

9.3 Minimum systems of inbreeding

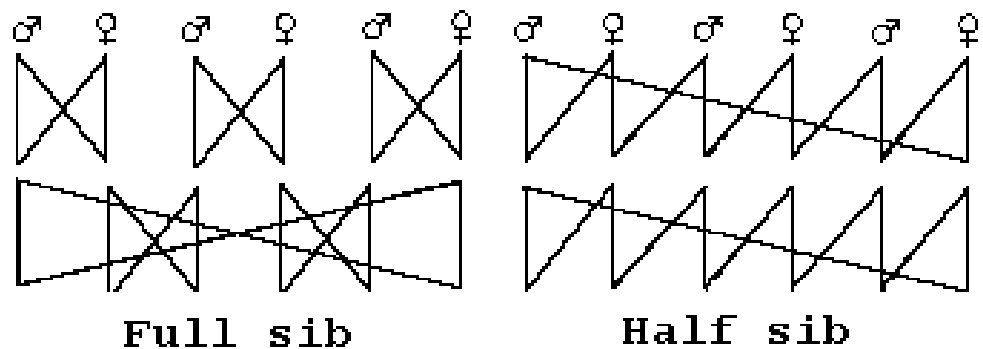
In small populations it is often desirable that the general increase in inbreeding is as low as possible. One way to reduce inbreeding is to arrange the mating so that all animals have the same number of offspring, which are used as breeding animals. In principle every individual should be sire or dame of one male and one female offspring. If this is the case, the effective population size would be twice the actual number. This is due to the fact that random mating, as in a H-W population, in principle will have a left skewed binomial distribution of offspring per animal (a Poisson distribution) with the mean value of two. This is a distribution in which the most frequent number of offspring is 0, 1, 2, 3, 4 per individual. This means that a fair number of individuals in an H-W population does not get any offspring at all.

To ensure minimal inbreeding it is necessary to work systematically. The best and most simple systems use circular mating, as shown in Figure 9.6.

The figure shows a circular half- and a full sib system. The full sib system is easier to use in practice. The half sib system demands the mating of every individual with two different partners. In the full sib system both offspring are normally from the same litter. The figure shows that the half sib mating system is repeated in every generation, whereas the full sib system has a cycle of two generations.

The practical implementation of the full sib system is very simple. Mice for instance are kept in boxes. Place the boxes on a circle, and keep the female offspring in the box where it is born and put the male offspring into the box on the right. Figure 9.6. Circular mating systems with minimum inbreeding.

Corresponding to the cyclic full sib mating system a population can be divided into four groups, numbered from one to four. The female offspring stay in the group, whereas all the male offspring are transferred to the group on the right. The animals can



only be mated with individuals from within the same generation. In this system there is no need to keep track of every single individual. The degree of inbreeding would not be higher if a pedigree had been used for four generations, to avoid close relationship between mated animals.