Examining ecological processes operate on different life stages using beta diversity concept

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Source of dissimilarity at local scales

Dispersal limitation

Negative density dependence / competition

Environmental filtering

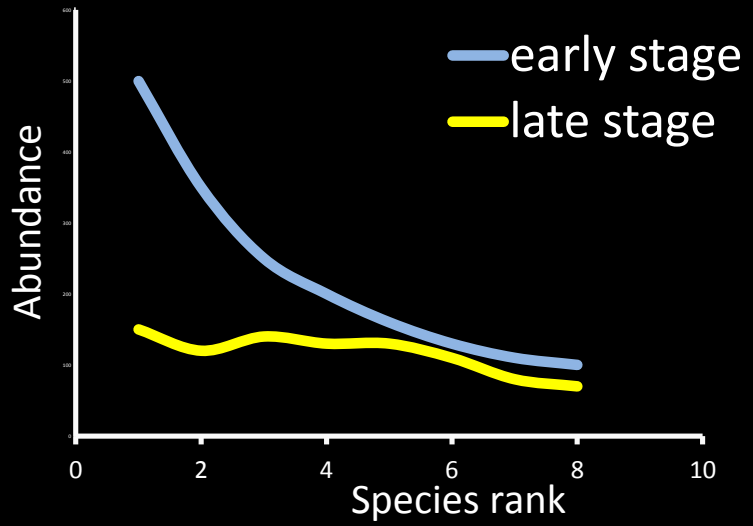
The questions

Is any of the local ecological processes still in action in the established tree community?

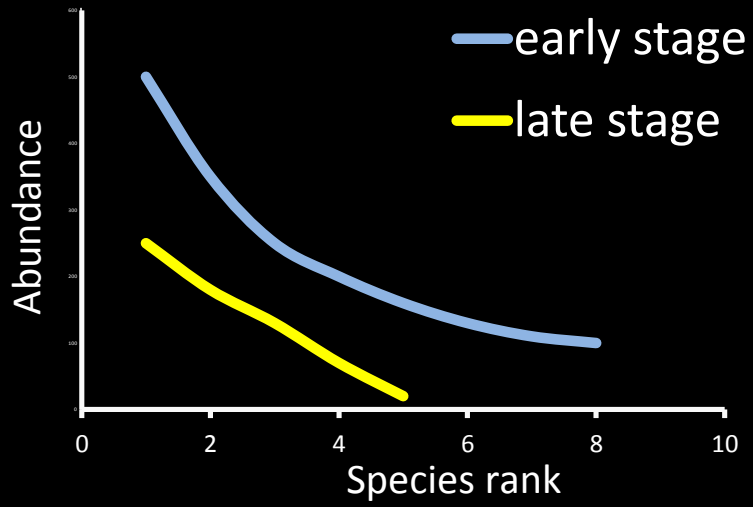
If so, which one is operating on the community?

Local processes and sub-communities of life stages

Negative density dependence (NDD) or
Competition (intra > inter-spp.):
Species coexistence with relatively even distribution in abundance



Environmental filtering (EF) or
Competition (intra < inter-spp.):
Loss of species and relatively uneven distribution



Shannon-Wienner index: $H = -\Sigma p_i \ln p_i$, $p_i = n_i/N$

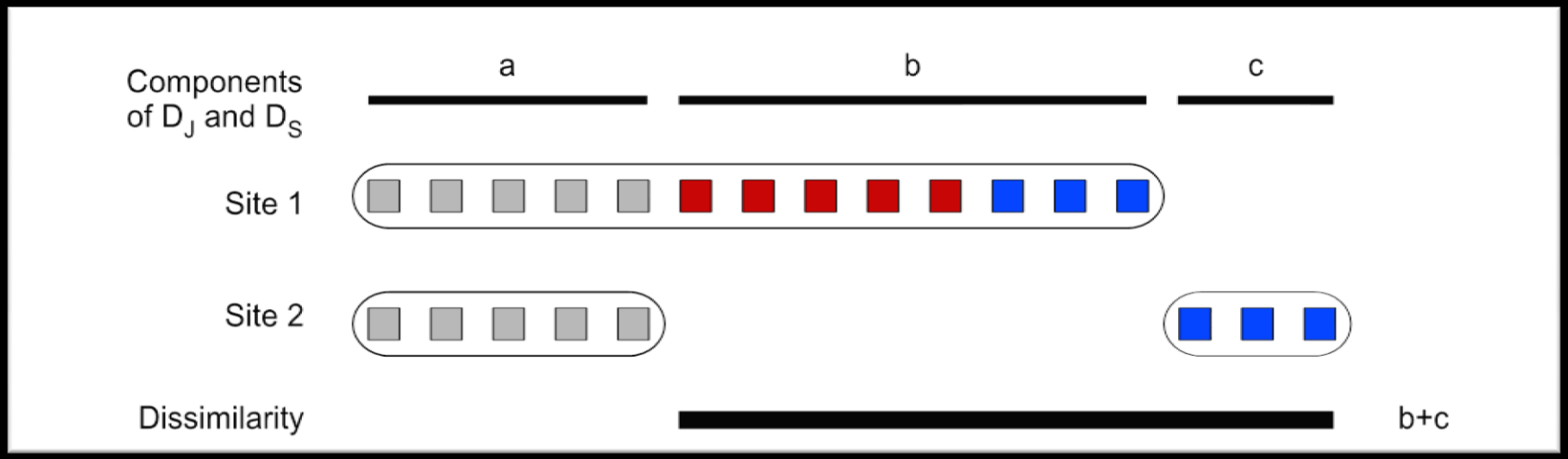
H=1.793

H=1.330

H=1.243

Diversity indices concerns both species richness and evenness.

