Kanazawa Izumigaoka High School 06

# An Efficient Method of Farming Crickets
## ~Their Reaction to Light and Sound~

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**Abstract**

There is a serious shortage of food today. Therefore, insect eating is attracting people's attention to solve this problem. And crickets are one of those insects.

However, harvesting crickets is done in an inefficient way. Therefore, we have conducted research on the habits of crickets for a better way of harvesting crickets.

First, we placed the crickets in a straight passage, and gave them stimuli of light and sound. Then, we measured how long they stayed near the light source.

As a result, we found that there was no synergistic effect by the stimuli of light and sound. We also found that crickets are most attracted by the 15kHz sound, but crickets are more sensitive to changes in light than sound.

**Introduction**

Harvesting crickets is done by hand, so it is not an efficient way. If we understand their behaviors, we can harvest them automatically by making use of their behaviors.

It is known that crickets are attracted to lights and 5kHz sounds, which is emitted when crickets show courtship behavior, and escape from 15kHz sounds, which bats emit to look for their food. However it is not known how crickets react when we stimulate them by using both lights and sounds. We considered that stimulating by using both lights and sounds properly is more effective to control them.

We conducted under the following conditions.

① 5kHz sounds from the light source side.

②15kHz sounds from the opposite side of the light source.

Under these conditions, we considered that crickets would stay near the light source side longer. We measured how long they stayed near the light source.

Figure-1. Passage from cardbord

**Experimental device**

We made a passage from cardboard. Its height was 3 cm, width was 3 cm, and length was 49 cm.

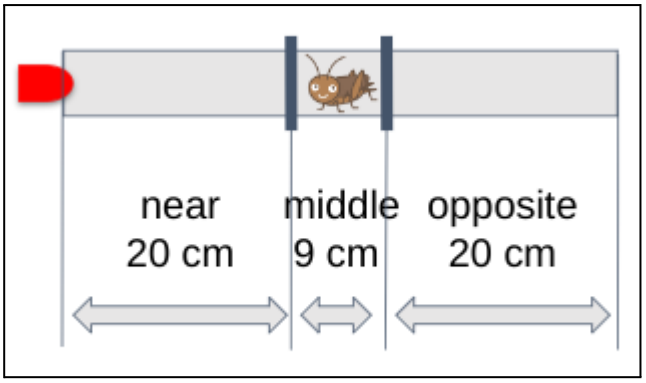


Figure-2. Structure of experimental device

**Experiment 1**

**Method**

We put a cricket (house cricket) in the middle of the passage. We shone light as a stimulus from one side of the passage. The colors and wavelengths of colors which we used were red (620 nm-625 nm), green (520 nm-525 nm), blue (460 nm-465 nm), and violet (390 nm-405 nm). We recorded crickets wandering for two minutes and we measured the time when they had been within 20 cm of the light source. We calculated the average time and compared the time of each color.

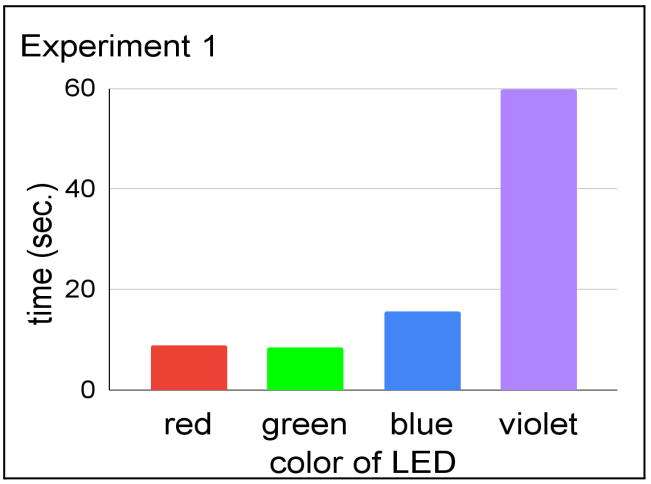


Figure-3. Average of the number of seconds spent on the light source side in each color over a 2-minute period

**Result**

The time of blue and violet are longer than that of red and green.

**Discussion**

Crickets are thought to have positive taxis to blue and violet light, especially violet light. The fact that they were less attracted to longer wavelength lights such as red and green suggests that stronger taxis are seen at shorter wavelengths.

**Experiment 2**

**Method**

We changed the kinds of stimulus and gave the crickets either blue or violet stimulus, plus either 5kHz sound stimulus from the light source or 15kHz stimulus from the side with no light source. The other methods in this experiment were the same as experiment 2.

