Project Pigeon Watch

Geog 330, Dr. C.M. Rodrigue
Darby Brooks, Ellis Armendariz, Marinnet Manalo, Katie Drozd

Intro

Our research was project pigeon watch which was started by Cornell Ornithology labs to get more people interested in participating in “citizen science,” no matter where they are from or what their background is. Pigeons were chosen for the study because their populations are accessible and the birds are recognizable to the average person. The goal of this study is to discover why, after many generations of pigeons, the population is not all one color morph. The original, or wild-type, pigeon morph is the Blue-Bar, which is a standard gray pigeon with a dark gray stripe on its wings. The other variations of pigeons are red-bar, checkered, red, spread, pied, and white. There continues to be occurrences of different colors in wild populations although pigeons that have stand out colors are expected to die off after a few generations because predators would eat them first, but there continues to be different colored pigeons. Our two hypotheses try to explain the continued presence of non-wild type morphs in wild populations:
Hypothesis 1: Pigeons that are isolated from the ocean (in the San Fernando Valley) have different color morphs than those that live in coastal areas, where the previous studies have been conducted.
Hypothesis 2: Natural selection favors significantly different mixes of pigeon morphs between urban and natural habitats.

Research and Data Methods

For our research we gathered data by visiting different sites in the San Fernando Valley and observing pigeons and their behaviors in each of these locations.
We visited 6 different sites: Stoney Point Ranch West and East, Reseda Boulevard, Northridge Hospital, Lake Balboa Park, Reseda Park, and Carl's Jr off of De Soto and Lassen.
At these locations we took two 10-15 minute intervals observing the pigeons to see how they interact with one another. While observing the pigeons we took notes on what they were doing and what types of pigeons were present along with their mating habits. Another things we took note on was the habitat of each of the locations and the food that could possibly be around for the pigeons to feed on.
After gathering this information we used the Chi-Square method to interpret what we found in our research. We used the Chi-Square method because it is a useful way to decide whether there is any difference between the observed (experimental) value and the expected (theoretical) value and to see if the color morphs of the observed pigeons are due to random chance or if there is really a major factor that causes the differences in the color morphs when the data is in the form of frequency counts.
We also took into account past pigeon counts from other students and compared their results to our own.

The alpha value chosen was 0.05, we chose this because it reduces the chance of a type 1 error also known as the “false positive” or rejection of the true null hypothesis, in other words it reduces our chance of accepting our hypothesis when it is actually false. Since we have a small sample size, we decided that it it is better to reject a false positive than to accept an untrue hypothesis and therefore a stricter alpha level.

Results

For our first chi squared test, we are analyzing our pigeon count in the San Fernando Valley and the pigeon count collected by our predecessors in rest of the region. Our alternative hypothesis is pigeons that are isolated from the ocean (in the San Fernando Valley) have significantly different color morphs than those that live in coastal areas, and our null hypothesis is that pigeons that are isolated from the ocean do not have significantly different color morphs than those that live in coastal areas. Ourcalc is 12.048 and our crit is 7.815. Since our calc is greater than the crit, this means that we accept the alternative hypothesis and reject the null, which indicates a significance. Our p value is 0.007 and the alpha was set to 0.05. This also indicates a significance since the p value is less than the alpha value. Our effect size is 0.043 and our power is 0.855. For our second chi squared test, we are analyzing pigeon counts in urban areas and pigeon counts in natural areas. Our alternative hypothesis is that natural selection favors significantly different mixes of pigeon morphs between urban and natural habitats, and our null hypothesis is that natural selection does not favor significantly different mixes of pigeon morphs between urban and natural habitats. Our calc is 0.771 and our crit is 7.815. Since our crit is greater than our calc, this means that we accept the null, indicating no significance. The p value is 0.856 and the alpha is 0.05. Since the p value is greater, this also indicates no significance. The effect size is 0.112 and our power is 0.063.

Discussion

According to the results of our first chi squared test, there is a significant difference between the pigeon count in the San Fernando Valley and the pigeon count in the coastal region. This means that the numbers between the two areas vary significantly. Since our effect size of 0.043 is very close to 0, this means that there is a weak association between the pigeon counts in the two areas. Since our power value of 0.855 is above 0.8, this means that we have a good ability to detect a real effect if it is present and we can trust our findings. In our second chi squared test, we have no significance which means that natural selection does not favor significantly different mixes of pigeon morphs in urban and natural habitats. This means that the pigeon morphs from the two areas do not vary significantly. Since our effect size is 0.112, this means that there is a weak association between the pigeon morphs in these two areas. Also, our power is 0.063, which is a weak value. This means that we do not have a good ability to detect a real effect if it is present and trust our findings. This probably means that we needed a bigger sample size.

Conclusion

Project Pigeon Watch is a citizen-science project that collects data regarding pigeon counts, including morphology and mating interaction, at various locations. The goal of this study was to explore whether there is a difference in color morphs in urban and rural habitats or in coastal or inland regions, due to natural selection. Our data implies that there is no significant difference between color morphs in different habitats. Our data was for this hypothesis was under-powered, had a high p-value, and a weak effect. This may have been influenced by a few issues that arose during our study. First, we didn't encounter very many pigeons, leading to small flock and sample sizes at each location. The small sample sizes are likely because we weren't able to get to each location early enough in the day, when pigeons are more present and active in these regions, according to Dr. Christine Rodrigue. Perhaps another study at the same sites, with a larger sample size, would yield more reliable results. Despite not detecting a difference in morphs between urban and rural habitats, we were able to find a significant difference between morph frequencies in our data vs data taken from previous Pigeon Watch studies. Data from this hypothesis was powered and had a moderate effect size, as well as a significant Chi-square value. This implies that there is a difference in morphs found in areas isolated from the ocean, as our sample was taken in the San Fernando valley and previous studies were conducted in regions with no barriers to the ocean. Further researchers may still want to study these sites at an earlier time in order to encounter more pigeons per flock. Throughout the entire study, we experienced difficulty while counting the flock sizes, as the birds tended to either walk or fly around the flock as we observed them. For the same reason, there was some difficulty in confidently distinguishing the color morphs. For future studies, we recommend arriving earlier in the morning, and allowing more time at each site to observe the pigeons and give them more opportunity to interact. Perhaps further research could determine whether there is a significant difference in the number of pigeons at coastal or inland sites.

References

LaBranche, M. S. 1999. *Why Study Pigeons? Birdscope, Volume 13, Number 3: 3.*