Sorenson dissimilarity index

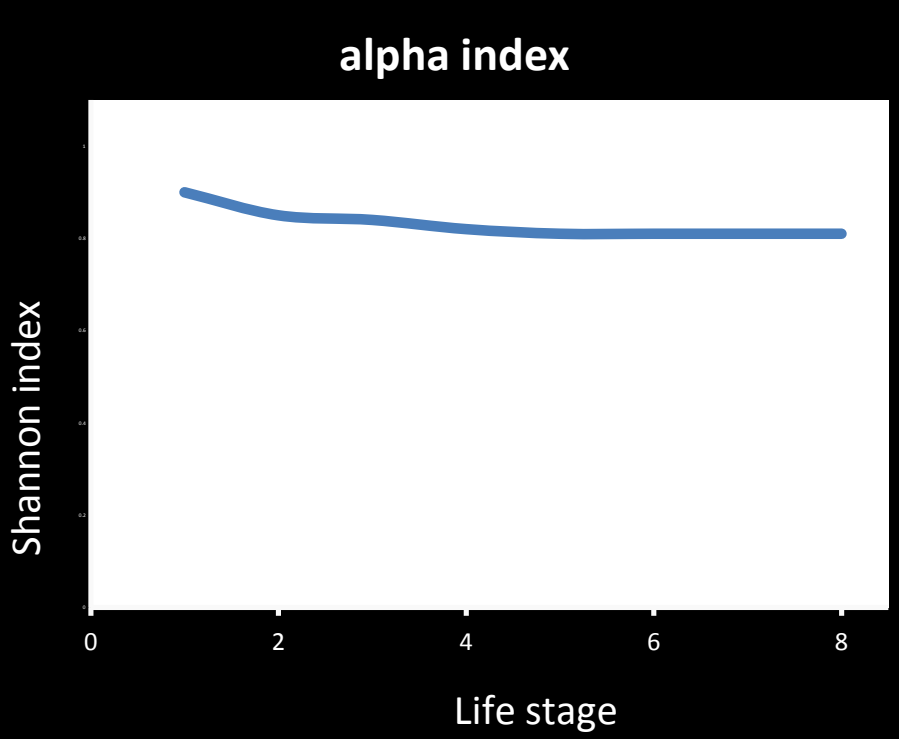


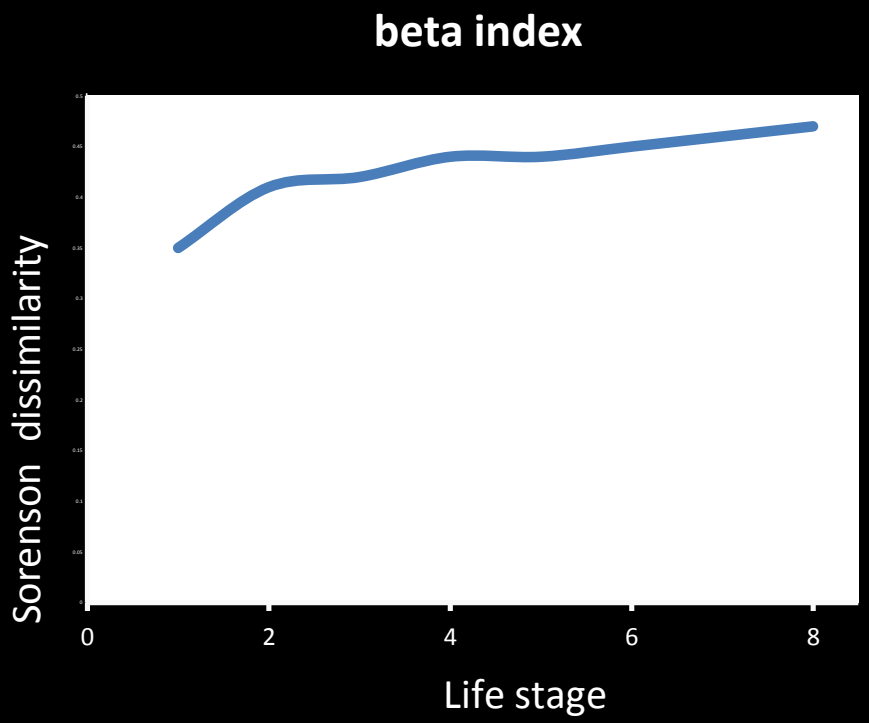
Sorensen dissimilarity index: (b+c) / 2a+b+c

