
Effects of anthropogenic pressures on morphological and phylogenetic diversity in french fish communities

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Abstract

Anthropization can lead to strong modifications 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 functional diversity. Recently, several metrics have been developed so as to evaluate biodiversity but the effects of anthropogenic disturbances on these metrics have rarely been documented.

In this study conducted at national scale, we used a morphological database on 66 species of freshwater fish for which abundances values were known. From another data set on 1391 sites all over France for which hydrological, geomorphological and connectivity alterations have been documented, we defined four levels of disturbances from reference to highly disturbed sites. We used 14 morphological ratios to quantify functional diversity among these sites described by four metrics: functional richness (FRic), evenness (FEve), divergence (FDiv) and dispersion (FDis). Several phylogenetic metrics (phylogenetic diversity PD, phylogenetic evenness PEve and MNTD) were calculated based on a phylogenetic tree of stream fish species.

Overall, we found significant effects of perturbation levels on metrics values, especially for highly disturbed sites with a decrease of diversity in disturbed conditions.

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.

Keywords: anthropization, functional diversity, phylogenetic diversity, conservation

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