# Butterflies in Space

## How to Build a Butterfly Habitat

*by*

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**RESOURCES**

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# Butterfly Habitats

In preparation for the flight experiment, butterfly eggs will be placed into the space habitat. To closely match the experiment protocol, obtain Painted Lady eggs from one of the suppliers listed below. In addition, larvae food will have to be obtained as a separate item. Painted Ladies also can be purchased as larvae, which are shipped from suppliers, usually with adequate food supplies. Larvae will be received in one of the early instar stages, perhaps as small as one centimeter in length. Whether you obtain eggs or larvae, your animals may be a few days ahead of or behind the flight experiment. Your students will need to determine the variation to accurately compare their butterflies to those on the ISS.

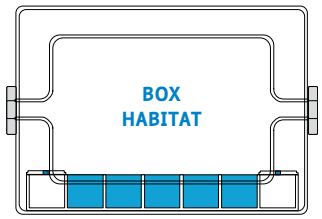
Painted Lady butterfly eggs, larvae and food are available from a number of companies, including the following suppliers.

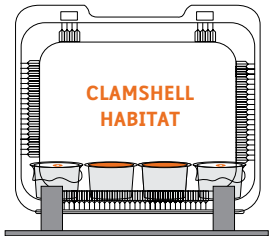
- Insect Lore, www.insectlore.com
- Carolina Biological Supply Company, www.carolina.com
- Ward's Natural Science, wardsci.com
- Simply Butterflies, www.simplybutterflies.com

## TYPES OF HABITATS

We provide instructions for two different classroom habitats. The "Box Habitat" is a clear plastic box that closely models the dimensions and conditions of the habitat on the ISS. Use this design if you wish to maintain conditions that are similar to those experienced by the space butterflies.

The "Clamshell Habitat" is a clear plastic food container (hinged to allow the box to be sealed shut), about 8 in. x 8 in. in size. Use this habitat for an easy-to-assemble, low cost approach. For details, see pages 3–4.




## MAINTAINING CULTURES

### Butterfly Larvae Food

When you prepare the habitats, distribute the larvae food evenly among the food containers. If you obtain eggs, do not place them directly on the food or the eggs will not hatch. Follow the instructions that come with the eggs. If you obtain larvae, use caution not to harm them while transferring food to the compartments. Place the feeding tray and the larvae inside the habitat.

### Inserting the Larvae

Carefully place the larvae on the food compartments inside the butterfly

## ADDITIONAL TIPS

**CLEAN HABITAT:** Keeping the outside of your habitat clean and free of fingerprints is important for clear visibility of your butterflies/larvae.

**HUMIDITY:** The environment in which the habitats will be kept on board the International Space station will have a humidity level of approximately 50%. However, the humidity level inside the butterfly habitat will be closer to 80–90%. Your classroom habitat probably will not be in an environment with such high humidity. This difference should not affect your larvae much. The food may dry out more quickly, but it should maintain its moisture content long enough for your larvae to develop and form chrysalises.

**LIGHTING:** For the space flight habitats, a 12-hour light/dark cycle is provided. Six LEDs (bright whites) are used in the butterfly habitat for daytime lighting. For classroom purposes, a standard fluorescent bulb in a "shop" light fixture or desk lamp would work sufficiently. A simple plug-in timer can be used for the 12-hour on/off cycle of the lamp. Incandescent light can be used, but should not be placed too closely to the habitat, since this type of lighting can become very warm.

**TEMPERATURE:** The ISS habitats will be kept at approximately 25 degrees Celsius. However, temperatures between 21–26 degrees Celsius will work fine in your classroom. The caterpillars will develop more slowly in cooler temperatures. Monitoring the temperature of your habitat will be useful when comparing the space flight and ground control specimens.

**VENTILATION:** Even without modification, your habitat should have sufficient ventilation through the lid seams. If desired, use a hot nail to melt vent holes, and then cover the holes with fine mesh.

**BUTTERFLY LARVAE HEALTH:** Once the butterfly larvae are hanging in the "J" formation, it is important to not disturb them. Your organism is very susceptible to damage during this stage of metamorphosis. A few hours after the full chrysalis is formed, you should be able to move the habitat gently without risk to your organisms.

habitat. A small paintbrush can be used to gently push the larvae on to the food. Begin daily observations.

### Adult Butterfly Nectar

Three or four days after the larvae have pupated, prepare artificial nectar for the adult butterflies using the following formula.

- 1 ounce of sugar
- 4 ounces of water
- 2 pinches of salt

Boil the water, and then add the sugar and salt. Stir to dissolve sugar and salt. Allow to cool completely. Moisten cotton balls with this mixture and place them in the two outer food compartments. Replace compartment lids.

### Butterfly Care and Feeding

It is simple to care for Painted Lady butterfly larvae, pupae and adults. Allow larvae to live on the commercial food until they create their pupae. The pupae (also called chrysalises) will be dormant for seven to ten days, during which time they should not be disturbed. When a butterfly is ready to emerge from its pupa, the pupal casing will become transparent and the wings will be visible. The butterfly then will begin to push on the pupal casing, causing it to break open along seams. Within two to five minutes, the butterfly should be free from its pupa. With hemolymph (circulatory fluid, or "blood" of arthropods) pumping through its veins, the butterfly will stretch out and straighten the wings. The wings will be sufficiently hard and ready for flight in two to eight hours. The butterfly also will cleanse its body by releasing a large amount of reddish waste, called meconium.

