Regular Systems of Inbreeding

Rates of increase in the inbreeding coefficient can be predicted when   a regular system of mating occurs, for example, self-fertilization or brother-sister mating. An analysis of the "pedigree" for the mating system can lead to a recursion relationship between the inbreeding coefficient in one generation and the inbreeding coefficient of previous generations. This application looks at the change in the inbreeding coefficient for several mating systems.

Five mating systems are used as examples:

(1) *Selfing* ± self-fertilization
(2) *Full-Sib Mating* ± brother-sister mating
(3)   *Half-Sib Mating* ± half-brother and sister mate; (mothers of half-brother and sister are full sisters)
(4) *Parent-Offspring Mating* ± offspring mates with younger parent
(5) *Backcrossing* ± offspring are repeatedly mated with the same genetic strain. This genetic strain may have some arbitrary level of inbreeding already.

A diagram of the inbreeding system is given together with the recursion equations. For system (5), you can vary the inbreeding coefficient of the genetic strain used in backcrossing. You should study each diagram to make sure you understand how the mating system works.

You can click the "Plot" button to see a simulation

of the currently chosen mating system. Each simulation assumes the population is completely outbred at the start ($F = 0$). The results for different breeding systems can be superimposed on the same graph for comparisons.

Questions

(1) Which mating system shows the fastest increase in the inbreeding coefficient?

(2) Which mating system shows the slowest increase in the inbreeding coefficient?

(3) Of the inbreeding systems (1)±(4) above, which two breeding systems show exactly equivalent increases in the inbreeding coefficient?

(4) Run several simulations of the "backcrossing" system using different inbreeding values for genetic strain A (F_A). What affect does F_A have on the time course of the inbreeding coefficient?

(5) Simulate backcrossing to a highly inbred genetic strain ($F_A = 1$). What other mating system causes equivalent amounts of inbreeding ?