

Scientific Method: The Cricket Lab

Purpose:

- To practice the steps of the Scientific Method
- To learn how to use an OnLine Lab simulation
- To determine which environmental variables influence how fast a cricket chirps
- To practice constructing data charts and graphs.

Hypothesis:

The chirping rate in crickets is affected by air temperature and is not affected by atmospheric pressure, humidity, or wind speed.

Procedure:

1. Go to https://www.gc.maricopa.edu/biology/glacier/scientific_method/index.swf
2. Follow instructions below for how to get into the site
YOU DO NOT HAVE TO LOGIN...Click *Continue* and then enter your first and last names
3. Do the tutorial on scientific method first if you want to review the steps (*optional*)
4. Follow the instructions for investigating the role of environmental variables on cricket chirps.
5. Write your results in the data charts below **Values in red are the baseline (control values)**
For your investigation, choose values that are higher and lower than those indicated in red.
You may add rows to the data chart as needed.
You need to record as you go because this OnLine site does not work well if you use the back button!
6. Graph your results using Create-a-Graph (<http://nces.ed.gov/nceskids/graphing/>) or Graph-Pad (<http://antoine.frostburg.edu/cgi-bin/senese/graphpad.cgi>)
Hint: Cricket Chirp Rate is the dependent variable and will be on the y-axis on all graphs!
You only need to construct graphs for the variable(s) that affect cricket chirp rate.

Results:

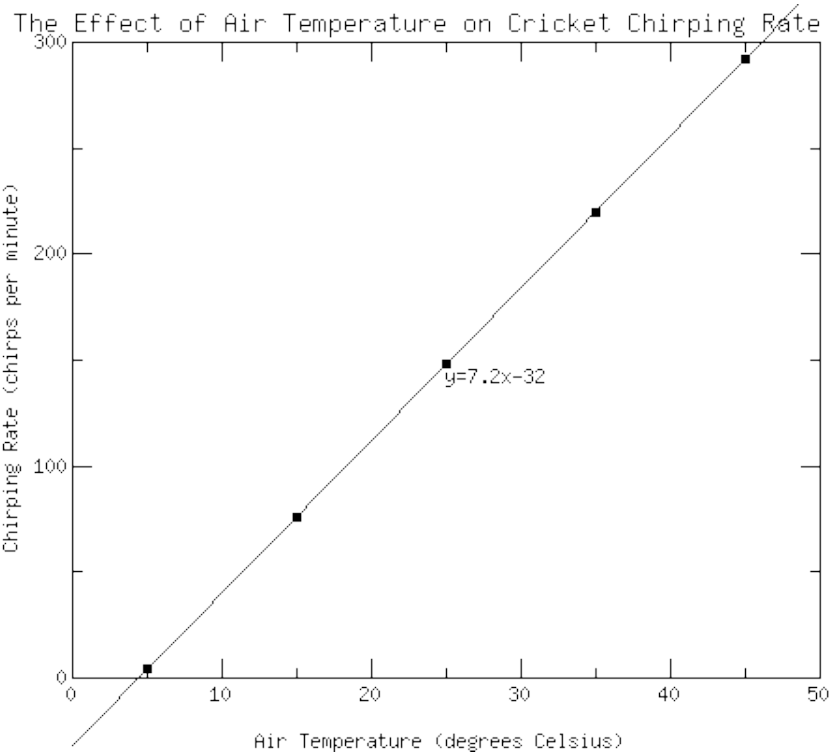
Data Chart A: Effect of Temperature on Crick Chirps	
Temperature (°C)	Cricket Chirp Rate (chirps/minute)
5	4
15	76
25	148
35	220
45	292

Data Chart B: Effect of Atmospheric Pressure on Crick Chirps	
Atmospheric Pressure (mm Hg)	Cricket Chirp Rate (chirps/minute)
700	148
730	148
760	148
790	148



Data Chart C: Effect of Humidity on Crick Chirps	
Humidity (%)	Cricket Chirp Rate (chirps/minute)
10	148
15	148
20	148
25	148
30	148
35	148
40	148
45	148
50	148
55	148

Data Chart D: Effect of Wind Speed on Crick Chirps	
Wind Speed (m/sec)	Cricket Chirp Rate (chirps/minute)
0	148
2	148
4	148
6	148



Discussion:

First, it was observed that one cricket in the White Tank Mountains chirped at different rates on different occasions. Later, the cricket was caught and taken to a laboratory in order to determine whether a single factor affects the chirping rate in crickets. Information from reference books and articles was collected. A hypothesis was formulated and four experiments were run to test the effect of air temperature, atmospheric pressure, humidity, and wind speed on the cricket's chirping rate. The laboratory conditions were set up to recreate the field conditions in the White Tank Mountains. For each experiment, at least two trials were conducted by raising and lowering the independent variable in comparison to the standard and recording the chirping rate of the cricket in number of chirps per minute over ten runs. All variables but the independent variable were controlled for each experiment. By comparing the chirping rate of the cricket for different trials in an experiment, conclusions were drawn. Of the variables tested, only air temperature affects the chirping rate of crickets, and temperature and chirping rate are directly related with chirping rate increasing more than sevenfold in chirps per minute for each degree Celsius increase in temperature.

The experiment supported the hypothesis that air temperature would affect the chirping rate of crickets while atmospheric pressure, humidity, and wind speed would not. The purpose of the experiment was fulfilled through practice with the online simulation and graphing programs. Since the experiment was completed online, there were few to no sources of error. The chirping rate was measured over ten runs to improve accuracy, and the chirping rate either remained exactly the same or changed substantially in response to the independent variable. Thus, it was obvious when an independent variable did or did not have an effect. In real life, the independent variable could change during the measuring of the chirping rate and could lead to error. Additionally, it might be difficult to count the cricket chirps at high rates and to control the other variables.

In this experiment, one cricket was used to make a generalization about all crickets through inductive reasoning. The experiment would be more meaningful if many crickets were used. The crickets would all need to be male since female crickets do not chirp. Otherwise, the experimental design was sound.

Conclusion:

Air temperature directly affects the chirping rate of crickets.

Reflection:

I thought that the temperature would affect the chirping rate of the crickets because temperature affected the respiration rate of goldfish during a physiology experiment in AP Biology. However, I was not sure that none of the other variables would have an effect. The chirping rate of crickets seems quite easy to determine since chirps can be perceived without difficulty even if the cricket moves.

