Does high functional diversity constrain intraspecific trait
variation in grassland communities?Grace Walker Mitchell & Benjamin Gilbert
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Background

Functional diversity can be defined as the distribution of functional traits in a community, and is useful for quantifying and comparing diversity within and between ecological communities (Forsyth and Gilbert, 2020).

- It refers to traits that impact fitness indirectly through effects on growth, survival, and reproduction (Violle et al., 2007).
- While interspecific variation is an important contributor to community functional diversity, the contribution of intraspecific variation at the individual level is less well understood, and is explored here.

Questions

- Do communities with low functional diversity experience higher levels of intraspecific trait variation at the individual level?
- Does the environment play a role in the ability of intraspecific variation to expand in communities with low functional diversity?

Hypotheses

If there is a given amount of functional diversity in a community (the range of x-values of the red curve in Fig. 1), we expect each species to occupy a range of trait values distinct from other species, with little overlap, to minimize



- competition (MacArthur and Levins, 1967).
- In communities with a lower species richness, each species should be able to occupy a wider breadth of trait values since they are less constrained by other species (panel b, Fig. 1).
- We hypothesize that in communities that have been calculated to have low functional diversity (based on past years' data), there should be a higher amount of intraspecific variation at the individual level compared to communities with high functional diversity.

Trait

Fig. 1: In more species rich communities (a)), intraspecific trait variation is more constrained in comparison to less species rich communities (b)), indicated by the breadth of the grey curves. In a), each species is constrained to a smaller portion of total functional diversity (red) to minimize competition. In b), intraspecific variation can increase while niche differentiation is maintained, due to lower species richness.



Methods

- This experiment was conducted at the Koffler Scientific Reserve in Newmarket, Ontario.
- The study site is an experimental field comprised of 14 blocks. Each block contains eight 0.5m x 0.5m plots, eight 1m x 1m plots, and four 2m x 2m plots (Fig. 2).
- In every block, two plots of each size with the highest and lowest functional

Fig. 2: The layout of the blocks in the experimental field (right) and the layout of plots within each block (left).

Discussion

If we reject our null hypothesis and conclude that intraspecific variation is higher in low functional diversity communities, it would indicate that intraspecific variation is an important contributor to functional diversity in certain communities and should be included in future functional diversity measurements. diversity were sampled, for a total of 6 plots per block.

- During the peak bloom time of every species that was found within the chosen six plots per block, 6 individuals were randomly sampled for functional trait measurements.
- The traits measured were: specific leaf area, stem specific density, reproductive to vegetative biomass, and maximum plant height.
- Data collection is still in progress, and statistical analyses have not yet been conducted.

References

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