a: shared species in both community
b, c: unique species from each community

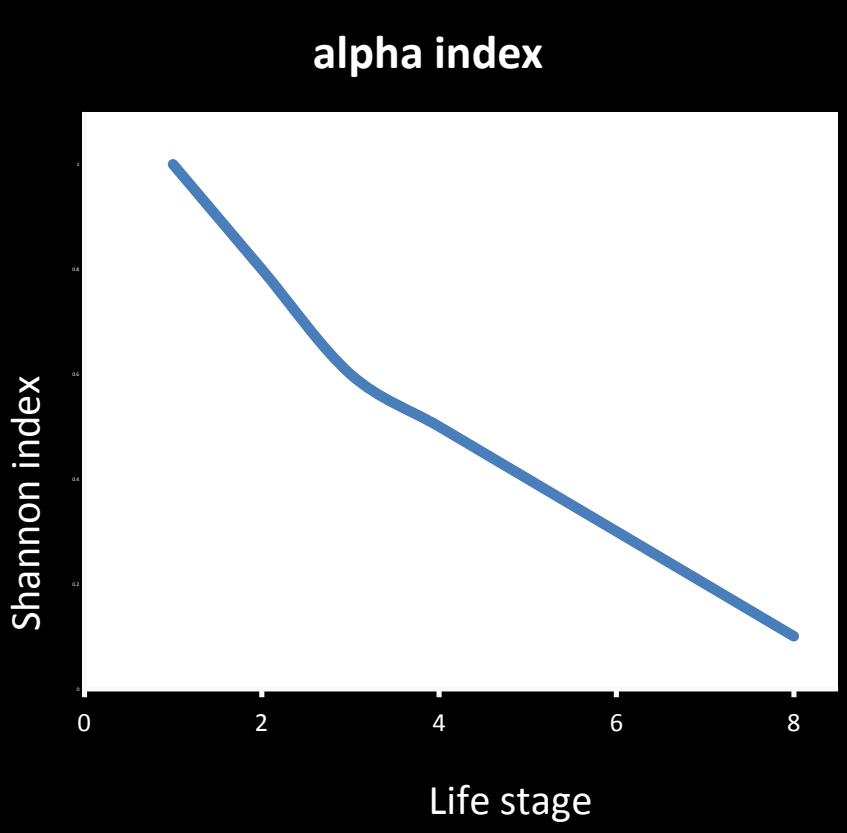
Carvalhol *et al.* 2012, 2013

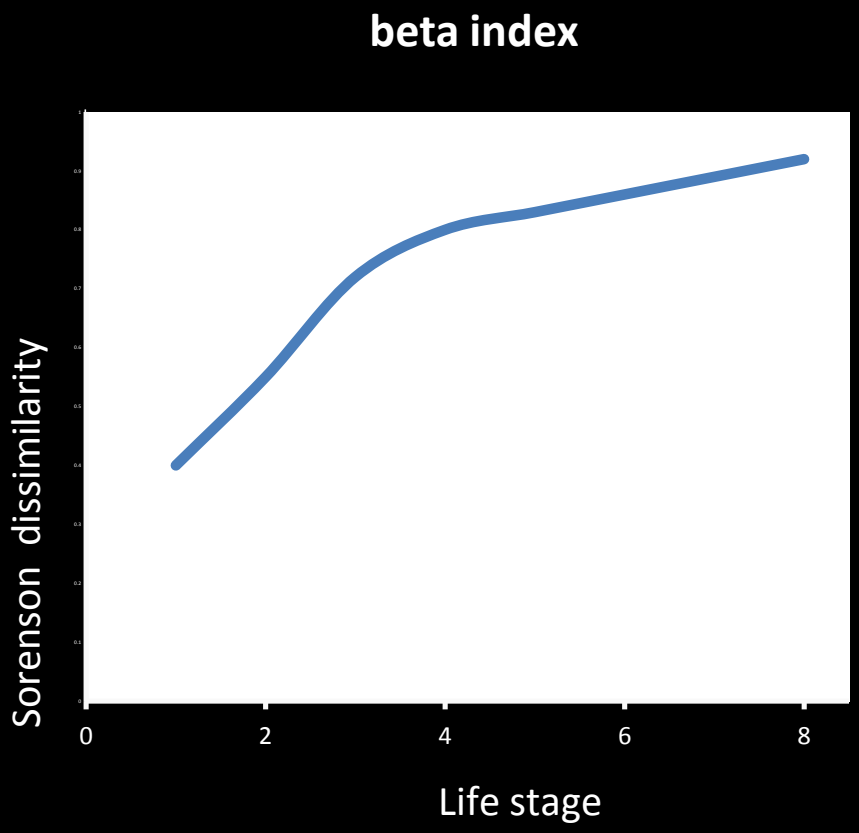
Trend of diversity indices through life stages under NDD



