# *ZOPHOBAS* BEETLE ADDENDUM

## *FOSS DIVERSITY OF LIFE, INVESTIGATION 9: ROACHES*

In states or districts where the Madagascar hissing cockroach is not permitted, *Zophobas morio,* the superworm beetle, can be used as an alternative insect in Investigation 9 of the **FOSS Diversity of Life Course.** The purpose of this addendum is to provide scientific and historical background on *Zophobas* as well as information on obtaining and caring for the organisms in the classroom.

*Zophobas* is often sold in pet stores in the larval stage as live food for reptiles and birds. The brown-banded larvae (4–5 cm long) are similar in appearance to the smaller golden mealworm, the larval stage of *Tenebrio* beetles, and their care is very similar. The large *Zophobas* larvae, however, can remain in the larval stage for 6–12 months, which makes them appealing as reptile food. In Diversity of Life, however, students will study the adult stage.

*Zophobas* beetles are members of the order Coleoptera. This is the largest order of insects and includes all beetles. In fact, there are more species of beetles than all other organisms combined. Beetles are found on every continent except Antarctica.

Beetles have two sets of wings. The forewings (elytra) are hard and cover the more delicate hind wings. They form the smooth, hard back of the beetle. During flight, the elytra open wide enough for the hind wings to extend. Most beetles have chewing mouthparts. The body of a beetle may appear to have only two parts, but there are three—the head, the thorax, and the abdomen.

The *Zophobas* beetle is about 2.5 cm long, which is smaller than a hissing cockroach. It is matte black. Males and females look the same, so telling them apart can't be part of the investigation as it is with hissing cockroaches (Part 2, Step 5). Beetles don't make hissing sounds like the cockroaches do (Part 2, Step 6). The beetles are easy to handle and do not bite. They can be picked up by placing your thumb and first finger on the sides of the body, or you can just let them crawl into your hand. They are active, but don't move too fast. Like all beetles, they have two sets of wings, but these beetles don't seem to use them to fly.

*Zophobas* undergoes complete metamorphosis with egg, larval, pupal, and adult stages. It is possible to "force" the larvae to pupate by isolating them and keeping them in a warm, dark environment. There are several ways to isolate them. You can put them in individual small plastic cups or containers with lids or use a divided plastic tackle box. With the sharp point of a pencil compass or a nail, make a small hole in each container lid for air circulation. There should be enough air circulation in the tackle box without making holes. Place a small amount of wheat bran and one *Zophobas* larva in each container. Keep the larvae at a constant, warm temperature of 28–29°C (82–84°F) in the dark.

After about 10–14 days the larvae should begin to metamorphose into pupae. Pupae don't move unless touched, and then they will wiggle a little. The pupae can be moved to a common container with a substrate of wheat bran. (If a pupa is motionless and straight, it has died and should be discarded.)

After another week or two, the pupae will develop into adult beetles. They are a creamy white at first. After a few hours they will be brownish orange. In a few days, they will be the characteristic matte black. Adults will live for 2–3 months.

About a month later, you may notice tiny, wiggling worms in the bottom of the container. These are the larvae that will develop into your next batch of adult *Zophobas* beetles. The adults can be moved to another container. Do not discard the substrate in the larva container. There may be many more eggs and larvae too small to see.

In 2–3 months, the larvae will be large enough to pupate, but they probably won't unless they are isolated. With food and water, they will remain larvae for 6–12 months. Unlike *Tenebrio* larvae, *Zophobas* larvae should not be refrigerated.

If you choose not to maintain the colony, at the end of the course, you can probably find a colleague that has a lizard that will gladly take the larvae. If you are left with no alternative, the most humane way to dispose of the colony is to bag and label the colony and substrate, and place it in a freezer for a couple of days. *Zophobas* beetles or larvae should never be released into the environment.

## CARING FOR ZOPHOBAS *BEETLES*

*Zophobas* larvae and adults need food, moisture, warmth, and substrate. Use a 6-liter plastic terrarium with a lid as the habitat.

- Cover the bottom of the terrarium about 1–2 cm deep with a substrate of wheat bran. Add material for the adults to crawl into and under for cover. Paper-towel tubes, paper egg cartons, chunks of tree bark, and the like will work. A piece of wood is good, as they will lay their eggs on it. The larvae burrow in the bran.
- Small pieces of vegetable or fruit (carrot, potato, apple, squash) will provide food and moisture for the larvae and adults. Adults will eat dry pet food as well. Replace the food every few days and remove moldy food or substrate immediately.
- Place the terrarium in a warm location. If the temperature is likely to drop below 20°C (68°F), keep a low-wattage lamp at one end of the terrarium.

*Zophobas* beetle adults can be obtained from Delta Education (part 270-4463, 12/package). The larvae can be obtained at pet stores.