Disturbance – Human Footprint gradient (%) All Alberta

Data summary

- Vegetation data PA from GitHub
  - 2504 unique ID (ID = protocol + site + year)

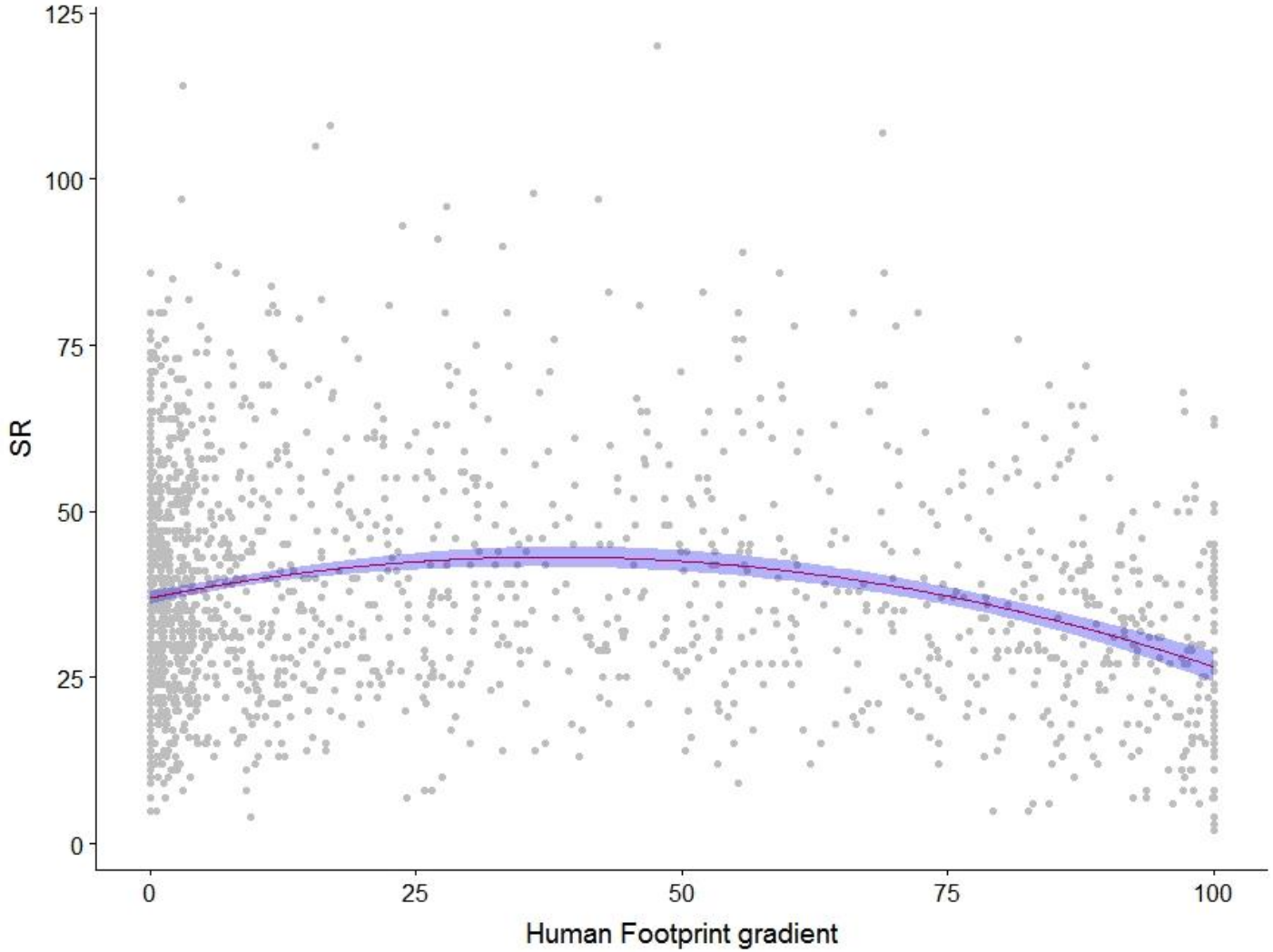
- Human Footprint (HF) % data from GitHub
  - 1866 unique ID

- 277 ID of vegetation data are not in HF data :
  - Not equal to 2504-1866 = 188 ID. Why ? Because HF data with value = 0% for terrestrial ID are not present (obvious for example because all Canadian Shield terrestrial ID are not in the HF dataset).
  - I assumed that all ID of vegetation data without HF data have HF data = 0%

- Combining this way vegetation and HF data, I obtained : 2054 ID for the final dataset

