



Heterogeneity of edaphic factors and the composition of fern species

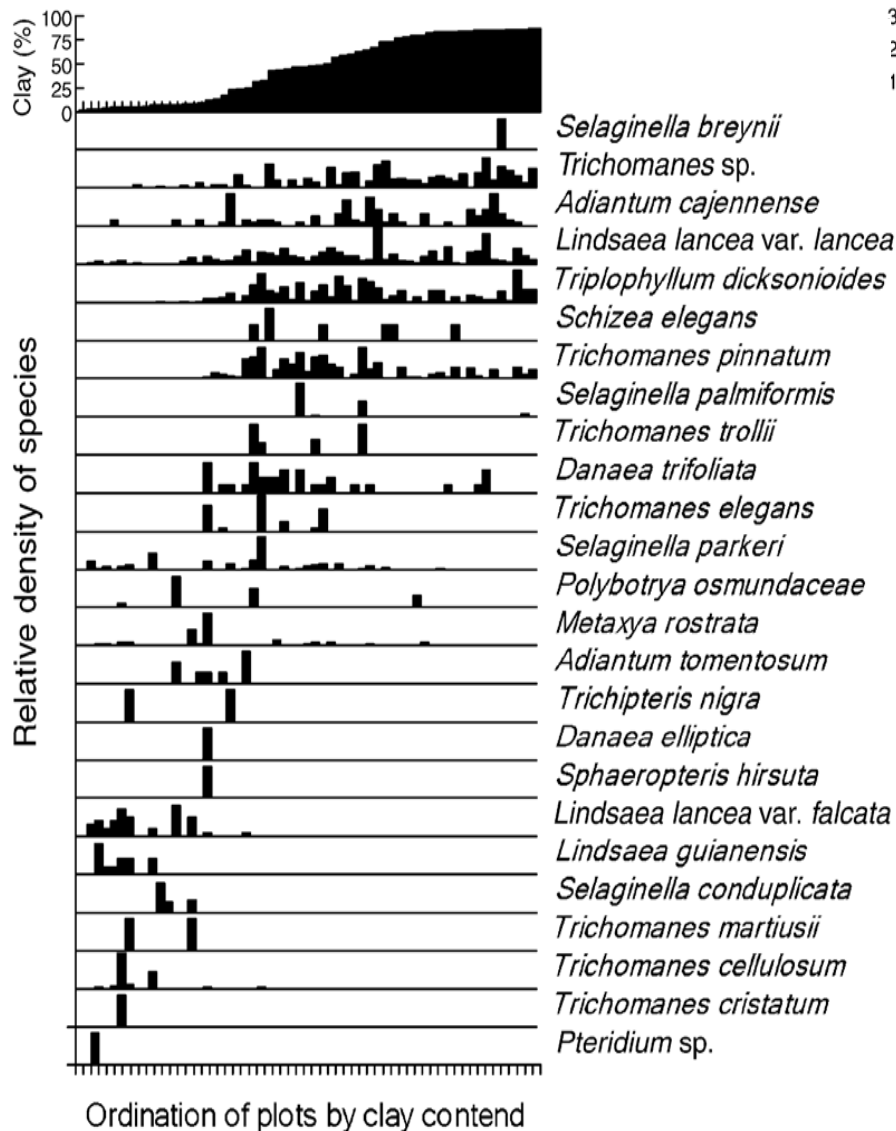
-Rebio Uatumã and DBFFP Reserves-

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In Central Amazon, soil texture (clay content) was indentified as the main factor determining the community composition of ferns

in Reserva Ducke



Costa et al 2005

And in DBFFP...

Table 2 Standard partial regression coefficients for each variable included in the multivariate multiple linear regression models, and probabilities associated (inside brackets)

		Variance captured by the ordination axis (%)	Clay content (%)	Base cation content	Slope	Log canopy openness	R^2
Quantitative composition	PCoA1	42.19	-0.647 (0.002)*	0.318 (0.119)	-0.101 (0.548)	-0.322 (0.031)*	0.353
	PCoA2	20.34	0.143 (0.437)	0.455 (0.020)*	-0.167 (0.290)	0.009 (0.947)	0.438
	Pillai-trace		(0.005)*	(0.037)*	(0.526)	(0.095)	0.381 (0.000)*
Qualitative composition	PCoA1	37.44	-0.168 (0.356)	0.056 (0.763)	0.385 (0.017)*	-0.521 (0.000)*	0.453
	PCoA2	27.14	-0.749 (0.000)*	-0.142 (0.367)	-0.192 (0.152)	0.018 (0.876)	0.602
	Pillai-trace		(0.000)*	(0.669)	(0.056)	(0.001)*	0.515 (0.000)*

