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Adaptive life-history and eigenfunctions in structured population models

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Life-histories in organisms faced with various selection pressures such as heterogeneity, intra- and inter-specific competitions, and variable environment. Ecologists have thought that evolution maximizes different objects from each pressure. For example, in the absence of the competitions, conventional Darwinism asserts that the adaptive life history maximizes the population growth. On the other hand, the presence of competitions is thought to evolves un-invadable life strategy from any other strategies such as maximizing the carrying capacity that r/K-selection theory asserts. Difference of each habitat, thus, yields different objective function and diversity of life-histories from precocity to altricity.

However, there is ambiguity involved in necessity for different objective function in each habitat. It is difficult to define the threshold changing from population growth rate to carrying capacity, as objective function. This difficulty fades r/K-selection theory and makes ambiguity in categrization of life history evolution. On the other hand, several indices which the fittest species have are suggested (ESS etc.), and these have a common point that the fittest species or genetic group occupy their habitat. If an objective function addresses the common point without presence and absence of competitions, and if it evolves all traits that are precocity, altricity, and so on in life history, evolution of life-history can be systematized by maximizing (or minimizing) a unique objective function.

In this presentation, I would like to propose that the adjoint eigenfunction providing reproductive value in a structure population model is a candidate of the unique objective function.

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