

Biotic resistance in freshwater fish communities

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Abstract

Invasions of non-native species cause problems in ecosystems worldwide, and despite the extensive effort that has been put into research about invasions, we still lack a good understanding for why some, but not other, communities resist these invasions. In this doctoral thesis I test hypotheses on biotic resistance using a large dataset of more than 1000 both failed and successful introductions of freshwater fish into Swedish lakes. We have found that the classic species richness hypothesis is a poor descriptor of introduction success because it fails to acknowledge that resident species contribute to the resistance in different ways. We developed a new measure of biotic resistance, the weighted species richness, which takes into account that the resident species contributes to the resistance with different strength and sign. Further, we correlated performance traits of species in their role as an invader and as a resident species to predict how the biotic resistance of these communities would develop over time. We found a positive correlation between performance traits: Some species have high introduction success, they make a large contribution to the resistance, and they cause extinctions when introduced but do not go extinct themselves when other species establishes, whereas other species are weak performers in these respects. Thus, the biotic resistance of these communities should grow stronger as non-native species accumulates. These results give us clues about what type of communities that should be most sensitive to further invasions, i.e., communities harboring species weak performers.

My results show that the biotic resistance of communities is an important factor in determining invasibility of a community. They also show that methods for quantifying resistance must take into account how interactions are structured in nature. What determine the biotic resistance of a community is the type of interactions that the resident species have with the invader and not the species richness of the community.

Keywords

biotic resistance; freshwater fish; introductions; invasions; invasion success; invasibility; invasiveness; species richness; saturation; species identity; weighted species richness

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