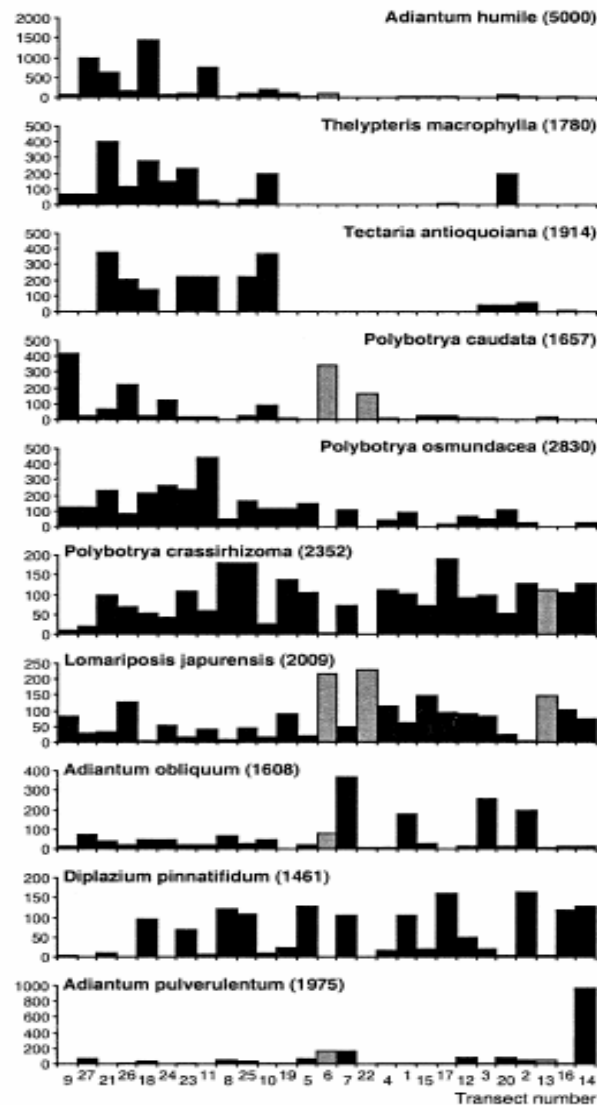
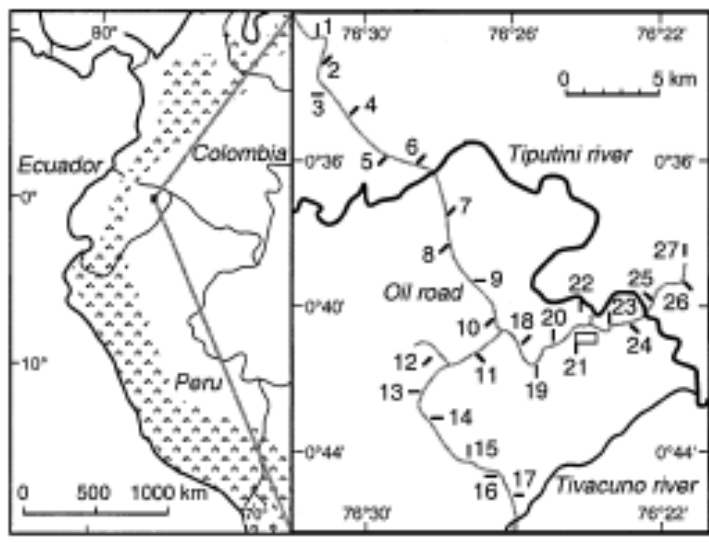
Probabilities associated with the Pillai-trace statistic represent the summed effect of variables over the two ordination axes

* $P < 0.05$

Zuquim et al 2008 (PDBFF)

This seems to be a consistent and general pattern to Central Amazon. BUT...

