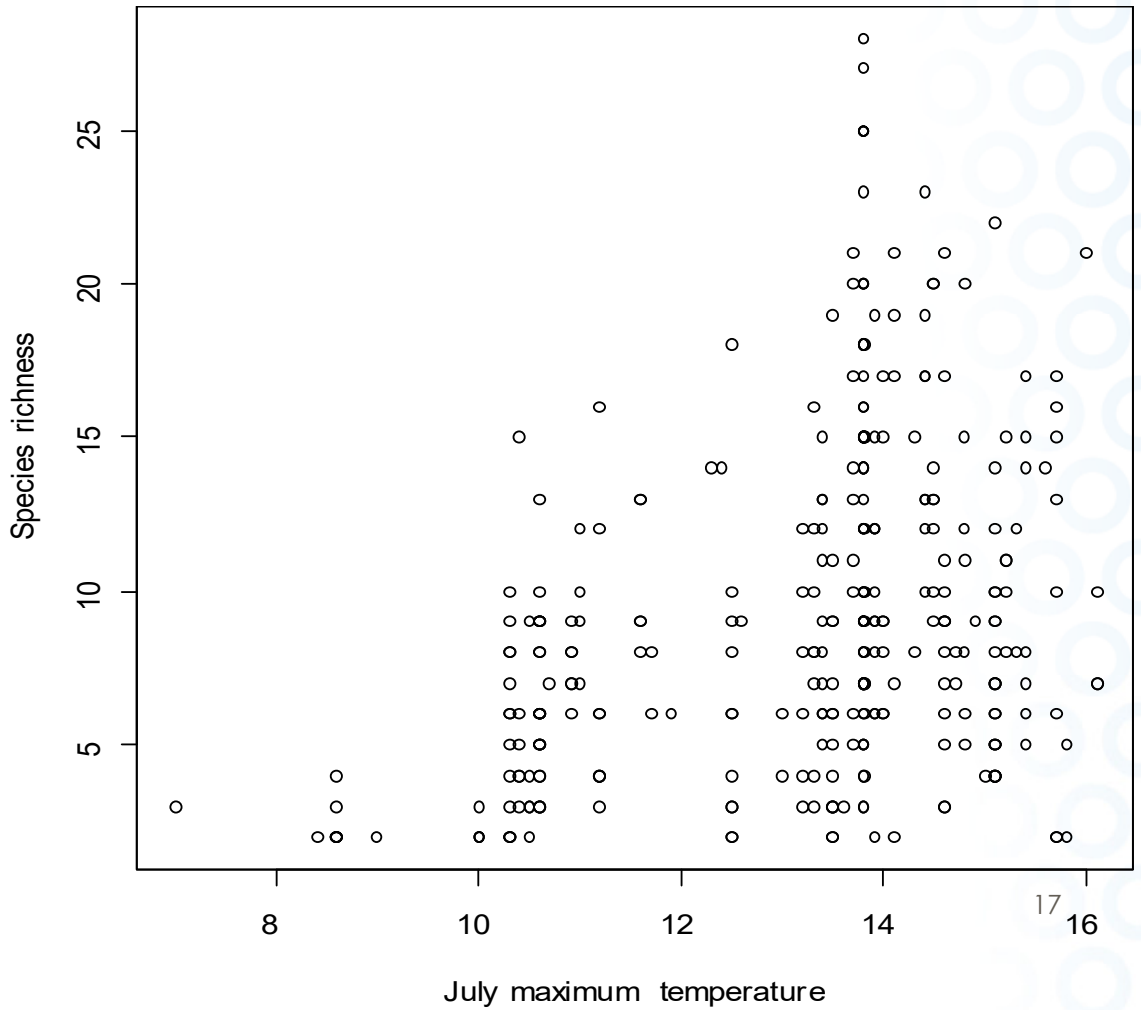
- Species richness was explained best by average July max. temperature (13 %)



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Summary

- Baseline study of arctic macrophytes suffered of poor definition of macrophytes and differences in methodology – helophytes and aquatic mosses were missing and abundance values were not available
- Total number of lakes and monitored lakes were not evenly divided > Russian lakes were missing and only very few lakes were available from North America
- Due to lacking water quality only diversity patterns were investigated
  - Diversity was dominate by turnover component
  - Species richness was related to summer temperatures
- Solid monitoring network is needed
  - OK in countries implementing WFD

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Thanks for your attention!

CAFF Conservation of Arctic Flora and Fauna

Life

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