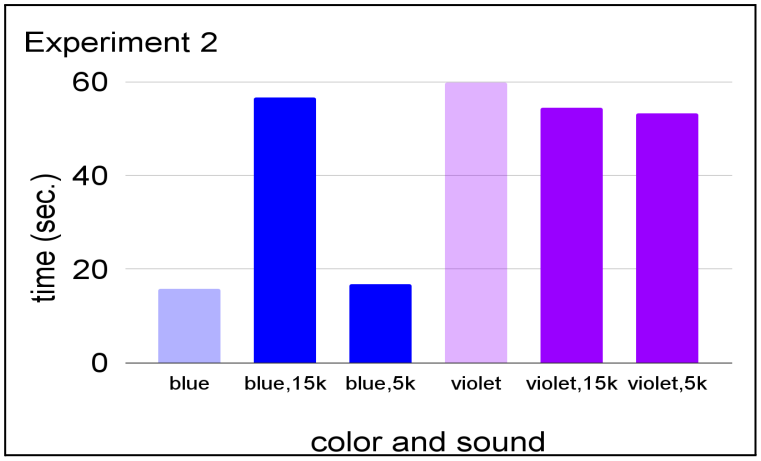


Figure-4. Same as figure-3, but for color is blue and violet, and combined sound

**Result**

Time of the combination of blue light and 15 kHz sound was longer than only blue light. However, the other combinations did not change.

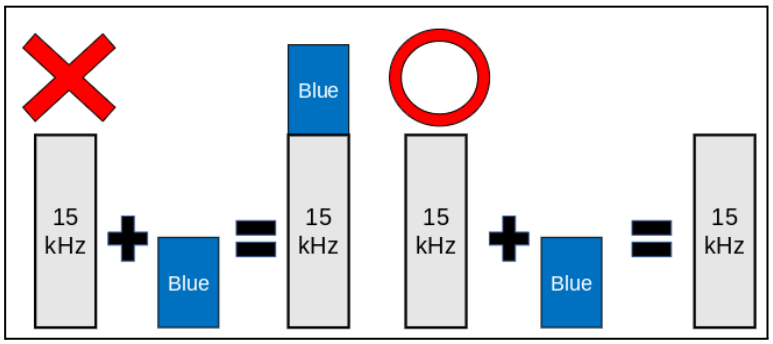


Figure-5. the image of the model we considered

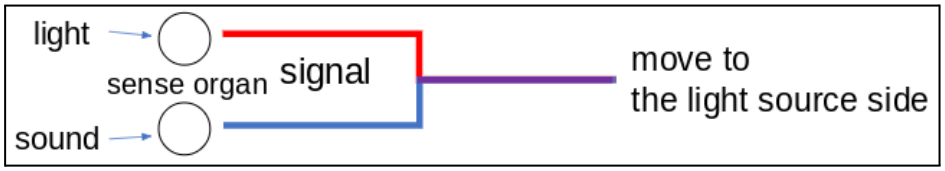


Figure-6. Mechanism of cross talk

**Discussion**

We considered that there are two reasons why other combinations did not attract crickets more strongly.

1.They might not recognize the direction of the sound, because a sound echoed on the wall.

2.The time of crickets staying on the light side is not a sum of times which is caused by lights and sounds but taxis time to the more effective stimulus.(Figure-5)

On the other hand, since the combination of blue and 15 kHz greatly increased the time spent on the light source side, we also considered the possibility of a synergistic effect. If there is a synergistic effect, the following reasons can be considered.

・The signal transmission course of the different systems has an influence on each other like Figure-6 (It is called “Closs talk”).

・Crickets act by thinking in their brain.

**Experiment3**

We did this experiment in a box and put in acoustic insulation to conduct it more precisely. We added the new conditions; no light and sound stimulus, and with either light or sound stimulus. The other methods in this experiment were the same as experiment 2.

