The hardy weinberg law

Using the Hardy Weinberg Law in a Squirrel Population The Hardy Weinberg Law allows us to determine allele frequencies in a given population provided that the population is not subject to mutation, migration, genetic drift or selection. In addition, the population must undergo random mating. In the case of a population meeting the above requirements, one can use the expression p^2 + 2pq +q^2 to determine genotypic frequencies. In this formula, let p^2 = homozygous dominant individuals, let p then be the square root of the number used for p^2. Also, let q^2 = homozygous recessive individuals, which means that q is equal to the square root of the number equivelant to q^2. Finally, we can assume that 2pq is self explanatory.

In the case of a squirrel population containing 1, 000 squirrels, there are 2 types of coat colors expressed, red and black. It was determined that 292 squirrels were homozygous dominant, 440 squirrels were heterozygous and 268 were homozygous recessive.

1a. Using the data above, calculate the genotypic frequencies.

The genotypic frequencies are as follows: Let us allow " R" to represent the allele for dominant, red fur. Let us then allow " r" to represent the recessive allele which when presented in a homozygous pair, results in black fur. If 292 squirrels were homozygous dominant, that means that 29. 2% of the squirrels were genotypically RR and red coated. If 440 of the squirrels were heterozygous, then 44% of the squirrel population was Rr and red coated. If 268 of the squirrels were homozygous recessive then 26. 8% of the squirrel population was rr and black coated. These percentages were simply obtained by dividing the number of squirrels within the same genotype (rr, RR or Rr) by the total number of squirrels. This number is a translation of the actual number of squirrels having the same genotype into a percentage of the overall population of squirrels.

1b. Using the data above, calculate the allelic frequencies within the population.

To determine the allelic frequency, we will first look at the formula provided in the beginning of this paper. We must know however that p represents frequency of dominant alleles and q represents frequency of recessive alleles. We know from the above data that p^2 = . 292 and represents percent of homozygous dominant individuals. The square root of . 292 is . 50. Therefore . 50 is the frequency of dominant alleles. In addition, we will want to know the frequency of recessive alleles. It is important to know that q^2 is equal to the percentage of recessive individuals. The square root of that number is the frequency of recessive alleles. In this case, q^2 = . 268. The square root of that number is . 52. Therefore the frequency of recessive alleles is . 52.

2. Was the population from question #1 in Hardy Weinberg's equilibrium Explain using the chi square test.

The chi test is a formula that can be used on each category; recessive and dominant. We compare what we expect to see to what is actually expressed and then we can determine if the population is in Hardy Weinberg equilibrium. The formula for doing this is simply (the sum of) (O-E)^2/E. Let O equal the observed numbers and E represent the expected numbers in each group. We expect to se 750 red coated squirrels and 250 black coated ones. We observed however 732 red coated and 268 black. When plugged in to the chi square model, the result is 1. 73 with one degree of freedom as there are only 2 possible phenotypic categories.

3. Ten years ago, similar results were obtained on the same population of squirrels, but only phenotypes were recorded.

3a. Assuming Hardy-Weinberg equilibrium, calculate the alelic frequencies of this population.

We are given the information that there are 773 red squirrels and 227 black. We have 1, 000 total in the population. We know already that the 227 black squirrels are homozygous recessive (rr) and therefore q^2 = 22. 7%. This means that q=. 48 which represents the frequency of recessive alleles. We then know that p + q = 1, therefore p + . 48 = 1. Thus, p = . 52 and represents the frequency of dominant alleles.

3b. Assuming Hardy Weinberg equilibrium, we know that 22. 7 % of this population is black coated and therefore homozygous recessive (rr). We also have calculated that p=. 52 and p^2 = the % of homozygous dominant. That number is 27% which is out of 1, 000 and is therefore 270 members of the population (RR). The remaining portion of the population is going to be heterozygous. AL we need to do is add 270 + 227= 497. When we subtract 497 from 1, 000 we get 503 which equals the number of heterozygous (Rr) red coated squirrels.

Works Cited

Mader, Sylvia S. Biology. WCB McGraw-Hill, Boston, 1998.