Temporal dynamics of assembly rules in stream fish communities

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Abstract

Communities, defined as local assemblages of co-existing species, represent non-random samples of the regional species pool in terms of functions and/or evolutionary history. Assembly rules theory provides an appropriate framework to understand community dynamics and mechanisms shaping diversity at the community level. Two main non-mutually exclusive mechanisms have been proposed to understand community assembly: habitat filtering and biotic interactions (e.g. competition). In the context of global changes, the dominant processes governing assemblages likely change over time since reassembly of communities can lead to novel assemblages. However, although community responses to global changes are fairly known, how assembly mechanisms are influenced by global changes remains unexplored. Based on national monitoring data collected over the last decades in France, we explored temporal changes in mechanisms shaping stream fish communities in 585 resurveyed communities since the 90s. Mechanisms were identified for each community using effect sizes of functional and phylogenetic diversity indices, and their dynamics over time was assessed using linear mixed-effect models. Our results revealed that the relative importance of competition in shaping communities decreased over time while changes in the strength of habitat filtering depended on the considered diversity metric. We emphasized that these changes were linked to global changes experienced by fish communities. Indeed, changes in temperatures, precipitation and non-native species abundances influenced habitat filtering while changes in land use modified competition between coexisting species. Understanding the dynamics of these mechanisms is essential to fully encompass the impact of environmental changes on community assembly.

Keywords: Assembly rules, community, temporal changes, competition, habitat filtering

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