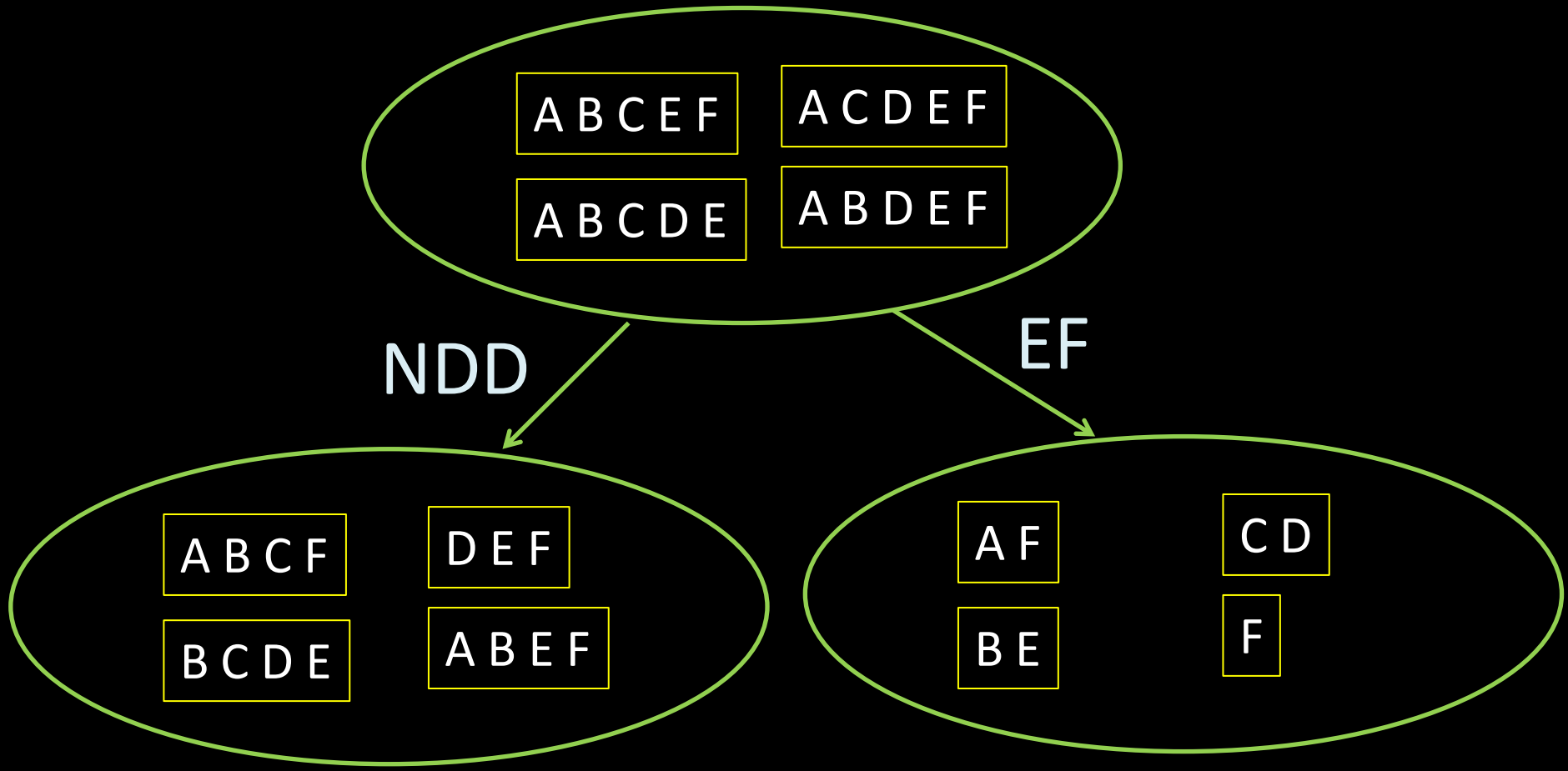


Trend of diversity indices through life stages under EF

