CRICKETS AND TEMPERATURE

One important aspect of behavior is communication, which is widespread among animals. Ask the students the following questions - How do humans communicate? Can insect talk? How do you think insects communicate?

Today we will learn about how insects communicate through sound production. There are many different ways that insect produce sound.

1. Stridulation - this is the moving of one body part against another. Some insects rub their wings together, others rub different segments of their abdomen. Some rub their legs and their wings, while others rub their legs against their head or their wings against their body. The most well known insects that use stridulation to produce sound are the crickets (rub their wings together) and grasshoppers (rub legs or leg and wing), but some ants, wasps, and beetles also use stridulation. Show examples, short-horned grasshoppers, long-horned grasshoppers, bess beetles

2. Strike a part of the body against a surface - deathwatch beetles tap their heads, cockroaches and some stoneflies tap the tip of their abdomen, and some grasshoppers tap their feet against a substrate to make noises.

3. Vibrating membranes - cicadas, which make very distinctive sounds vibrate tymbals. Tymbals are membranes located on the abdomen that are moved by muscles. Other insects make sounds by vibrating their wings or other body parts.

4. Forcing air through body openings - although many vertebrates use the expulsion of air to make sounds (as we do when speaking), this form of communication is fairly uncommon among insects. Some cockroaches make a hissing sound by ejecting air. The death's head sphinx moth expels air to make a whistling sound.

Why do insects make sound? Insects often use sound to communicate with each other. Most often, insects produce sounds to attract mates. Usually, the male's song attracts the female. Often, insect will make noise when they are disturbed - this may be to scare off the predator or to warn other insects of danger. Some insects use sound to mark their territory. A male insect may sing in order to let other males know that an area is his territory.

What is a disadvantage of stridulation. Predation - you let everyone know where you are!

How do insect detect or hear these sounds? Crickets, grasshoppers, katydids, and cicadas all possess hearing organs called tympanum. The tympanum is located on the front legs of crickets, katydids, and long-horned grasshoppers and on the abdomen of short-horned grasshoppers.

Temperature Inquiry:

Background:
Male crickets and katydids chirp by rubbing their front wings together. Each species has its own chirp and chirping is temperature dependent. Crickets chirp faster with increasing temperature and slower with decreasing temperatures. Therefore, at least in theory, the temperature can be estimated by counting the chirps. However, problems with putting this theory into practice abound. For example: (1) crickets generally do not sing at temperatures below 55 F or above 100 F, (2) some crickets do not chirp in discrete bursts, they utter a more continuous "trill", (3) chirp rate is affected by other factors such as the cricket's age, mating success, hunger, and with competition from nearby males. Nevertheless, this is a fun inquiry to do.

Methods:
The simplest method is to count the number of chirps in 15 seconds and add 40. The sum usually approximates the temperature within a few degrees Fahrenheit.

The original formula for determining temperature from cricket chirps appears to have been published in 1897 by A.E. Dolbear, a physics professor at Tufts College. Since Dolbear's time, formulas have been devised for various species. Here are Three formulas which may or may not actually work! In all cases, T is the temperature and N is the number of chirps per minute.

Field Cricket: $T = 50 + (N - 40 / 4)$

Snowy Tree Cricket: $T = 50 + (N - 92 / 4.7)$

Katydid: $T = 60 + (N - 19 / 3)$

Additional Notes:
This exercise may be done whenever crickets are heard, either in the field or with classroom cultures.