Assignment 1: Species-Habitat Interactions

Teaching Notes

Part II

- Other gas sensors and interfaces can be substituted as long as beetle respiration rates are measured in a closed system. Incubators, or other environments with controlled, constant temperatures can be used in place of the water baths
- Burying beetles need to be trapped. This in itself can be an engaging activity for students and a simple introduction to field sampling methods. Review the video from the online module titled "The Story Behind the Data;" it provides directions for setting up beetle traps. Following is a list of materials required to make one beetle trap:

-1 large coffee can. Puncture the base with several holes to allow water drainage.
-1 tall metal or wooden stake. Traps need to be elevated off the ground to protect them from unwanted visitors (such as coyotes).
-A few feet of wire to secure the trap to the stake
-A piece of wire mesh large enough to cover the top of the can. Cut a small hole in the center for the beetles to fall through.
-1 rubber band. This needs to be large and strong enough to wrap around the can and secure the mesh lid.
-Fresh soil to fill 2/3 of the can. If the soil is hard and clay-based, mix in a bit of potting soil.
-1 chicken drumstick.
-Water. Add a few splashes to the soil.
Set the trap and return daily to check for beetles. Add water to the trap if the soil is cracked and dry. The chicken drumstick will need to be replaced if it has dried out or become riddled with maggots.

- The availability of burying beetles will depend on your location. Consider the following descriptions:
  "*Nicrophorus investigator* is widely distributed throughout Canada and Alaska and along the Rocky Mountains to New Mexico and Arizona. It is occasionally found in the northeastern United States." (Ratcliffe 1996)
  "*Nicrophorus guttula* is widely distributed in the western half of the United States, southern British Columbia, Alberta, and Saskatchewan in Canada, and northern Baja California in Mexico." (Ratcliffe 1996)
  If possible, contact a local entomologist to discuss the occurrence of burying beetles in your area.
- Beetle trapping will be most successful during the months of June, July, and August. However, substantial numbers can still be collected in May and September, and even April and October (depending on the local climate).
- Please be aware that the American burying beetle, *Nicrophorus americanus*, is an endangered species; it should not be trapped and used for the biomass conversion experiment. The USFWS South Dakota Field Office describes an easy method for identifying American burying beetles and distinguishing them from other *Nicrophorus*: https://www.fws.gov/southdakotafieldoffice/BEETLE.HTM

Ratcliffe, B.C. 1996. The Carrion Beetles (Coleoptera: Silphidae) of Nebraska. The University of Nebraska State Museum. Lincoln, NB, pp. 67-70.

- **Question 6**
  Some students may need to be reminded that in the equation y = mx + b, m is the slope
- **Question 8**
  This question may provide an opportunity to introduce students to the *temperature-size rule*. According to Angilletta et al. (2004), "relationships between environmental temperature and life history in ectotherms have puzzled biologists because of the paradoxical effects of temperature on growth rate and size at maturity: lower temperatures cause ectotherms to grow slower but mature at a larger body size."

  Angilletta, M.J. Jr., Steury, T.D., and Sears, M.W. 2004. Temperature, growth rate, and body size in ectotherms: Fitting pieces of a life-history puzzle. *Integrative and Comparative Biology* 44 (6): 495-509.

Part III

- **Question 1**
  Reiterate that there are *two* sides of the sampling sites diagram to complete.
- **Question 12, c**
  Encourage students to look critically at the weather station data (it is *real* data!). What could be causing a divergence from the expected pattern of an increase in precipitation and decrease in temperature at higher elevations? For example, the precipitation recorded at billy barr is unusually low. Are the numbers simply a result of an equipment malfunction? Perhaps the differences in temperature and precipitation between sites would be more significant if sites were spread along a larger elevation gradient. What logistical roadblocks might a researcher face in trying to add sampling sites to an elevation gradient (for example, the new sites might be inaccessible by vehicle or on private property)? Reinforce that it can be difficult to collect accurate and reliable data from the field, and that a substantial amount of planning and troubleshooting is involved.
- **Question 13, b**
  This question may provide an opportunity to review the scientific method. When evidence doesn't support a hypothesis, it must be rejected or modified. Students should understand that rejecting a hypothesis is not a "bad" thing.