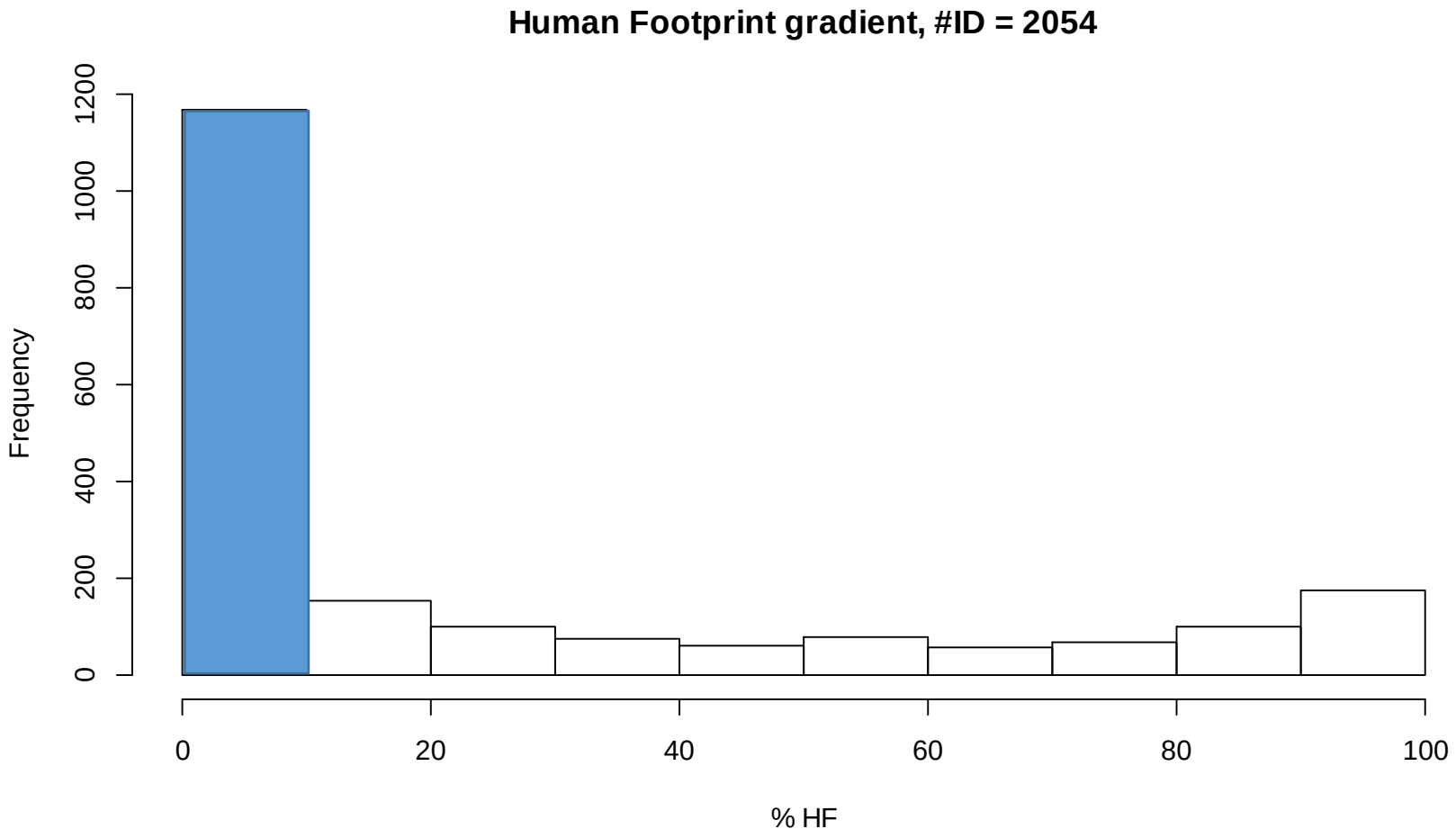
Intermediate disturbance hypothesis

- Small but the pattern is here, and see Mayor et al. 2012



Calculation of Species specialization index (SSI) along the HF gradient

- Distribution of the number of samplings in 10 classes of HF are very uneven:



How to tackle this for calculation of SSI?