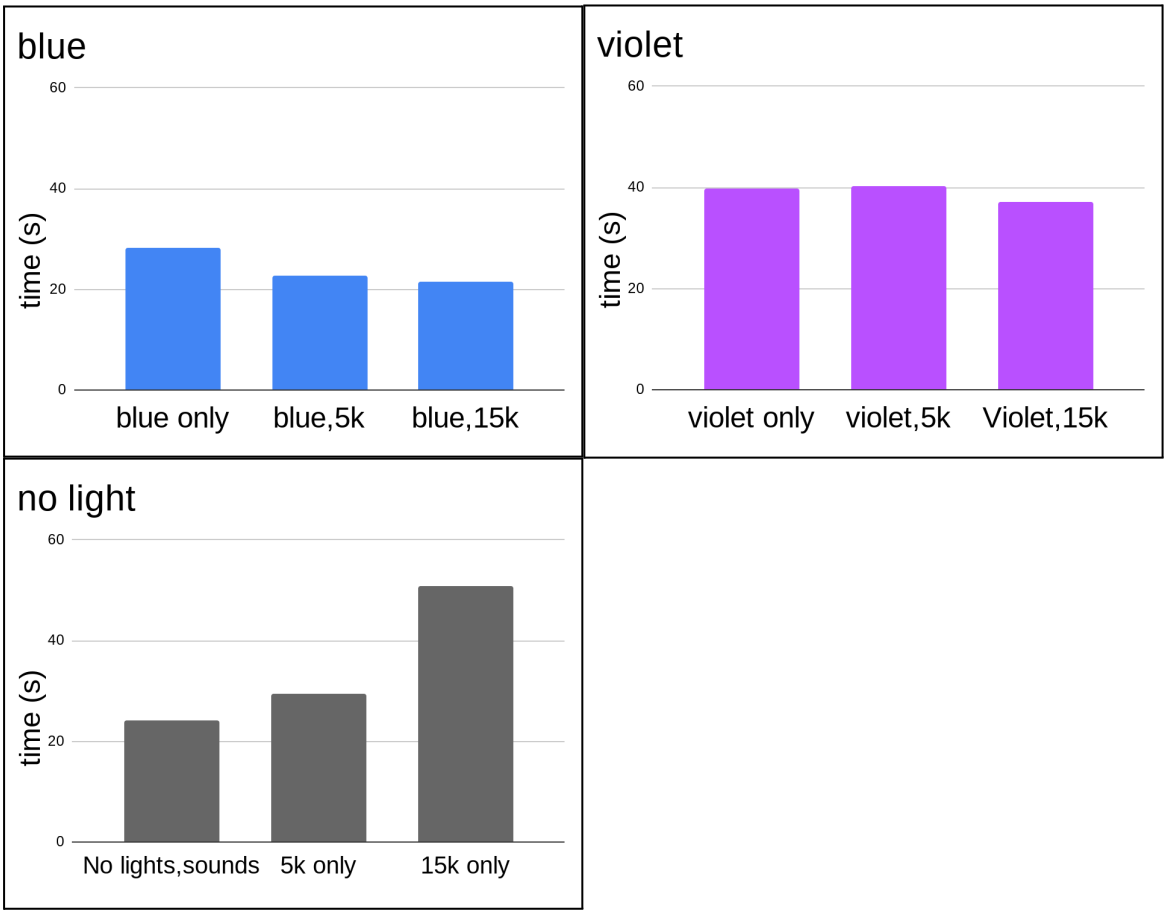


Figure-7. Same as figure-3, but for improved conditions as described above.

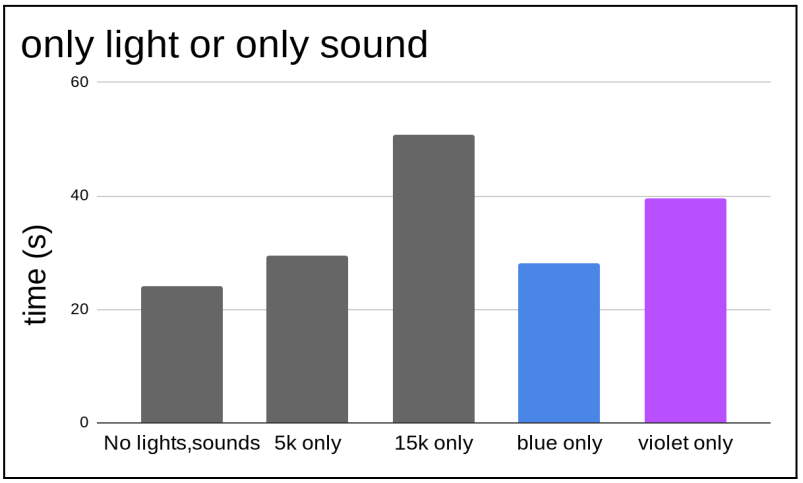


Figure-8. Same as figure-3, but for added only sound conditions

**Result**

There was no increase in the number of seconds the cricket was on the light source side for any of the light or sound combinations as seen in experiment 2. Besides, the length of time changed more when we altered the color of light than when we altered the frequency of sound.

**Discussion**

The most efficient way to control crickets is stimulating them by using 15 kHz sound under completely dark conditions.

We think the influence of light is stronger than sounds. The influence of sound is weakened when light is present, and the influence of sound is stronger when light is not present. The reason why the level of the influence of sound changes with or without light is probably because diurnal animals value light information more than sound, and nocturnal animals value sound information more than light.

**Conclusion**

15 kHz sound is the most efficient thing to control crickets. The most efficient kind of light color is violet.

Stimulating by using both light and sound is not more effective than by using only light or sound. However, under these conditions, light is more effective than sound. That is a new finding. We should do more research about it and make use of our research in farming crickets.

**References**

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**key word**
cricket (*Acheta domestica*)　taxis　Insect eating