BUT... In Western Amazonia, many studies show soil fertility as the main predictor of the community composition of ferns



The transects are arranged in increasing order of soil cation content (sum of exchangeable Ca, K, Mg, and Na).

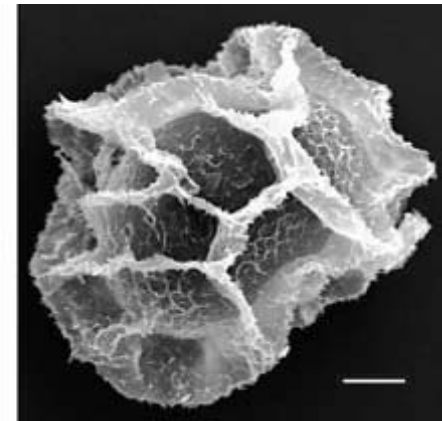
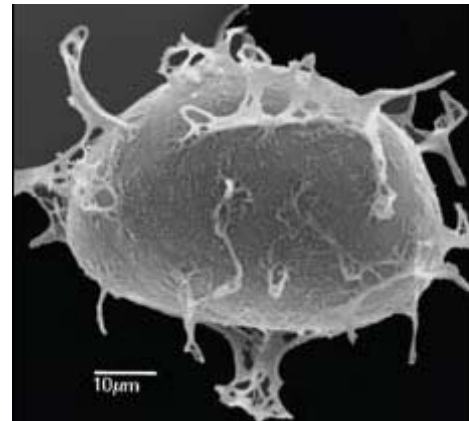
Why?

- This difference may reflect the range of the environmental gradients in each region
- The longer the gradient, the bigger the importance of the factor to predictive models.
- We expect that floristic heterogeneity will be related to the heterogeneity in soil fertility.

Ferns

- ~ 13000 spp in the world, ~500 spp in the Amazon
- Alternation of generations
- Intense production of spores
- Spores are wind dispersed
-
- Low rate of evolutionary morphological changes*