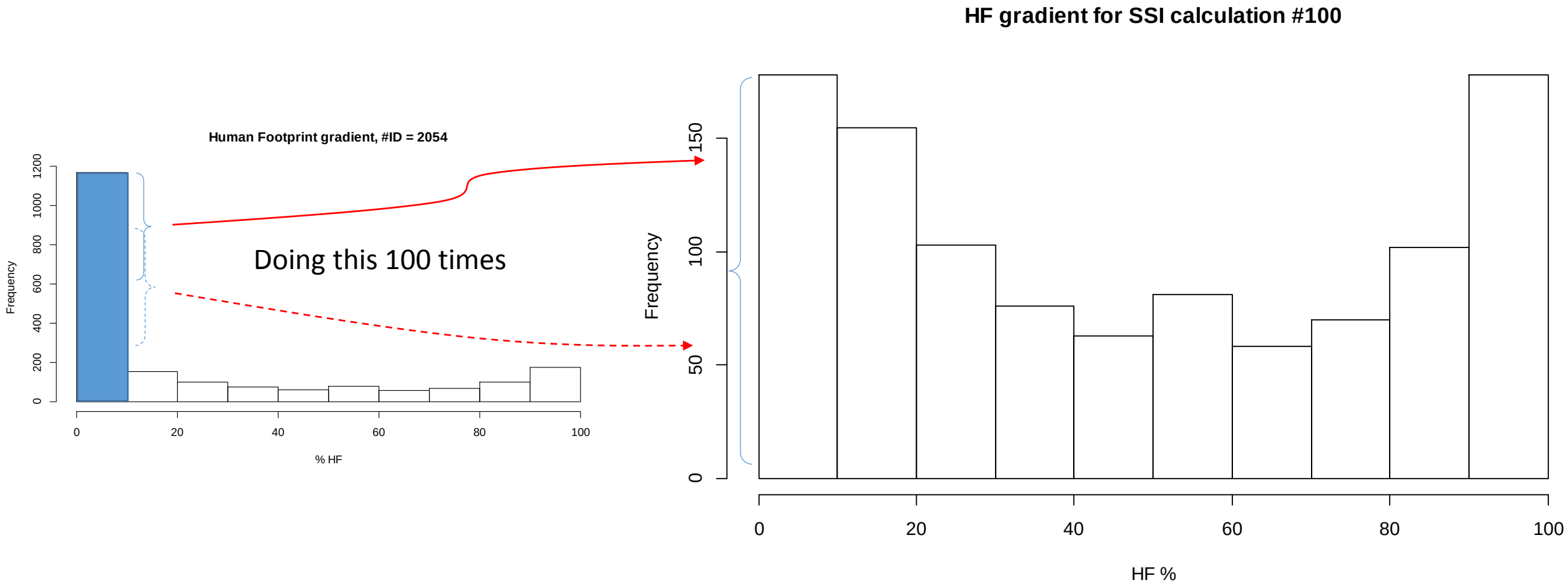
Applied a randomization process

Obtained 10 categories of HF % where I have each time the same number of samplings per category.

Calculating SSI on these “new” categories.

Calculation of Species specialization index (SSI) along the HF gradient

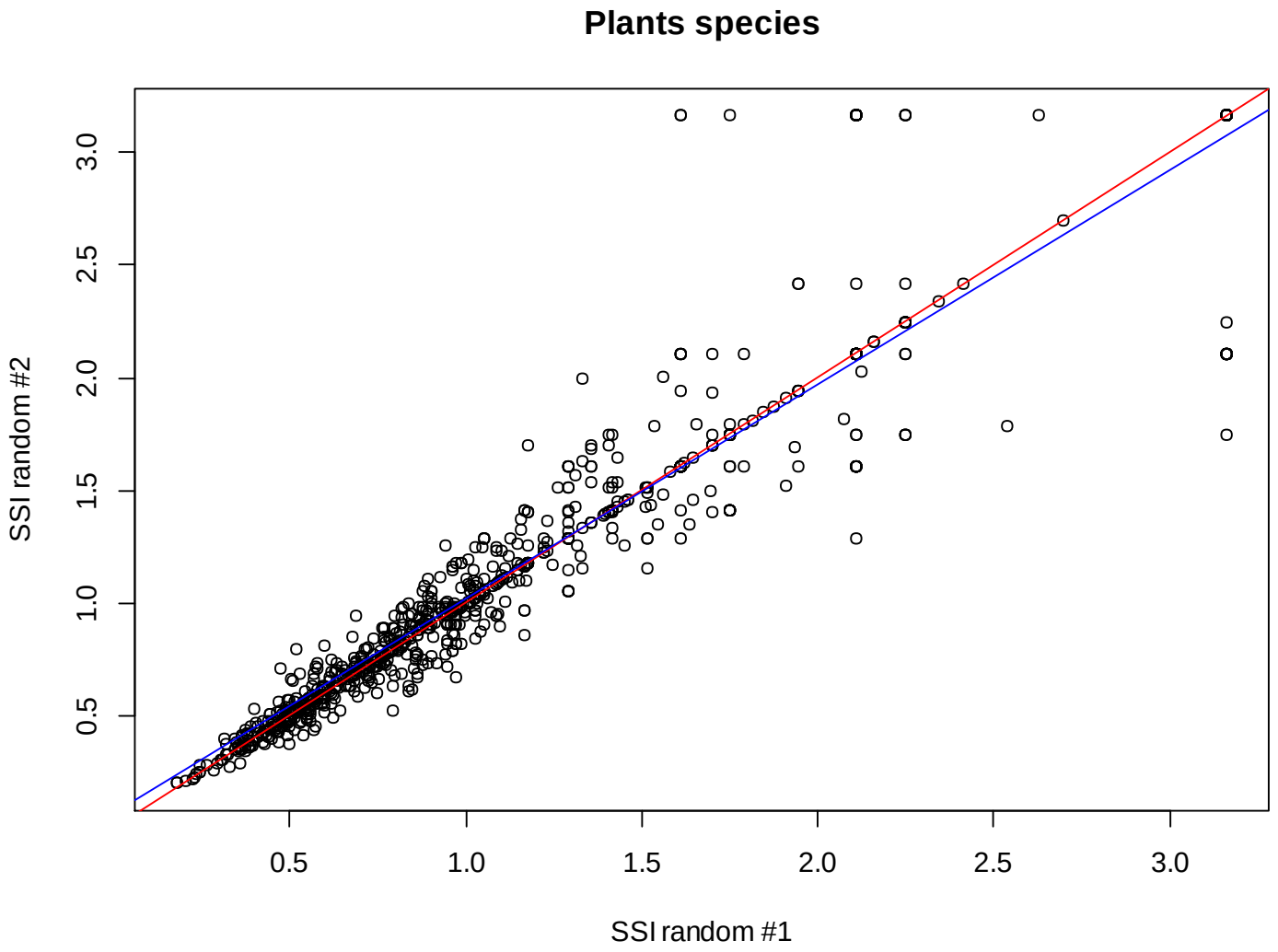
- “New” distribution of HF % used for one (over 100) calculation of SSI values:
  - As SSI is the coefficient of variation of species frequency in each bin, need a more even gradient.



