

# Environmental and spatial controls of taxonomic versus trait composition of stream biota (Göthe et al. 2016) [1]

The spatial organisation of biotic communities derives from factors operating at a wide range of spatial and temporal scales. Despite strong scientific evidence of prevalent spatial control of community composition in freshwater ecosystems, local environmental factors are often considered as the main drivers of community change. Furthermore, taxonomic approaches are most frequently used, and few studies have compared the relative importance of local and regional control of trait versus the taxonomic composition in stream ecosystems.

Using a spatially dense data set covering all stream sizes in a lowland European region of c. 42 000 km2 and three organism groups (macrophytes, macroinvertebrates and fishes), we compared the relative importance of spatial and environmental determinants of species and trait composition in the study streams, classified into headwaters (stream order 1-2) and downstream sites (stream order >2).

We hypothesised that (i) there is a higher correspondence between environmental conditions and trait composition than with species composition, (ii) dispersal limitation (pure spatial structuring) is greater in headwaters than in downstream sites and (iii) dispersal limitation (pure spatial structuring) is weakest for macroinvertebrates, intermediate for macrophytes and strongest for fishes.

The most consistent pattern across organisms and stream order groups was a higher correspondence between environmental variation and trait composition as well as a higher number of environmental variables significantly related to trait composition than with species composition (hypothesis 1). Spatial structuring peaked in headwater macrophyte communities and downstream fish communities (hypotheses 2 & 3) - a pattern that was amplified when separate analyses of traits describing species dispersal potential were undertaken.

Our study highlights the potential of traits to capture multiple environmental changes in stream ecosystems and illustrates how organism-specific and highly context-dependent patterns in community organisation can emerge as a consequence of interactions between habitat connectivity (i.e. top versus lower parts of the stream network) and organism dispersal potential.

## **Publication Date:**

Friday, 9 December 2016

### **Full reference:**

Göthe, E., Baattrup-Pedersen, A., Wiberg-Larsen, P., Graeber, D., Kristensen, E. A., & Friberg, N. (2016). Environmental and spatial controls of taxonomic versus trait composition of stream biota. Freshwater Biology

## Link to DOI:

http://dx.doi.org/10.1111/fwb.12875 [2]



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