Hardy-Weinberg Equilibrium Practice

Many populations are widespread; when this is the case, individuals are often more likely to mate with neighbors than with geographically distant individuals. Consider the following pair of subpopulations of a tropical butterfly, with genotype frequencies as shown:

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Lowland</th>
<th>Mountain Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>.64</td>
<td>.16</td>
</tr>
<tr>
<td>Aa</td>
<td>.32</td>
<td>.48</td>
</tr>
<tr>
<td>aa</td>
<td>.04</td>
<td>.36</td>
</tr>
</tbody>
</table>

Three biologists head to the field to collect this species, and each ends of collecting 500 individuals.

The first biologist gets altitude sickness easily, so he samples only individuals from the lowlands.

What allele frequencies does the first biologist find (assuming he has a random sample of the population)?

Freq. A =
Freq. a =

What are the expected genotype frequencies assuming Hardy-Weinberg Equilibrium?

Freq. AA =
Freq. Aa =
Freq. aa =

How do the observed genotype frequencies compare to the expected frequencies?

The second biologist hates the heat, so she drives up the mountain and samples only individuals from the top.

What allele frequencies does the second biologist find?

Freq. A =
Freq. a =

What are the expected genotype frequencies assuming Hardy-Weinberg Equilibrium?

Freq. AA =
Freq. Aa =
Freq. aa =

How do the observed genotype frequencies compare to the expected frequencies?
The third biologist is a bit more adventurous, and samples individuals continuously as she hikes up the mountain. Assume that she ends up sampling an equal number from the lowland and mountain top populations.

What are the observed genotype frequencies in the sample obtained by the third biologist?

Freq. AA =

Freq. Aa =

Freq. aa =

What are the allele frequencies in this sample?

Freq. A =

Freq. a =

What are the expected genotype frequencies assuming Hardy-Weinberg Equilibrium?

Freq. AA =

Freq. Aa =

Freq. aa =

Which genotype(s) is overrepresented in the observed sample compared to the expected sample? Which is underrepresented?

What would the third biologist conclude about Hardy-Weinberg Equilibrium?

What assumption that we used in deriving the Hardy-Weinberg Equilibrium is violated in this case?