Obtaining 100 gradients like this on which SSI are calculated

Calculate SSI on the 10 categories for each random dataset - Plants

- Look at correlations between the calculated SSI on each different gradient (n = 100)
  - mean correlation values = 0.94 ± 0.01



Good overall correlations

Red line = perfect correlation

Blue line = linear model of actual relationship between two random set of SSI calculation

→ Take one of the random calculation of SSI for next analyses

Calculate SSI on the 10 categories for each random dataset - Plants

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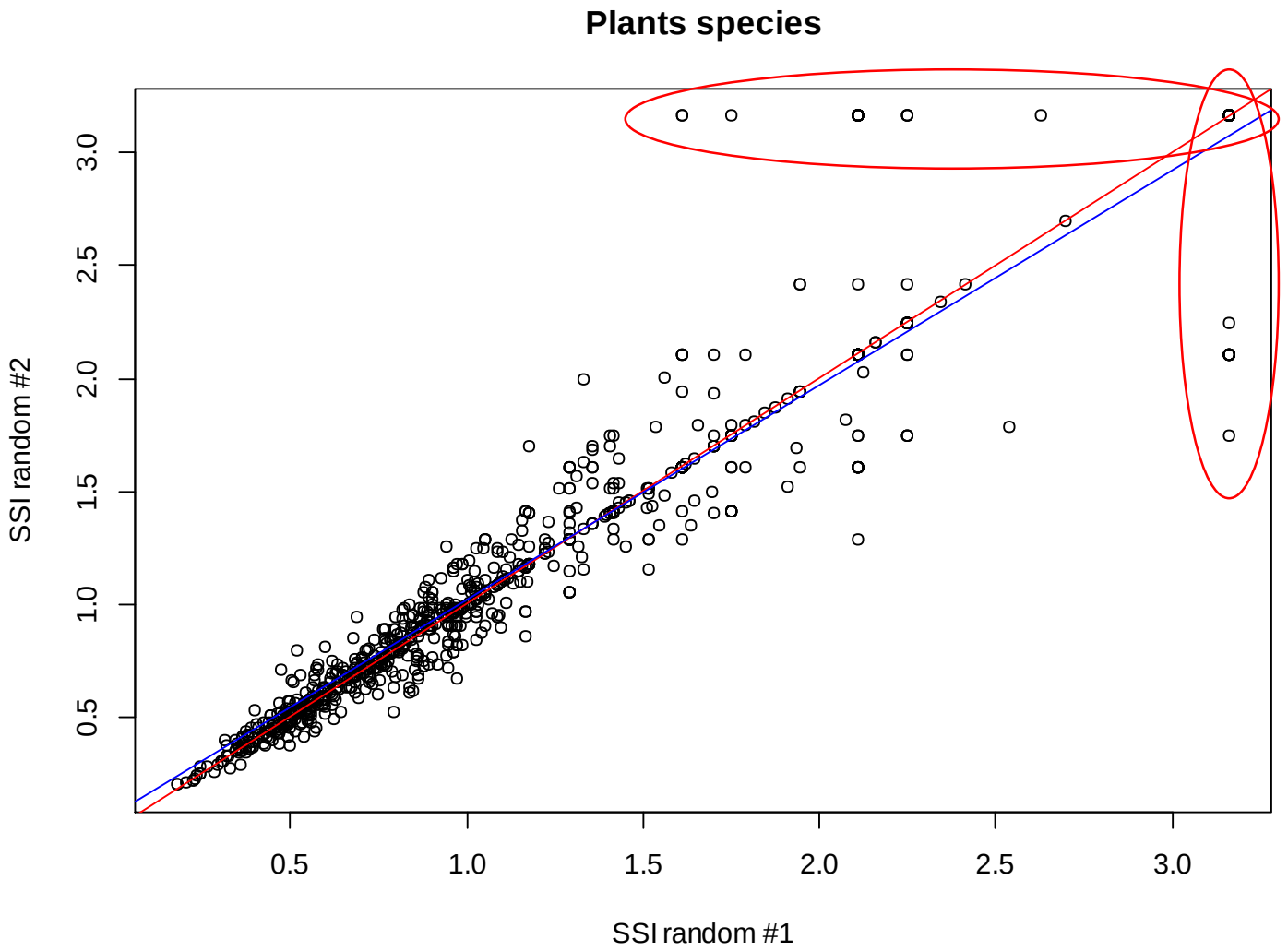
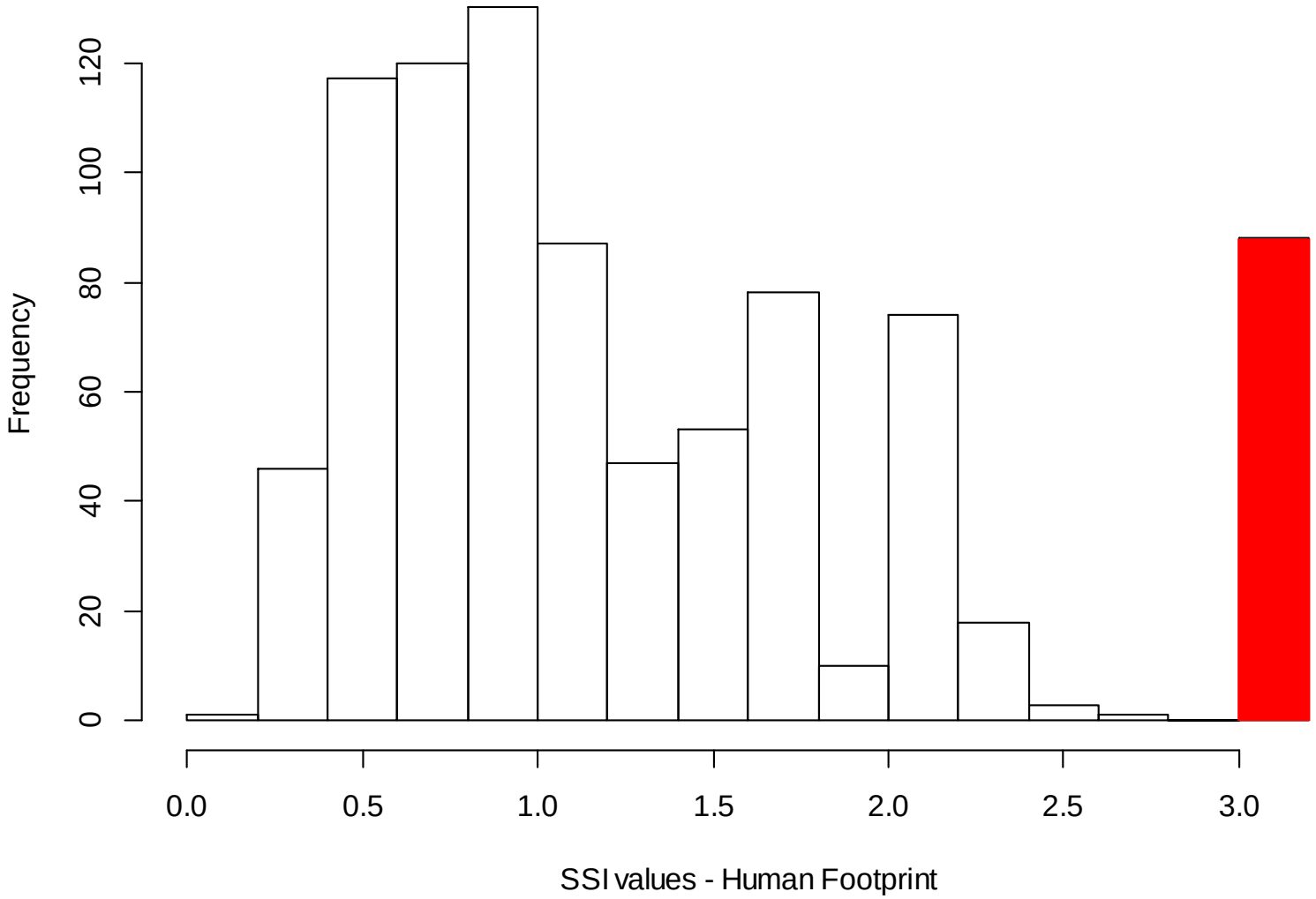