*Haufler, 2007



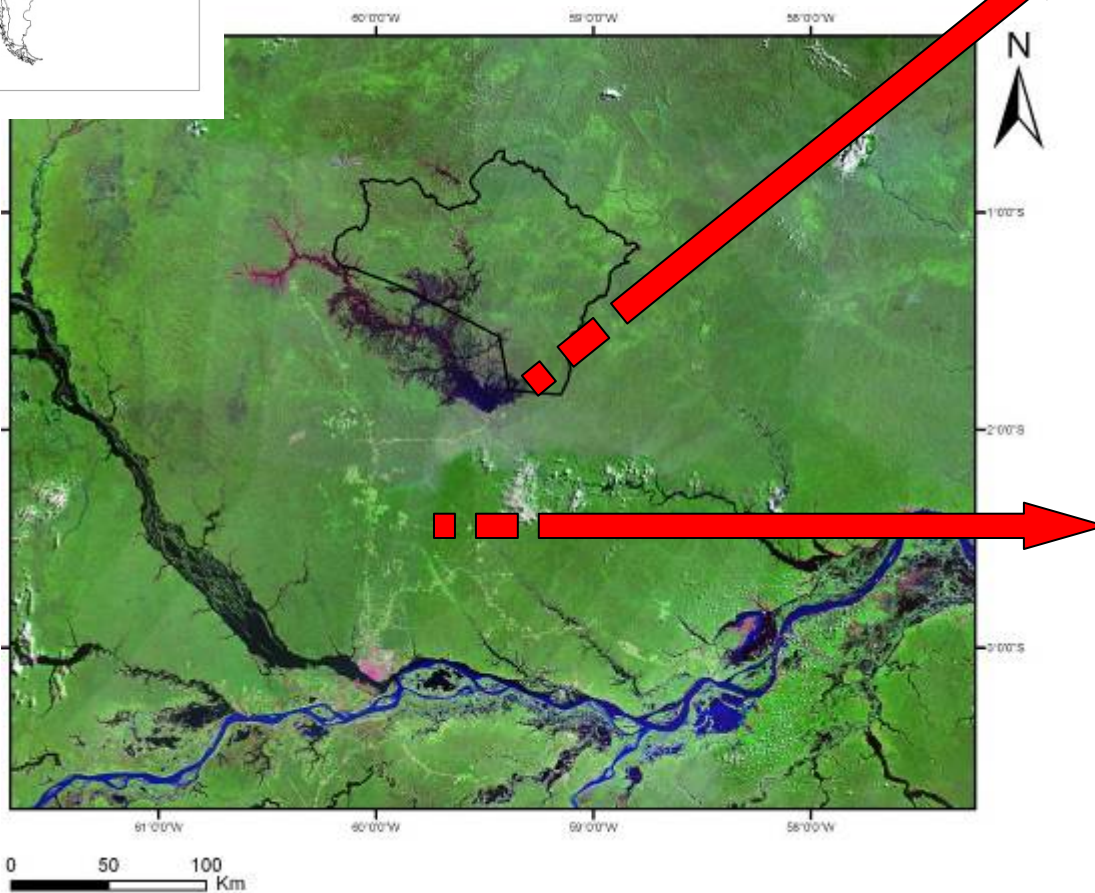
Questions

What are the main determinants of floristic composition in 2 different sites?

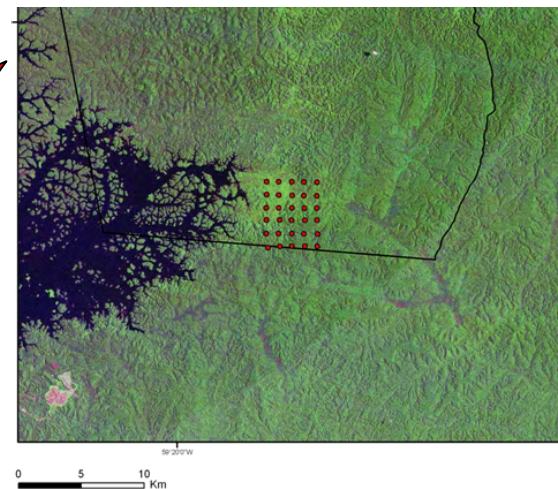
How and why do relative contributions of each factor differ?

To what level is the floristic heterogeneity associated with edaphic heterogeneity?

