

Golden Raintree/ Soapberry Bug Survey

Grades 4 and up

Updated October 23, 2015



Summary

Students will explore the insects living on golden raintrees (*Koelreuteria paniculata*). We suggest teachers or parents locate the trees in advance and allow students to identify and count insects. If you locate the soapberry bug *Jadera haematoloma*, please also count the number of adults with long and short wings. If a camera is available, take images of the tree and insects you find. Upload your data to bugsinourbackyard.org, where you can also retrieve data submitted by other participants.

Background

The soapberry bug *Jadera haematoloma* is one of the most interesting, but little-known insects in America. These true bugs originated in Florida, along the Gulf Coast, and in isolated interior river valleys, where they fed on native plants in the soapberry family. Early in the 20th century, urban developers introduced the golden raintree (*Koelreuteria* sp.) from China, and *J. haematoloma* evolved rapidly to exploit this new food source. Golden raintrees have been planted in urban and suburban areas throughout the US, and the soapberry bugs have moved north following this human urban development. But there's a twist: not all soapberry bugs can fly! Many of them have short, non-functional wings.

By reporting the locations of golden raintrees, you can help us document the potential resources available to *J. haematoloma*. Many golden raintrees in northern states won't have soapberry bugs-- but we need to know that too! And it will be useful to know what insects, if any, are present on these trees before *J. haematoloma* colonize them.

By reporting occurrences of the soapberry bugs-- and telling us about their wing length-- you can further help us understand how variation in wing development helps or hinders their range expansion.

Learning goals

After completing this activity, students should be able to:

- Identify the golden raintree *Koelreuteria paniculata*.
- Identify the soapberry bug *Jadera haematoloma*
- Identify some common insect orders and families.
- Record data based on their observations.
- Contribute those data to a collaborative online research network.

Ideally this activity also allows students to appreciate that animals and plants form ecosystems, even in urban environments. We suggest this activity is followed up with others, such as raising true bugs in the classroom or analyzing data collected by your class or the *BioB* project.

Preparation

Selecting a site for the survey

This activity will work best if you locate a site with suitable host plants before involving students.

Goldenrain trees are not native to North America, but they have been planted in many cities and towns. In the spring and early summer, these trees stand out with sprays of bright yellow flowers, which develop into golf ball-sized pods. The pods mature in late summer and fall to a gold or red color.

You can find golden raintrees with help from the **BioB Field Guide** (page 17-18), which is available at bugsinourbackyard.org/modules/. A number of other websites may also help:

- leafsnap.com provides easy examples of many trees found in the Northeastern US.
- gobotany.newenglandwild.org has a simple key for identifying trees and other plants.

Bugs can be found during most warm months of the year. In Florida, it is possible to find bugs during the entire school year. In states as far north as Maryland and Delaware, soapberry bugs can be found by June and will stay active until nighttime frosts become common in October or November.

If you find host plants on private land, please request permission of the property owner to bring your class and to examine "native insects". Avoid suggesting that the property has "lots of bugs", since some people may consider this a reason to spray pesticides. Most businesses and churches are happy to work with local schools.

If you find host plants on public land, most municipalities and states require no permits if the insects and plants are not injured and if all insects are released after your survey. However, if you have any concerns, it is always best to contact the appropriate administrative office.

Student scaffolding

Before going into the field, it is useful to talk with your students about the purpose of the project. Introduce them to the concept of ecological diversity, insect-host plant relationships, or the soapberry bug wing polyphenism project through the materials on bugsinourbackyard.org. You can also schedule a video conference with project personnel from Colby College.

Materials

Once you've selected a site and arranged for the off-campus field trip, you'll need the following materials:

- **identification keys** — bring at least one copy of the BioB Field Guide (bugsinourbackyard.org/modules/) to allow students to identify insects and their host plants
- **data sheets** — for students to record observations
- **camera** — a cell-phone camera will work, as long as its capable of good resolution for smaller subjects. If your camera has a "macro" mode, use that setting.
- **Petri dishes** — When you catch bugs, a plastic Petri dish is a convenient place to take its picture.

Optional materials:

- **GPS device** (or cell phone app) — for determining latitude and longitude of the field site. If you don't have one, find the site on GoogleMaps. Clicking on the map will display a window with the grid coordinates in the proper decimal format.
- **metric measuring tape** — for measuring the trunk diameter of host plants

- **vials** — or small containers for catching bugs.
- **soft paintbrush** — useful for gently sweeping insects into containers to catch them.
- **counters** — Hand held counters can be useful in quickly making observations. For example if you have two counters, have two students each take one. Have the rest of the class search for bugs and call out when they find a "long-wing" or "short-wing" bug. One student can click for each long-wing call and the other for each short-wing call.
- **quadrat** — This is a small square made out of wood or PVC tubing, which makes a defined area in which to count specimens. Traditionally quadrats are 1 m² but you can use any convenient area. For a site with many bugs, a square 10-cm on each side may be convenient for students. Using a quadrat is useful when there are hundreds of bugs or plants at your site, but it's not necessary unless there are more bugs than you can easily count.
- **cooler of ice** — This can be used to slow bugs down in order to take their picture.

