The effects of intra- and interspecific competition on mortality and growth of tropical tree seedlings

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Background: An important question in Ecology is how so many species can coexist in mega diverse regions, such as tropical forests. One of the main coexistence mechanisms is negative density dependence (NDD), especially at the seedling stage, due to Janzen-Connell effects and intraspecific competition. Most studies have focused on the former rather than the latter, even though they may contribute differently to coexistence. This is because competition not always leads to death as plants can compensate for the high density of neighbours with a plastic response involving decrease in growth rate and reproductive success. Additionally to resource sharing within seedlings, they may also compete with conspecific and heterospecific adults. Nevertheless, conspecific effects should be stronger as a requirement for NDD to promote diversity. Here we assess the effects of intra- and interspecific competition on mortality and growth of seedlings of five tree species of the Brazilian Atlantic Rainforest.
Method: We used modern spatial point pattern analysis with appropriate null models to assess density dependent mortality due to intraspecific competition within seedlings, the probability of seedling mortality near conspecific and heterospecific adults, the effects of intraspecific competition within seedlings on their size, and the effects of intra- and interspecific competition from adults on the size of seedlings.
Result: Only one species presented density dependent mortality due to intraspecific competition within seedlings. The probability of seedling mortality was random in relation to the distance from conspecific and heterospecific adults for all species. Three species, which do not include the one that showed density dependent mortality, presented decrease in growth at areas with high seedling density and near conspecific adults. Only one of them also presented decrease in growth near heterospecific adults.
Conclusion: Mortality due to intraspecific competition is not pervasive at the seedling stage as to promote coexistence through NDD. However, NDD is not restricted to seedlings and future studies should aim at integrating the lifetime effects of neighbours across all stages in order to assess the full scope of density dependent mortality in community assembly at the Brazilian Atlantic Rainforest. This study also shows that plants may respond differently to resource sharing, as some of the species studied presented decrease in growth rather than mortality.