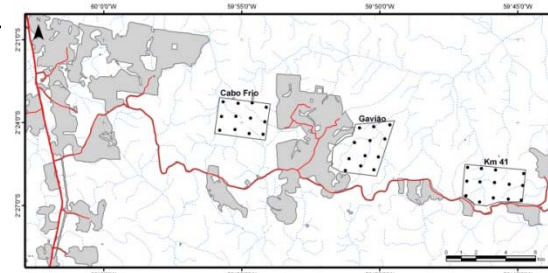
Study sites



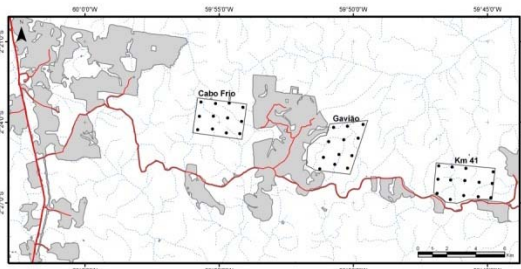
Rebio Uatumã



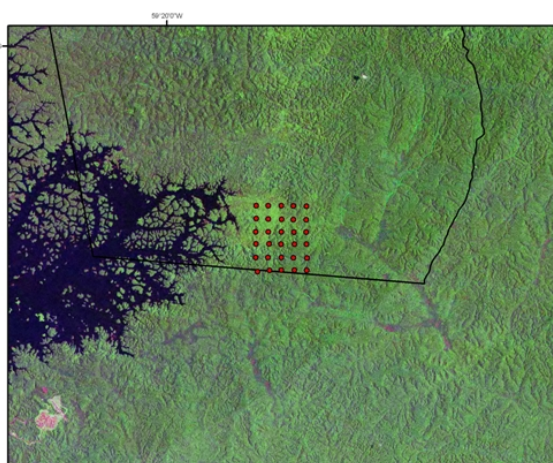
DBFFP continuous reserves



Location of the plots



DBFFP: 38 plots, 12-14 per reserve; 1 – 25 km apart
PPBio modules

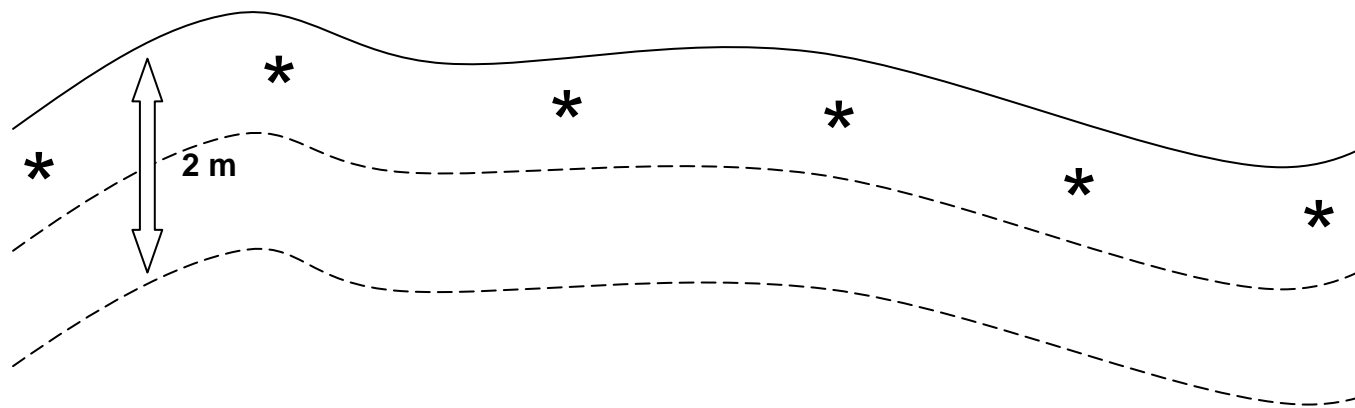


Uatumã: 30 plots, 1 – 7 km apart
