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Herbivore personality and plasticity in food web interactions

Research Summary:

The relationship between predators and their prey has long been viewed as a gradual antagonism, in which adaptation occurs slowly through reciprocal shifts in hunting and evasion tactics. The stability of predator-prey relationships depends on how prey respond to predators; flexible responses tend to increase stability of the relationship, whereas inflexible responses tend to decrease stability (Fischer et al. 2014). Behavior is an immediate way for prey to cope with change because behavioral responses are rapid and highly flexible (Kawecki & Ebert, 2004; Sih et al. 2004) Flexible behavior provides a way for individuals to acclimate to change within their lifetime, including changes to their predation landscape.

Predators can reduce prey fitness directly through mortality and indirectly through risk perception, which alters prey behavior, growth, and development (Agrawal 2001; Sih et al. 2004). Predation risk varies in both time and space (Schmitz 2010) which has theoretically favored the evolution of behavioral plasticity, allowing prey to respond adaptively by reducing immediate risk. However, ecologists are increasingly recognizing that behavioral differences between individuals exhibit a high degree of consistency. Consistent behavior across environmental context is termed a personality trait. Personality on a shy-bold continuum has important implications for the outcome of ecological interactions (Belgrad & Griffen 2016; Start & Gilbert 2017). Individuals exhibiting bold personalities may forage at higher rates and hence have higher fitness than shyer individuals. Alternatively, boldness may reduce fitness if it results in lethal encounters with predators.

I used grasshoppers and spiders at Yale-Myers as a model system understand the effects of personality in an ecological setting. I set out to measure (1) whether personality is consistent over an individual's lifetime (2) whether personality is plastic under predation risk (3) and whether individual personality influences herbivory and survival.