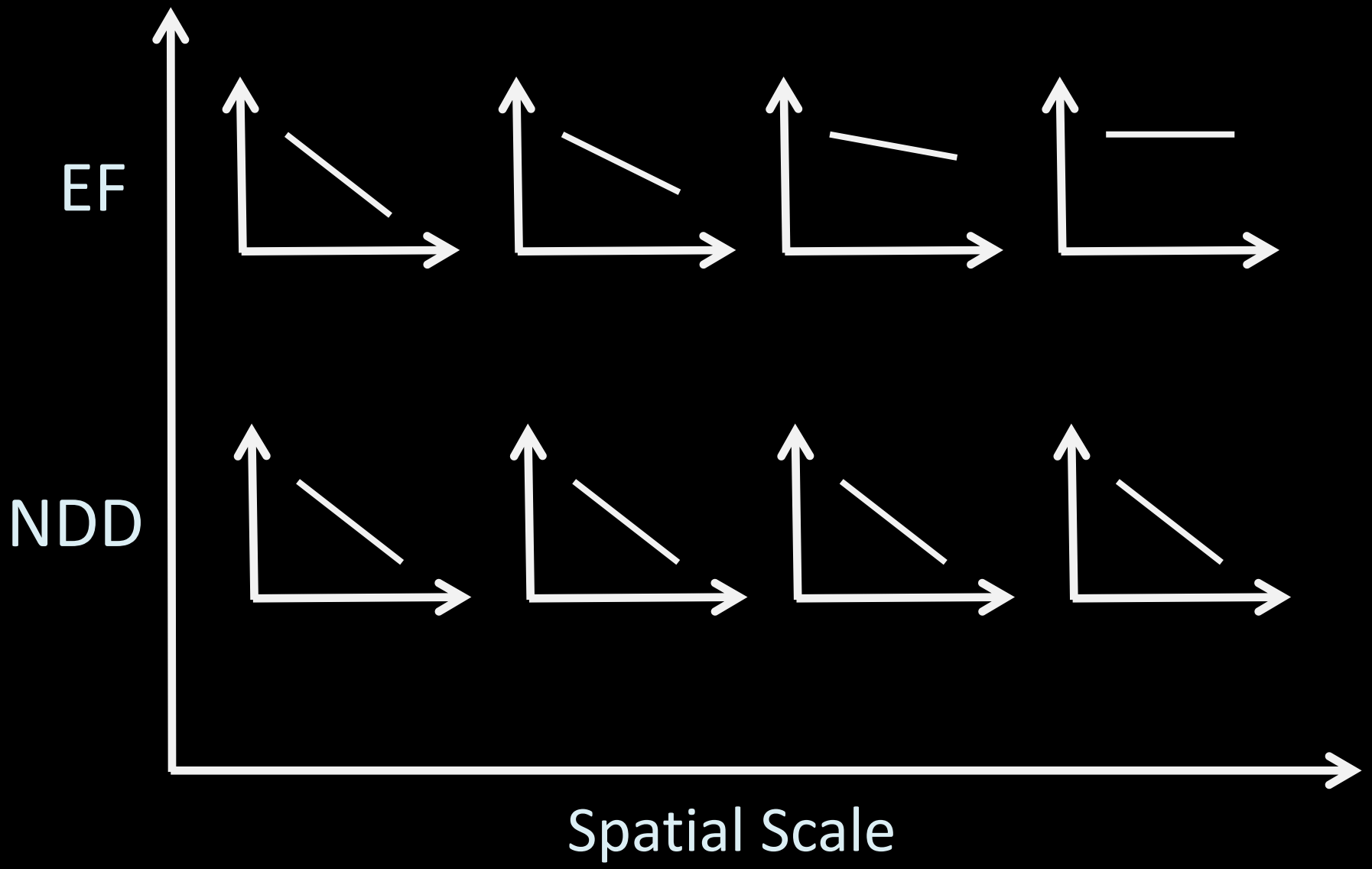




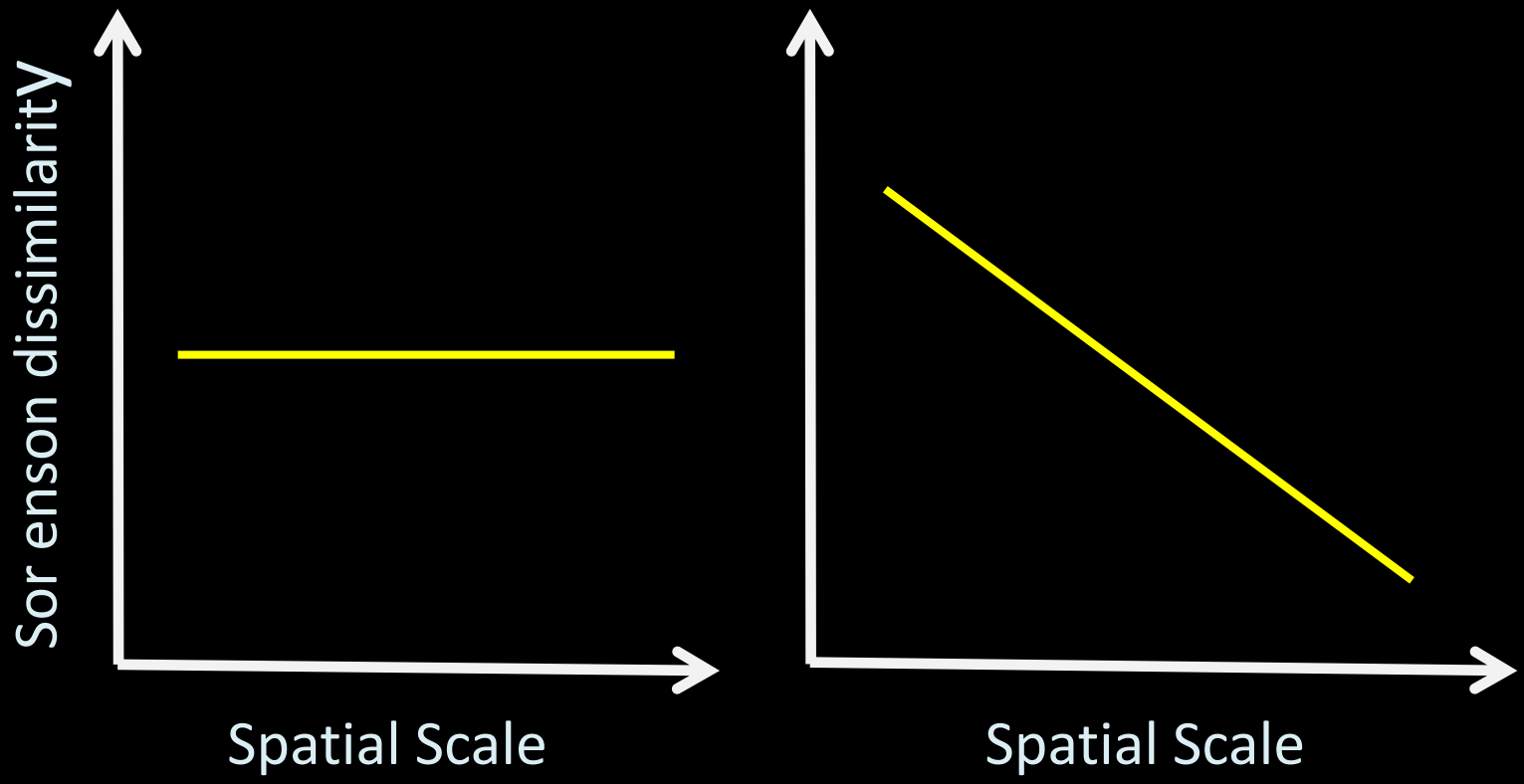
Trend of Sorenson index on axis of spatial scale