PPBio complete grid

0 5 10 Km

Plots

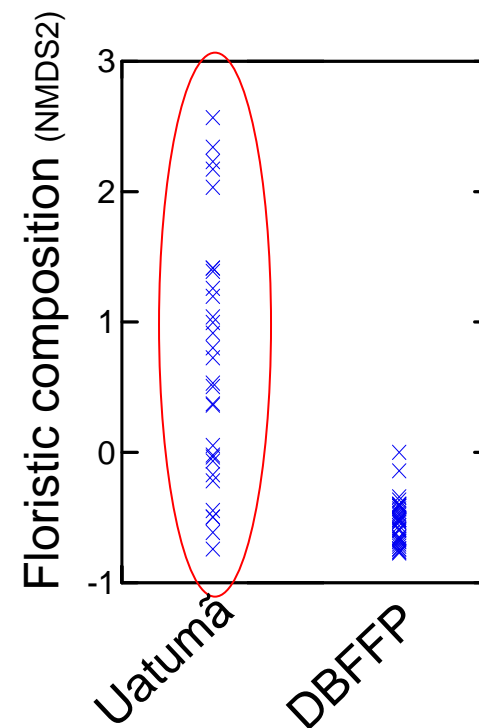
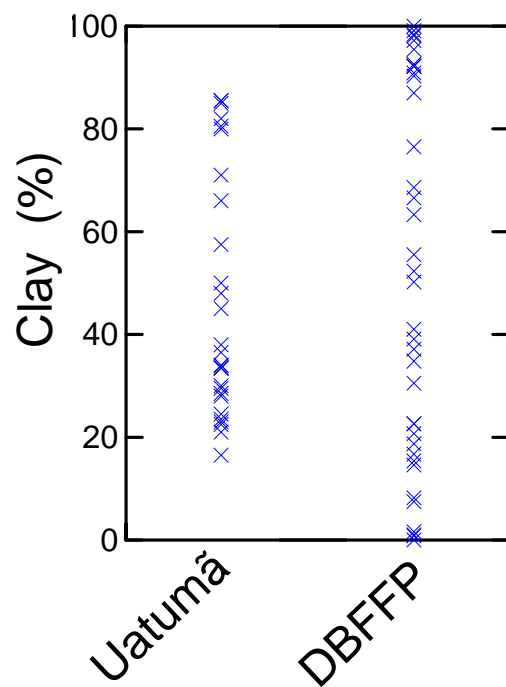
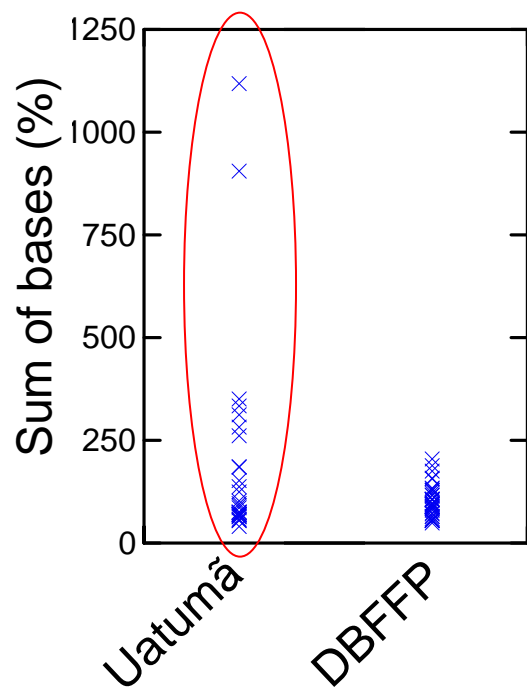
- 250 x 2 m
- Longer axis following the contour line
- **Soil:** sub-samples at each 50 m
- **Ferns:** terrestrial and hemi-epiphytes (leaves longer than 10 cm)



