
A multi-faceted view of biodiversity to disentangle the assembly rules of Guianese freshwater fish assemblages

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Abstract

Both evolutionary and ecological processes affect the assemblage composition and spatial structure. To disentangle their relative strength, community ecologists have shifted from the use of taxonomic based information (species identity and richness) towards a more extended view of biodiversity that also encompasses the species role in the ecosystem (functional diversity) and their evolutive history (phylogenetic diversity). Combining taxonomic, functional and phylogenetic information and looking at the relationships between those facets can help to better understand assembly rules. We here used this framework to unravel the local and regional processes that structure Guianese freshwater fish assemblages, in both small streams and larger rivers.

We showed that, locally, neither environmental filtering nor limiting similarity dominates within-assemblage diversity, both for river and stream assemblages. The explanation to this neutral assembly process might lie on the fact that fish diversity is mainly driven by the size of the stream in French Guiana, leading to a high heterogeneity of habitats that blurs environment and competition effects. At the regional scale, dispersal limitation was the main driver of fish assemblage spatial structure, but the causes of this limitation differed between streams and rivers. Indeed, between streams assemblages, rivers constitute the main barriers to dispersal for stream fish, whereas the marine environment is a barrier to fish inhabiting rivers.

This work will constitute a basis to evaluate the future impact of anthropogenic disturbances on freshwater fish assemblages, as we can expect that, with the strong changes induced in local environmental conditions, the processes structuring both local assemblages and their structures will also change.

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