Relationships between taxonomic and functional diversity: insights into assembly processes.

STAGNOL Doriane [1,2,*], BACOUILLARD Lise [1,2], DAVOULT Dominique [1,2]

1: Sorbonne Universités, UPMC Univ Paris 6, Station Biologique, Place Georges Teissier, F-29682 Roscoff, France.

2: CNRS, UMR 7144 AD2M, Place Georges Teissier, F-29682, Roscoff, France.

* Corresponding author. Email: doriane.stagnol@gmail.com

Abstract

Among the potential indicators of biodiversity, those based on the functional traits of species are interesting because they measure the aspects of diversity that potentially affect community assembly and function. However, trait-based approaches are still rarely considered and little is known about the degree to which taxonomic diversity (TD) and functional diversity (FD) are correlated. Yet, this relationship is thought to depend on the extent of ecological redundancy within the assemblage, i.e. the number of taxonomically distinct species that exhibit similar ecological functions. In this study, we characterized taxonomic and functional diversity within and between two marine habitats (rocky shore vs mudflats) under human-induced disturbances. Models were also used to test whether the relationship between TD and FD differed according to the indices used to characterize them. We found little effect of human disturbance on the shape of the TD-FD relationship, whereas communities of the mudflat appeared to be less redundant than those of rocky shore. This could be explained by the assembly rules of ecosystems: biotic filtering (competition and resource partitioning) reduces redundancy by selecting for functionally dissimilar species, whereas abiotic filtering increases redundancy by selecting for similar species sharing adaptations to a particular environment. The rocky shore environment is characterized by heterogeneity that allows the formation of distinct ecological niches that can be colonized by similar species: the abiotic filtering does not limit the redundancy permitted by habitat. Conversely, in the more homogeneous environment of mudflat, the biotic filter mitigates redundancy. Trait-mediated abiotic filtering appears to play an important role in community assembly in complex habitats, whereas the relative importance of competitive exclusion appears to be greater in homogeneous habitats.

Keywords: community assembly, biological traits, functional redundancy, ecosystem functioning