The role of seedling bank in the evolution of masting in trees

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Trees in mature forests often show intermittent reproduction. Intensive flowering and seed production occur only once in several years (masting), often synchronized over a long distance. Coupled map models have been adopted for the dynamics of individuals' resource reserve. Here, individual tree accumulates resource every year, and invests it to reproduction when resource reserve exceeds a threshold. Reproductive investment depends on a key parameter k (resource depletion coefficient). When k is large, tree invests a lot of resources for a reproductive opportunity and needs several years before recovery to the reproductive threshold. Hence the tree reproduces intermittently. Trees in the forest are coupled with each other by the need of outcross pollen, resulting in synchronized reproduction (masting). When k is small, trees reproduce every year (no masting).

In this talk, I discuss the evolution of resource depletion coefficient k. Basic assumptions are as follows: a forest consists of N individuals (constant). An individual seedling is recruited from seedling bank when a tree falls down, seedling inherits k from one parent in equally probability, and mutation occurs in a small probability. I found that tree evolves masting (k becomes large) when survivorship of seedlings is large to form a seedling bank in the understory. Otherwise, tree reproduces every year (k becomes small). The stochasticity caused by the finiteness of population size also promotes masting evolution.