Red ellipses show outliers values that should be deleted :

Variance of SSI values for these species are too high

Expected to be rare species with not reliable SSI calculation.

Distribution of SSI values (randomly chosen from the hundred calculated) - Plants

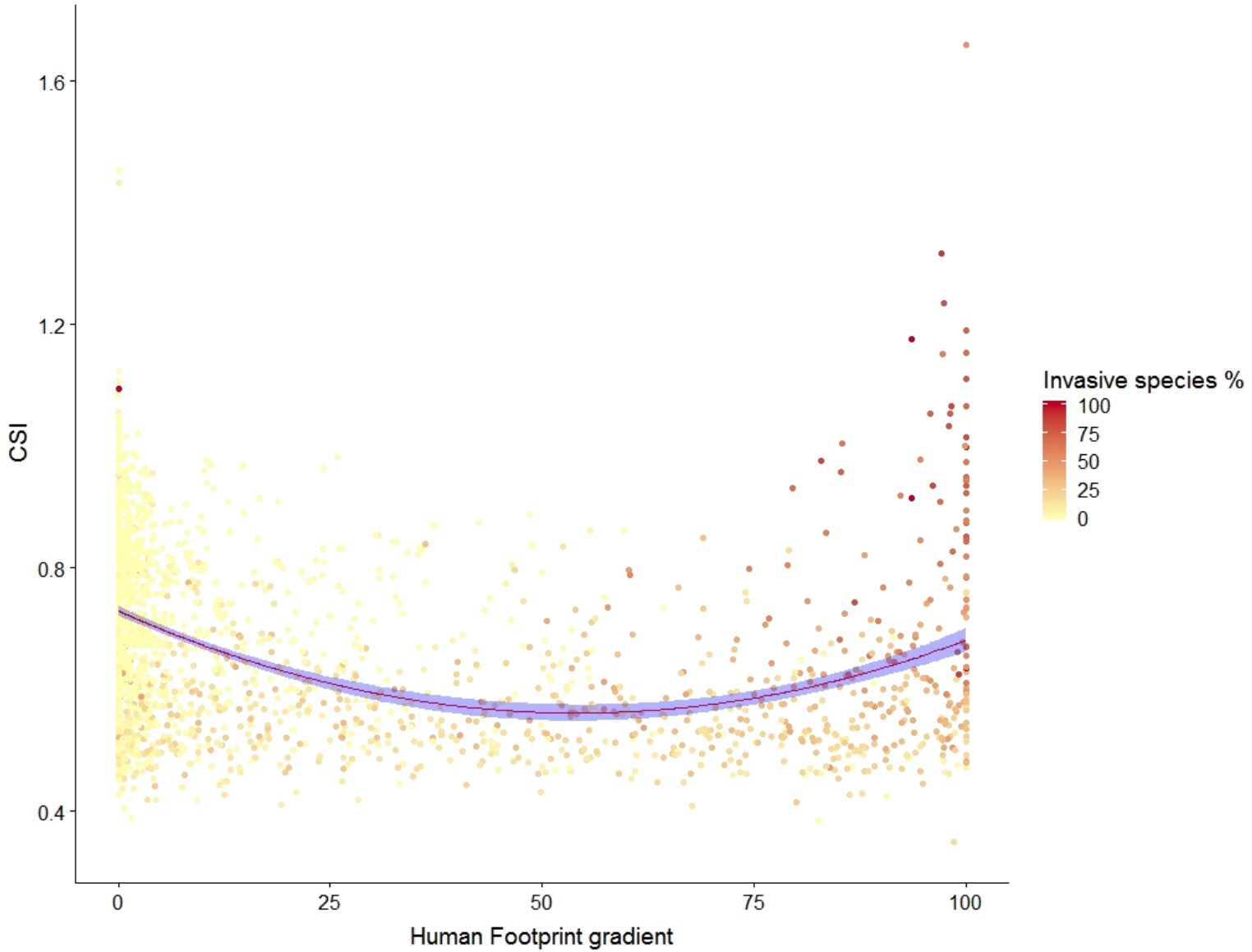


Red Bar = outliers SSI values (the one in the red ellipses in the previous slide) that are deleted for next analyses (i.e. removing these species of the communities)

