**The mechanisms of frequency-dependent selection in gynodioecious *Lobelia siphilitica***

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Frequency-dependent selection occurs when the fitness of an individual depends on its phenotype and on the frequency of that phenotype within the population. Negative frequency-dependent selection is thought to be common in gynodioecious plants, where individuals are either female or hermaphroditic plants; if the fitness of female plants is limited by the availability of pollen to fertilize their ovules, then females should have higher fitness when they are rare relative to hermaphrodites. Although negative frequency-dependent selection is often invoked to explain how females persist in gynodioecious species, it is rarely experimentally tested. To test whether females have higher fitness when rare, we manipulated the frequency of female and hermaphrodite plants within artificial populations of the gynodioecious wildflower, *Lobelia siphilitica*. We also hand-pollinated half the female plants in each population to test whether the mechanism of frequency-dependent selection is variation in pollen availability. Females set 44% more fruits in populations where they were rare relative to hermaphrodites, as expected if frequency-dependent selection contributes to the persistence of females in gynodioecious species. However, the relationship between fruit set and female frequency was the same for hand- and open-pollinated plants, indicating that variation in pollen availability was not the mechanism of frequency-dependent selection. Instead, both hand- and open-pollinated females produced 33% more flowers in populations where they were rare, suggesting that changes in flower production can also be a mechanism of frequency-dependent selection. This mechanism could explain how females persist in gynodioecious species even when reproduction is not limited by pollen availability.