Trend of Shannon index on axis of spatial scale

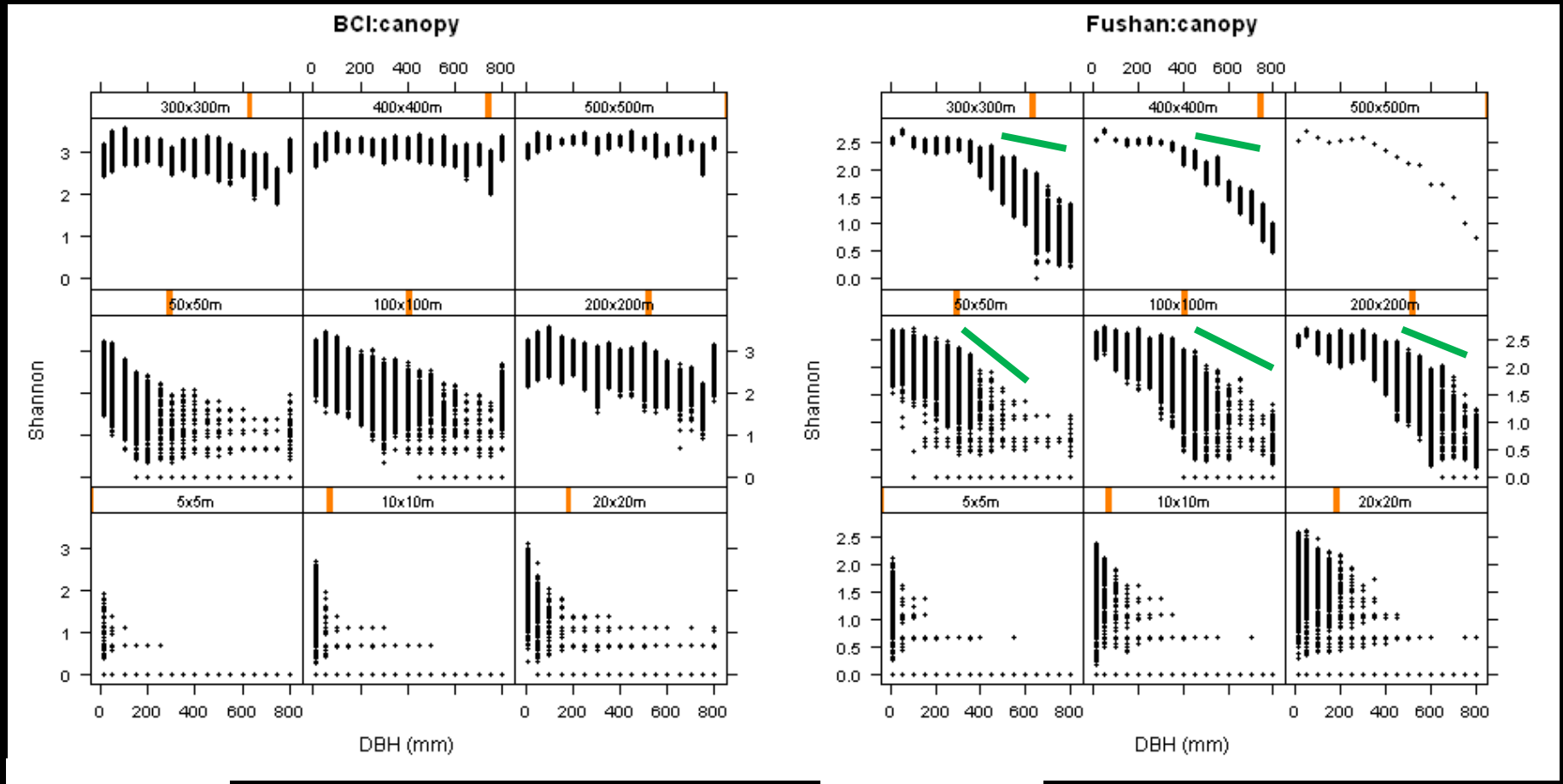


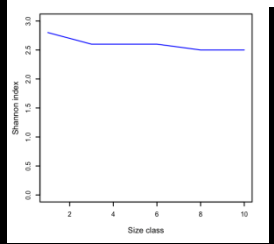
Trend of Sorenson index on axis of spatial scale

