A shared component hierarchical model to represent how fish assemblages vary as a function of river temperatures and flow regimes

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Abstract: Studies on global change have pointed out a fast evolution of temperature and flow regimes over the few last decades. It is therefore of primary importance to understand how these changes influence the aquatic systems functioning. A hierarchical model is developed to understand how juvenile fish assemblage structure answers to interannual variations of temperature and flow regimes. Long-term datasets are necessary to study global change effects. Datasets of water temperatures, flows and electric fishing samples have been collected on the upper River Rhone since 1980. A latent variable of interest is introduced to represent the common source of variation for the environmental and the biological data. This shared component links two sets of variables with different types: on one side, the latent variable can be understood as a factor from the continuous explanatory variables recording the environmental variations while, on the other side, it can be considered as a logistic regressor in a multinomial response model for proportions of various fish species juvenile collected under poorly controlled electro-fishing experiments. The response variable consists in three groups of species determined according to their synchronic reaction to environmental variations. Inference relies on Monte Carlo Markov Chain techniques under the Bayesian paradigm.