88 species, mostly present on 1 or 2 ID (max 4)

Calculation of CSI values and plot along the HF gradient + Invasive species proportion

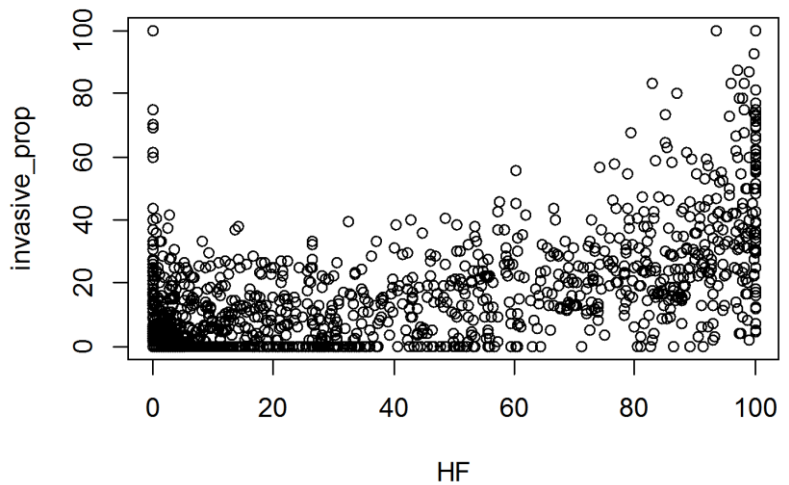
- CSI = Community specialization index = mean of SSI present in each community



Interpretation:

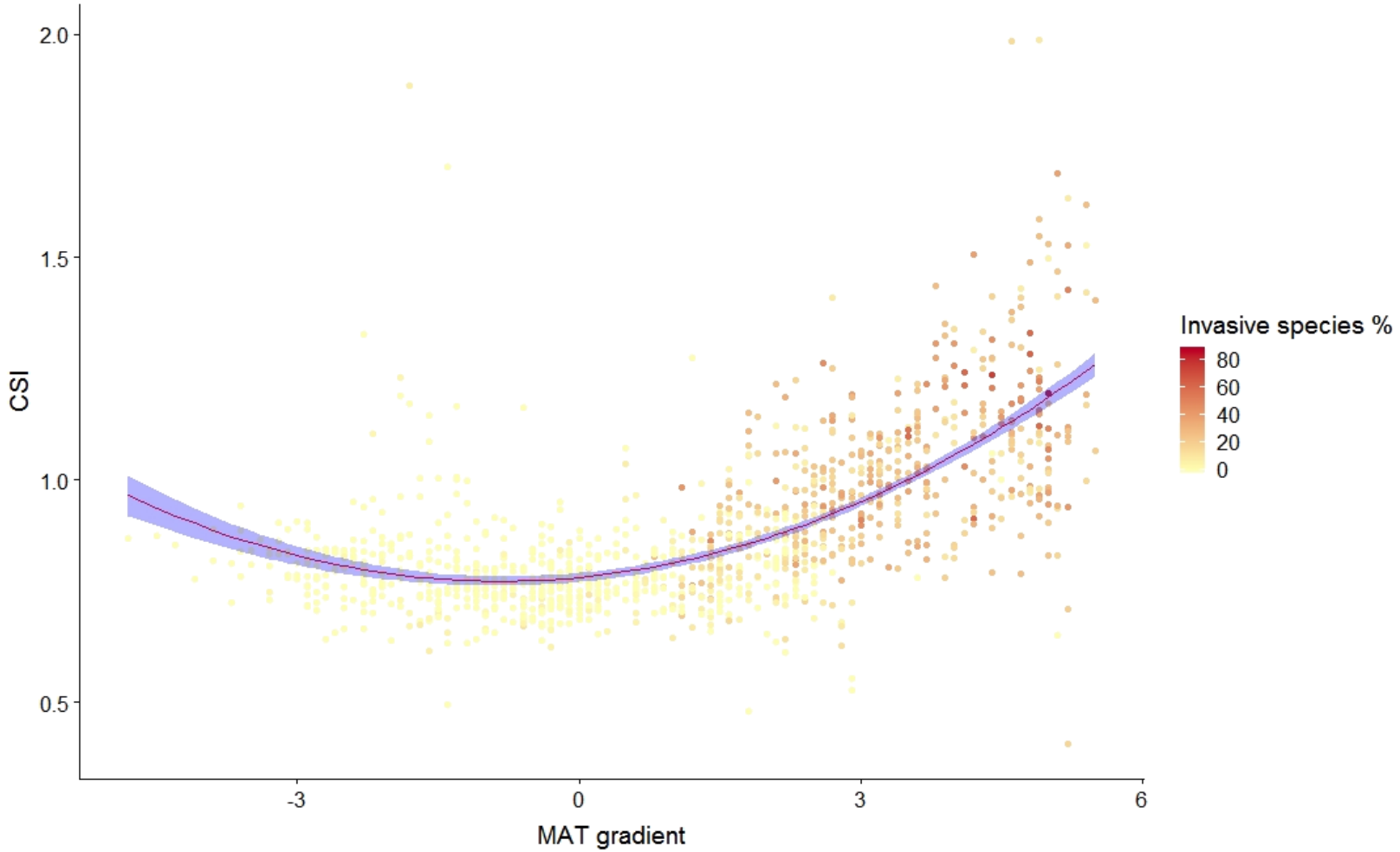
U-curve of community specialization is explained by the replacement of native species by invasive ones.

