

3.4 Selection against heterozygotes

The table, which was used in the selection for heterozygotes, can also be used in selection against the heterozygotes. Selection (s) of the recessive and the dominant type now has a negative sign and again it is relative to the heterozygote type, see Figure 3.5.

Table formulating selection for heterozygotes, s_1 and s_2 is now negative:

Genotype	EE	Ee	ee	Total
Frequency	p^2	$2pq$	q^2	$= 1,00$
Fitness	$1-s_1$	1	$1-s_2$	
Proportion after selection	$p^2(1-s_1)$	$2pq$	$q^2(1-s_2)$	$= 1-p^2s_1 - q^2s_2$

After selection the gene frequency is calculated by means of the gene counting method as shown in section 3.2.

$$q' = (2q^2(1-s_2) + 2pq)/(2(1-p^2s_1 - q^2s_2))$$

The frequency q' represents the genes which survive and therefore corresponds to the gene frequency in the next generation before selection. The equilibrium frequency is $q(\text{hat})$, and equilibrium occurs when there is no change from one generation to the next, i.e. $\Delta q = 0$.

$$\Delta q = pq(ps_1 - qs_2)/(1-p^2s_1 - q^2s_2) = 0$$

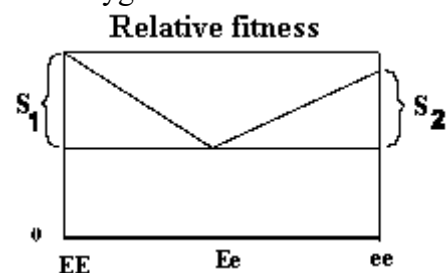
$$q(\text{hat}) = s_1 / (s_1 + s_2)$$

Figure 3.5 shows the fitness level when selection against the heterozygotes has been made. The two homozygote types' fitness level is higher than the heterozygotes, whose fitness is 1.

Δq is the change in gene frequency from one generation to the next. When the gene frequency is larger than the equilibrium gene frequency $q(\text{hat})$, Δq is positive, and when the gene frequency is lower Δq is negative. Therefore selection against the heterozygotes leads to an unstable situation. It leads to fixation of the allele whose frequency is higher than that of the equilibrium. In some cases the heterozygotes can be selected against in one life period and selected for in another, and still equilibrium occurs.

Figure 3.5

Fitness condition by selection against the heterozygotes.



An example of selection against the heterozygotes: When chromosome polymorphism occurs in the Blue foxes, as shown in section 10.3, the heterozygotes individuals have a lower reproduction rate than the homozygotes individuals. But the polymorphism is still found in many natural populations?