

**Title: How do changes in population size affect hybrid speciation?**

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**Abstract:** Due to human activities and environmental changes, many species are in risk to become extinct. Extinction and speciation, i.e., the formation of new species, are natural mechanisms, with the former being deregulated through the action of humans. It is therefore crucial to better understand the genetic mechanisms responsible for the establishment and maintenance of reproductive isolation. In particular, having two previously isolated species coming into contact may have diverse outcomes: stable coexistence, one species taking over the other or more rarely the formation of a new species. This latest case, named hybrid speciation, is one of the hotly debated questions in the research area of speciation that has received a lot of attention recently [1,2,3,4].

The probability of hybrid speciation is usually investigated assuming that the population size is constant: selection only affects the relative proportions of the genotypes but there is always enough offspring produced each generation to reach the carrying capacity; this selective scheme is called soft selection. Here, we want to investigate what happens when this unrealistic assumption is released. We aim to address this question using C++ simulations, which have been previously implemented for the study of hybrid speciation with soft selection [3]. The student's project will be to implement hard selection (i.e., selection affects the size of the population) in the C++ program, and to compare how soft and hard selection impact the probability of hybrid speciation. The project involves coding in C++, visualization with R or Mathematica, and the interpretation of simulated data with respect to a biological question.

**References:**

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