High correlation (r = 0.70) between HF % and Invasive species %



Next steps ?

- Plants :
  - Look at how specialization of species is related to exotic status and preferences along the gradient, i.e. species with high specialization that preferred disturbed part of the gradient are really exotic ones?
  - Verify the found pattern and potential biases or confounding variable effect



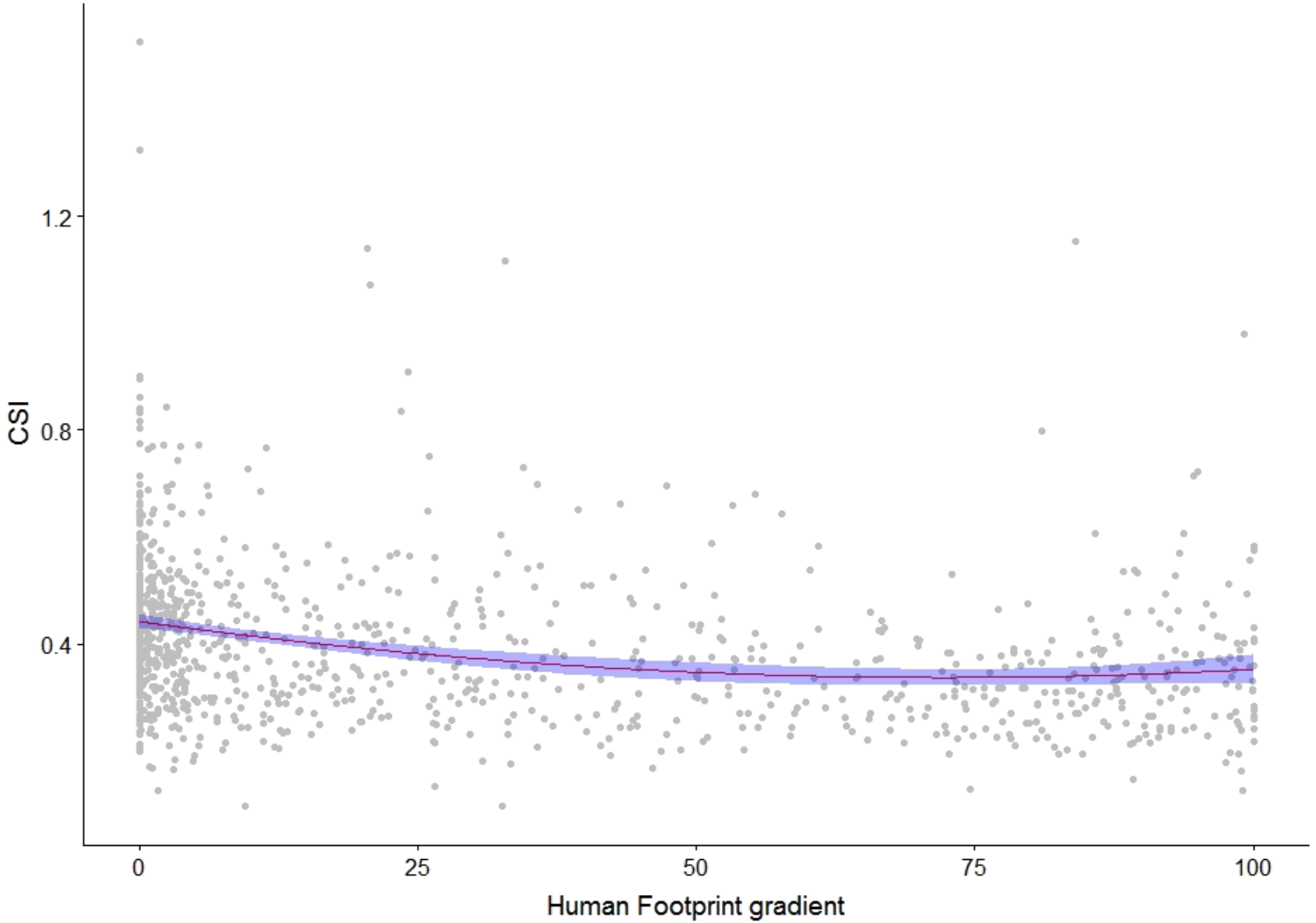
Same pattern for MAT gradient?

