

Does sexual allocation favor masting?

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Many tree species in mature forests have masting behavior, i.e. reproductive activity fluctuates among years, with a large variance. There is often synchrony of flowering and fruit production over extensive spatial areas on various scales. Resource-based models [1, 2] that include non-linear resource allocation and pollen exchange successfully explain some characteristics of masting phenomena. However, these models assume that cost for seed crop is proportional to the cost of male flowers. This is not always the case of *Quercus* because *Quercus* produces male flowers even in crop failure years [3]. Here we introduce an evolutionary game model under frequency dependent selection that considers evolution of sex-ratio based on an extension of Satake & Iwasa's global pollen coupling model [2].

We define the invasion fitness from the reproductive success of a rare mutant every year, and examine pairwise invasibility plot (PIP) to determine the evolutionary course of sex-ratio, assuming the lottery process. We then carry out the direct simulation of the evolutionary process to confirm the scenario deduces from the PIP, and show a seed crop dynamics for an evolved value of sex-ratio.

The model suggests that masting dynamics is favored for a considerably large parameter range together with a polymorphism of sex-ratio, even in including a large mutation step. In addition, We will discuss the reason why there are many individuals producing male flowers in crop failure year.

References

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