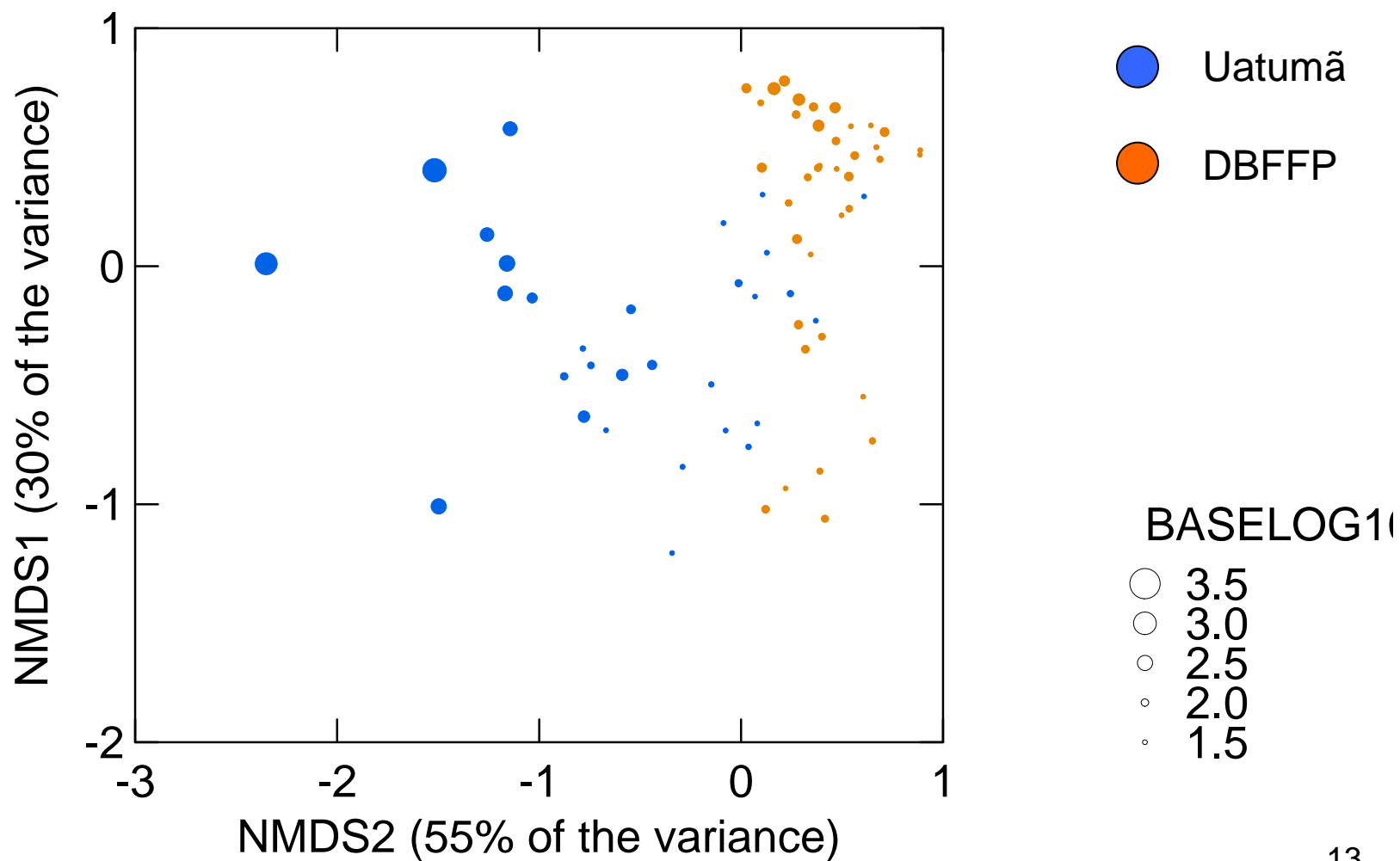
Data analysis

- NMDS
- Linear uni and multivariate regressions
- PCOrd and Systat

Range of the fertility gradient x floristic heterogeneity



Strong influence of soil fertility



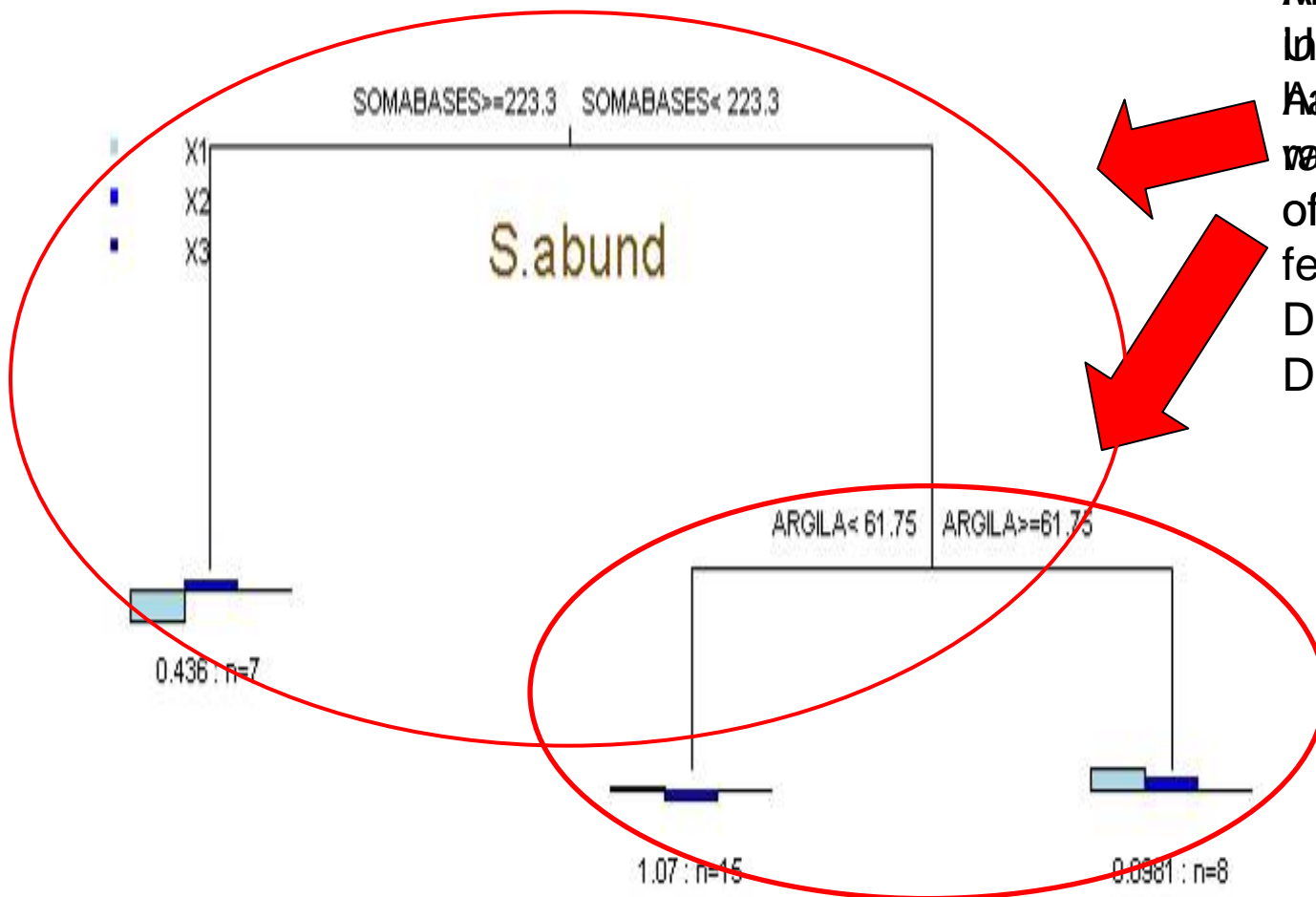
Strong influence of soil fertility

			Clay content (%)	cation content	R2	Captured byNMDS
Quantitative composition	NMDS1	Stand. Coef.	0.58	0.084	0.35	80.00%
		p	>0.000	-0.407		
	NMDS2	Stand. Coef.	0.247	-0.72	0.54	
		p	0.005	>0.000		
	Pillai-Trace		>0.000	>0.000		
Qualitative composition	NMDS1	Stand. Coef.	-0.225	0.694	0.5	67.00%
		p	>0.000	0.013		

Tree regression

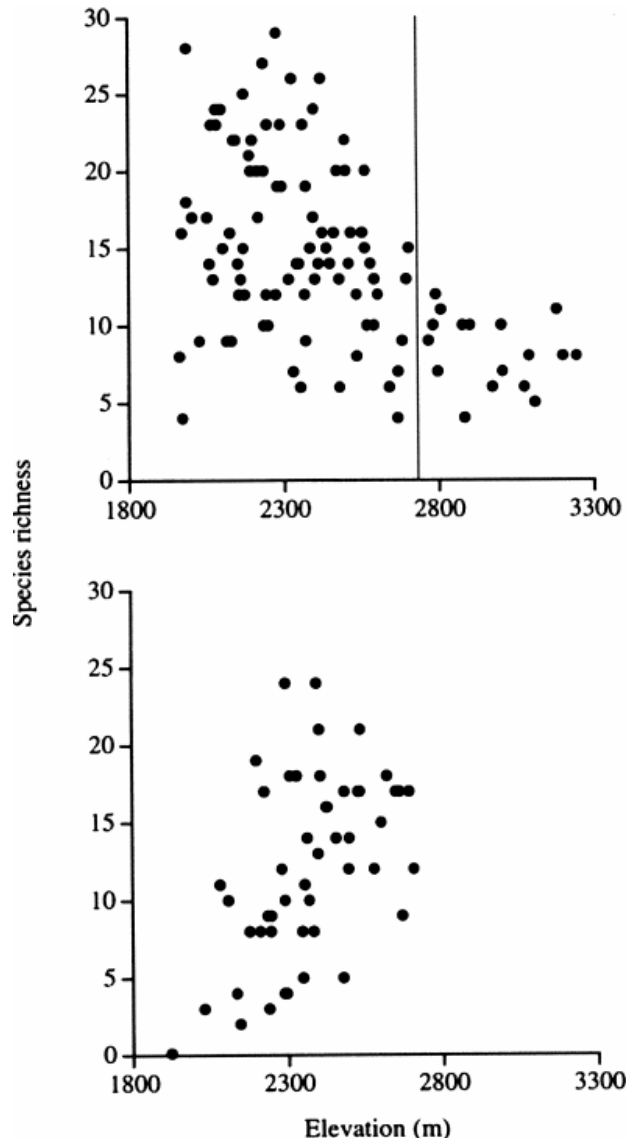
- the hierarchical influence of edaphic factors

Most of the plots, located in region Anasazide with the variation of soil fertility, ex. DBFFP and Ducke



NMDS1, NMDS2 (abundance) = c + cation content + clay content

Length of the gradient



McCoy, 2002, Butterflies from Florida

The perception of the effect of soil fertility on fern community is highly dependent on “where” we are within the gradient

These results shed light on the consistency of species responses to soil gradient across geographical regions within Amazonia.

Obrigada



PELD



Tânia Pimentel,
Maria Luziene,
Juruna, Joelson, field
assistants,
Chicon,
Bill Magnusson,
friends and colleagues.