(here only show wetlands protocol vegetation data because I did not have climate for the terrestrial sites (but could be the same values actually…)).

Miscellaneous results

Calculation of CSI values and plot along the HF gradient – **Aquatic invertebrates**

- CSI = Community specialization index = mean of SSI present in each community

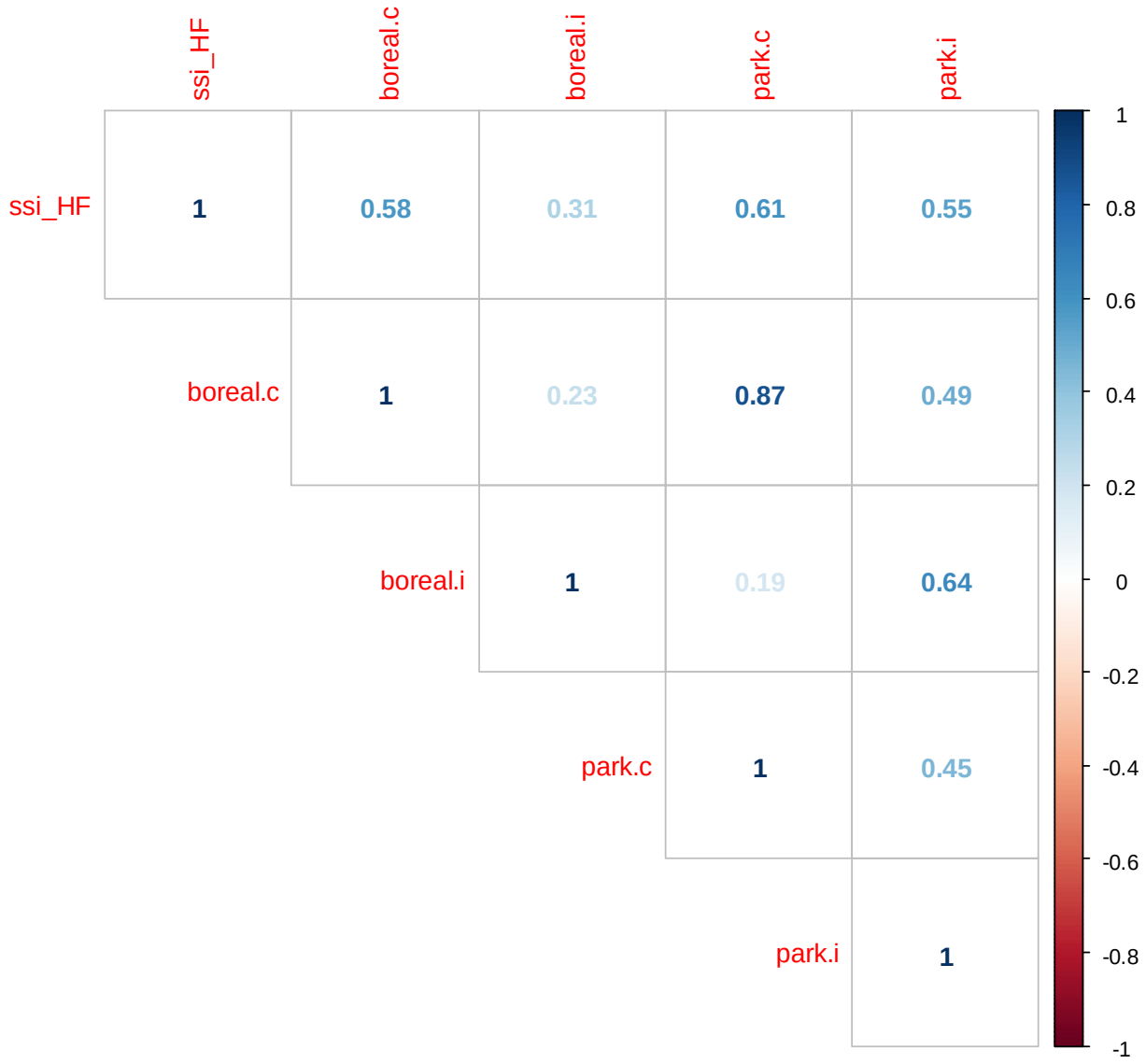


Interpretation:

U-curve pattern is low for invertebrates

Community specialization seem to decrease with gradient, no specialized species of disturbed part of the gradient.

Comparison of SSI values with c-scores and Intactness scores - Plants



SSI good indicator of conservatism ?

Easy to implement
Not based on expert opinion