Procedure

- As you travel to the field site, remind students of the **purposes of the activity**:
 - to appreciate local insect and plant diversity,
 - to appreciate the relationship insects have with host plants
 - to collect data on the diversity of true bugs for contribution to the citizen-science network provided by *BioB*.
 - and (if soapberry bugs are your primary target) to determine the local proportion of long and short wing morphs among *Jadera*.
- Ask students to review the identification keys.
 - Can they find other host plants or insects as you walk or drive to your intended site?
- Once you arrive, remind students of **proper field behavior**. The animals and plants may be observed and handled gently, but shouldn't be damaged or harassed.
- Remind students to **be respectful of the land** and any wishes of the property owner.
- Organize students into groups of 2-4 and provide each group with a Field Survey Record Sheet and an Identification Key. **As students find plants and insects, have them complete each section of the sheet.** (If any sections are left incomplete, the data are still useful and should always be submitted online.)
- Have the students **find host plants**.
 - While it's convenient for the teacher to find the host plants in advance, it may be instructive to bring the students nearby but ask them to find the specific plants.
 - At this point, students should follow the Record Sheet and record the information needed.
- Next, the students **search for insects**.
 - If no insects are found, the data can still be submitted. The project still benefits from documentation of whether bugs are not found!
 - If insects are found, the students should take a picture of them before they are disturbed.
 - Using the key, students should determine the insect's species.
 - Record the number of insects on the Data Sheet, and whether there are any juvenile or short-winged individuals.
 - **If you have soapberry bugs, *Jadera haematoloma*, make a careful count of the number of long- and short-wing adults.**
 - On the data sheet, check off any behaviors that are observed.
- Finally, insects can be **captured for photographing**.

- All insects are useful in comparisons, but the species of greatest importance for the project are soapberry bugs, *Jadera haematoloma*.
- The best method for capturing most insects is to use a small vial or clear container. Slowly approach the insect without bumping the plant it's on and without letting your shadow fall on it. Once you're about a foot away, move quickly to cover the insect and close the container.
 - Avoid directly handling the insects. While soapberry bugs don't bite, other insects can bite or produce defensive smells.
 - Avoid harming the insect during its capture!
 - A soft paintbrush or torn piece of paper can help sweep insects into a container.
- Transfer the insect to a Petri dish.
- Put the dish against a 1-cm² grid, such as the area at the bottom of the Data Sheet.
- Wait a minute or two for it to settle down. If the bugs are very active, place the Petri dish in a cooler of ice for a minute. This should slow the bugs down.
- Take a picture where you can clearly see the back edge of the insect's wings.
- Gently turn the Petri dish over, and take a picture of the bottom of the insect. If it is a true bug, be sure the beak is clearly visible in the photograph.
- If there are many bugs at your site, take dorsal and ventral pictures for up to 10 adults.
 - If the bugs are *Jadera haematoloma*, and both long and short winged adults are present, image 5 long-winged and 5 short-winged adults.
- When you have completed the survey, **release the insects** you've collected.
- Once you've returned to the classroom, have students enter the data from their Field Survey Record Sheets online, <http://www.bugsinourbackyard.org/field-survey/>
 - If you have an iPad or other tablet you can enter data directly to the website from the field!

Remember, you can revisit the same sites at different times of year and the composition of insects will change. You can also survey the same field sites year after year and observe the continuity of the ecological community.

New data are reviewed by *BioB* project personnel regularly and added to the page of Survey Results, where you can see the data collected from other citizen scientists around the country.

The data are made freely available and can be used in a variety of activities. Depending on the level of your students, you may choose to illustrate or analyze the data in different ways.

- Graph the short-to-long wing morph ratio for your location, compared to others.
- Test for significant differences in the ratio of morphs at different locations, using Fisher's exact test (http://en.wikipedia.org/wiki/Fisher's_exact_test).
- Perform linear regression of morph ratios based on latitude.
- Perform ANOVA on morph ratios based on collection site, urban scale, or other factors.

Periodically, personnel at Colby will also make analyses of the data and post their results on our blog at [bugsinourbackyard.org](http://www.bugsinourbackyard.org). Sign up for RSS or e-mail notifications of new blog posts, where you and your students are welcome to comment.

Thanks for your participation in the *BioB* project, and we hope your class will continue to be active members of the collaboration!