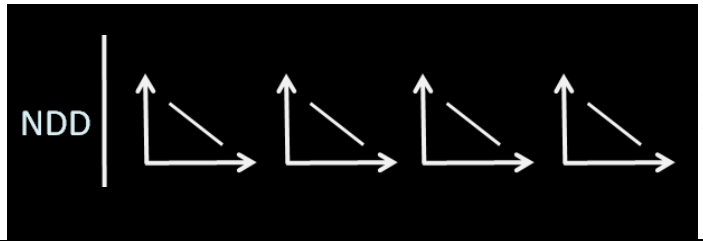


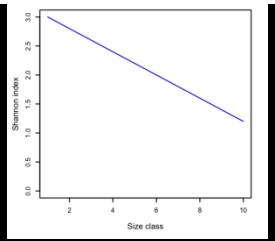
Preliminary results

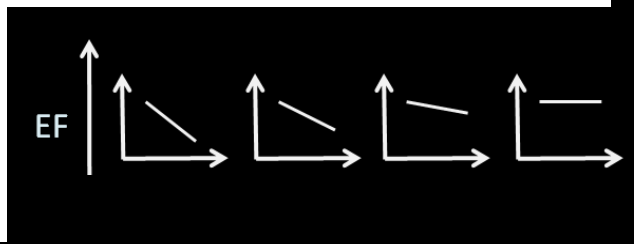
- Shannon index



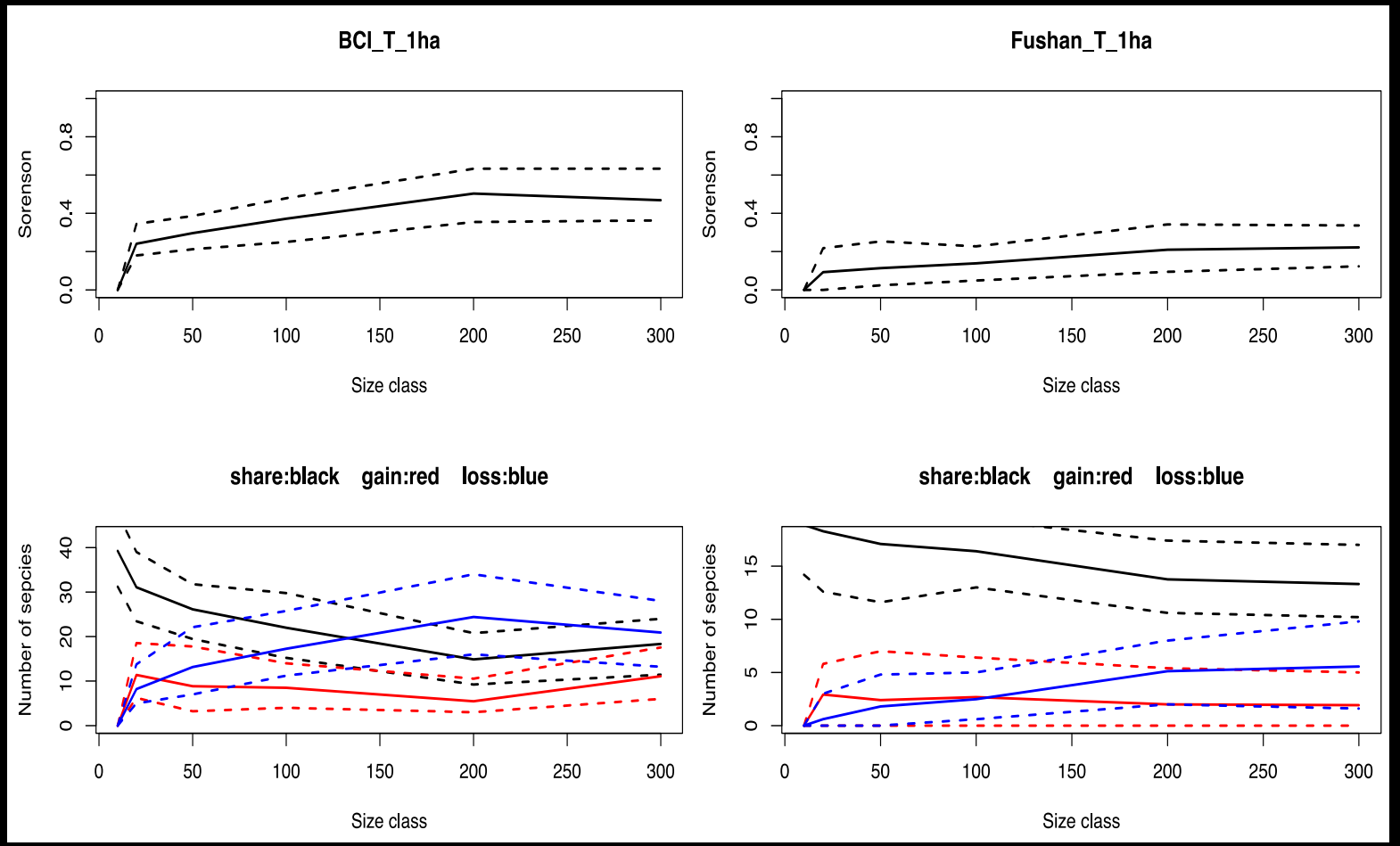


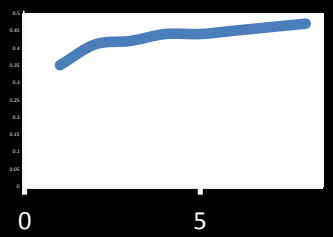




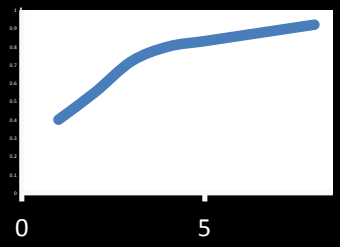


Beta diversity Small spatial scale



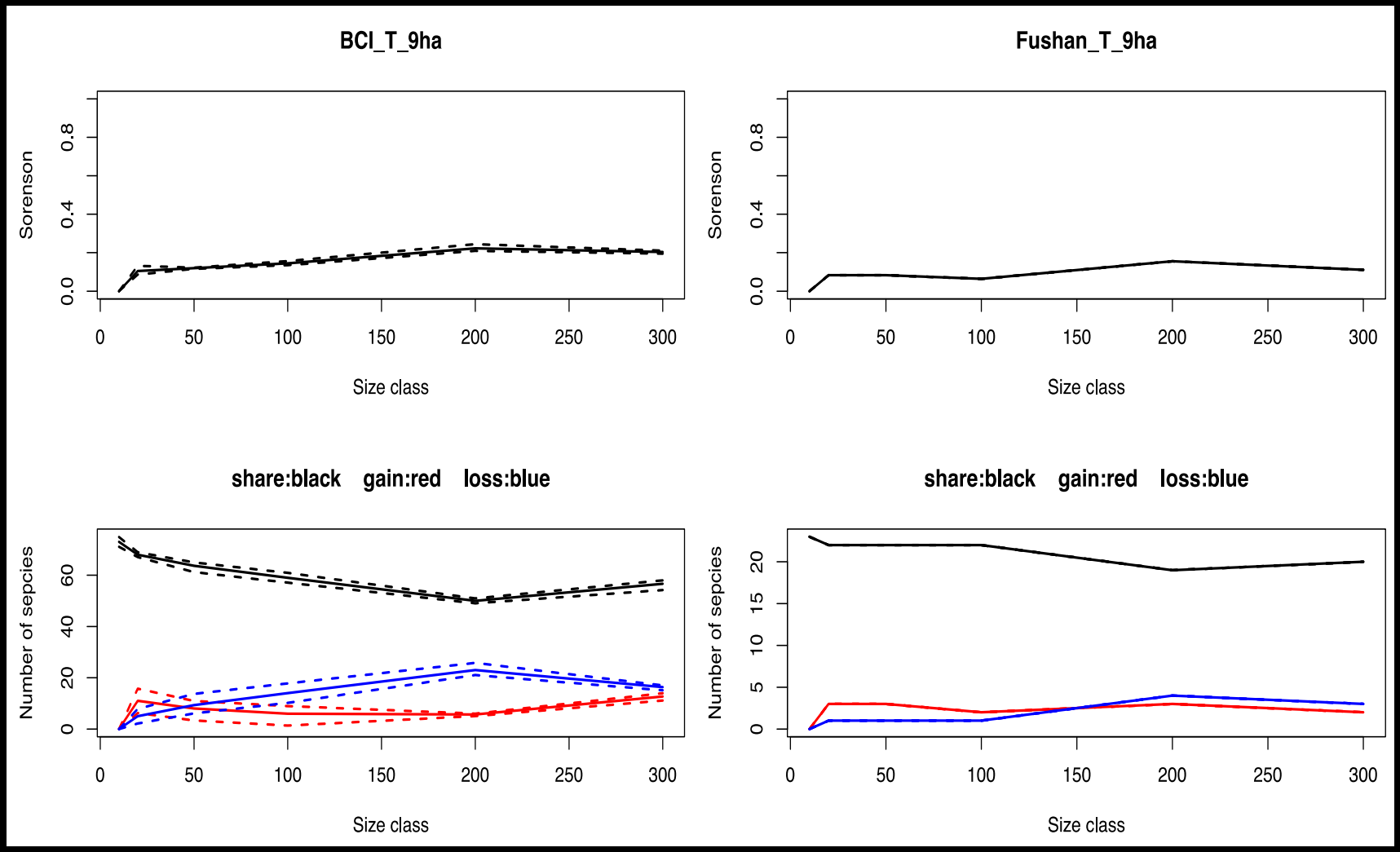


J-C hypothesis
Intra- > inter-spp. comp

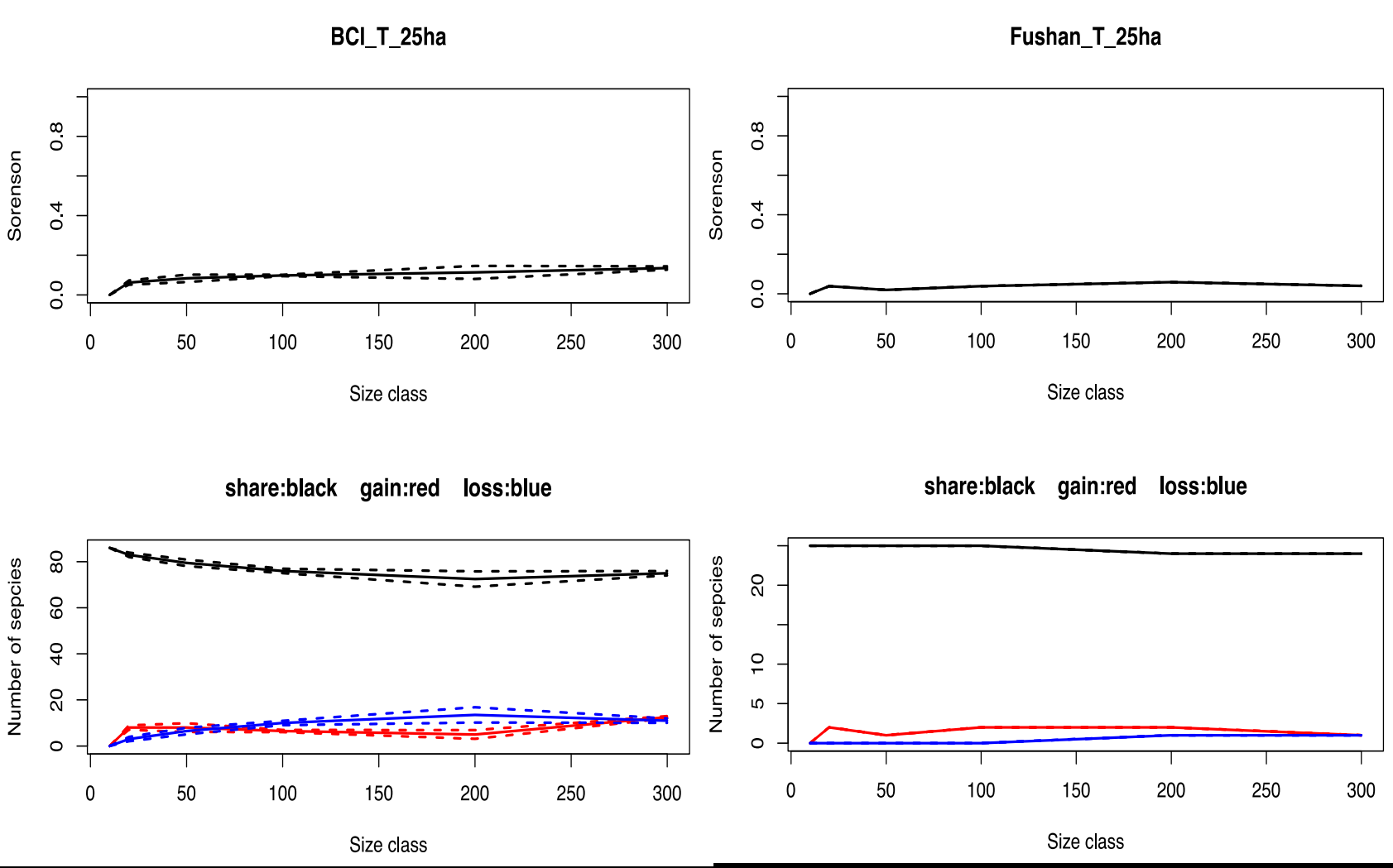


Environmental filtering
Inter- >intra-spp. comp

Mid spatial scale



Large spatial scale



NDD or environmental filtering?

- Our result implies stronger effect by environmental filtering both in BCI and Fushan forests.
  - Under rather constant beta dissimilarity, alpha index decreased in large size class, which indicates increasing unevenness locally.
  - Fushan plot experienced stronger filtering effect.
- Increasing difference is mainly caused by loss of individuals/species, not by local presence of new species.

Future work

- Substantial statistical tests and null models
- Simulations for different scenarios
- Additional aspect: functional trait?