Effects of anthropogenic disturbances on temporal trends of indicators of ecological, morphological and phylogenetic diversity

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Résumé

Anthropization can lead to a strong modification of communities especially in aquatic ecosystems where disturbances of geomorphological characteristics can highly modify biodiversity patterns and ecosystem functioning.
In this context, it is necessary to understand how these disturbances can affect different facets of biodiversity, such as phylogenetic but also ecological and morphological diversity. Recently, several metrics have been developed so as to evaluate biodiversity and the effects of anthropogenic disturbances on these metrics have been documented. But the effect of these pressures on the dynamic of the temporal trends of these diversity indcators remains unknown.

In this study conducted at national scale, we used morphological and ecological databases on 70 species of freshwater fish for which abundances values were known. From another data set of roughly 400 sites all over France sampled on at least 10 years and for which hydrological, geomorphological and connectivity alterations have been documented, we analyzed the temporal dynamic of ecological, morphological and phylogenetic indicators in freshwater fish communities. We also studied the link between these temporal trends and the population dynamics of the different freshwater fish species so as to identify which species contribute the most to temporal trends of the diversity indicators.

We focused on three metrics or components of diversity: richness (FRic), evenness (FEve), divergence (FDiv). Several phylogenetic metrics (phylogenetic diversity PD, phylogenetic evenness PEve and MNTD) were also calculated based on a phylogenetic tree of stream fish species.

Globally, we showed significant effects of some disturbances and climatic factors on temporal trends of diversity indicators, depending on the facets and the components considered. We quantified the relative contribution of species to temporal trends of diversity indicators and showed that the contribution of species differed between components and facets.
These results highlight how exploring various biodiversity facets provide promising insights into our understanding of community responses to anthropogenic pressures and could be useful for both conservation and biodiversity management studies.

Mots-Clés: Temporal trends, Anthropization, Functional diversity, Phylogenetic diversity

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