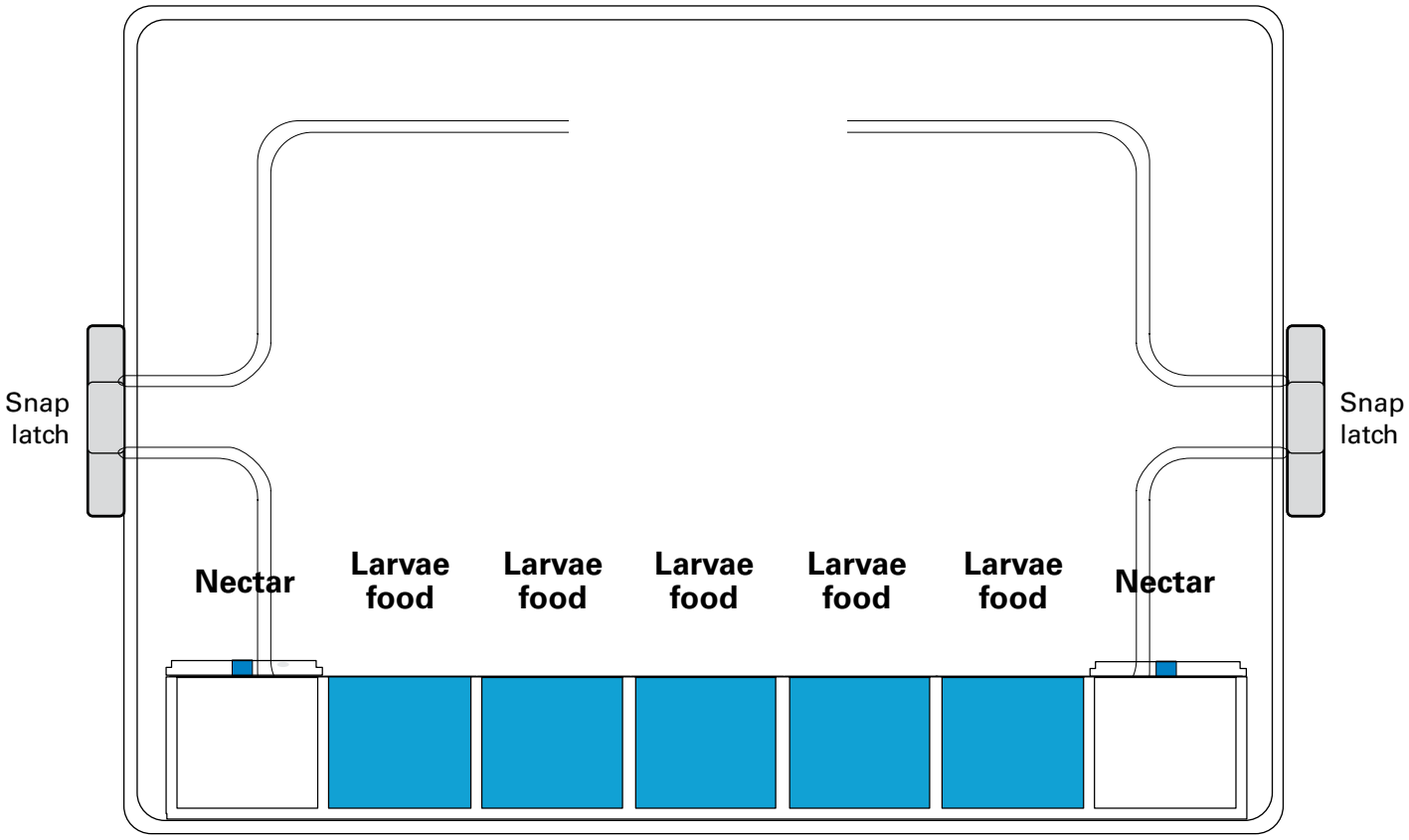
Adult Painted Lady butterflies usually feed 12–24 hours after emergence. They will require a liquid diet of artificial nectar. Use the formula above to create nectar for your habitat. Butterflies also will do well with juicy fruits, such as orange slices and sports drinks. However, these are not being flown in the space experiment and should not be used with your specimens. Adult Painted Lady butterflies have a relatively short lifespan of one month or less.

## SAFETY

Always follow all district and school laboratory safety procedures. It is a good idea for students to wash their hands with soap and water before and after any science activity.

For guidance on the proper care of animals in the classroom, consult the NSTA Position Statement, *Responsible Use of Live Animals and Dissection in the Science Classroom,* http://www.nsta.org/aboutpositions/animals.aspx.

# Box Habitat




## MATERIALS FOR ONE HABITAT

- Clear plastic box, item number 079-C (7-7/16" x 5-5/16" x 3-34"). Order from Pioneer Plastics (sold by case, 18 per case) at 800-951-1551 or www.pioneerplastics.com.
- Clear or white 7-day medicine organizer, 6" x 1.25" x 1" (available at most pharmacies)
- Drill (or nail and pair of pliers, see Item 3 below)
- Prepared larvae food and nectar (see "Maintaining Cultures," p. 11)
- Red permanent marker

## PROCEDURE

1. No modification of the box is necessary.
2. Cut off the Monday–Friday lids of the medicine organizer.
3. Drill 1/8-inch holes through the Sunday and Saturday slots of the organizer (to hold nectar). OR, hold the nail with a pair of pliers and heat the nail with a candle flame. Push the heated nail through the center of the Sunday and Saturday lids. The plastic will melt around the nail and cool to form a hole. Using the marker, draw a red circle around each hole.
4. Place the modified medicine organizer with food on the bottom edge of the box (see "Maintaining Cultures," p. 11) and stand the box on its side, as shown above.
5. Place the habitat in an area where it will not be disturbed. It may occasionally be necessary to move or open the box, so it should not be fixed permanently to a shelf or counter top.

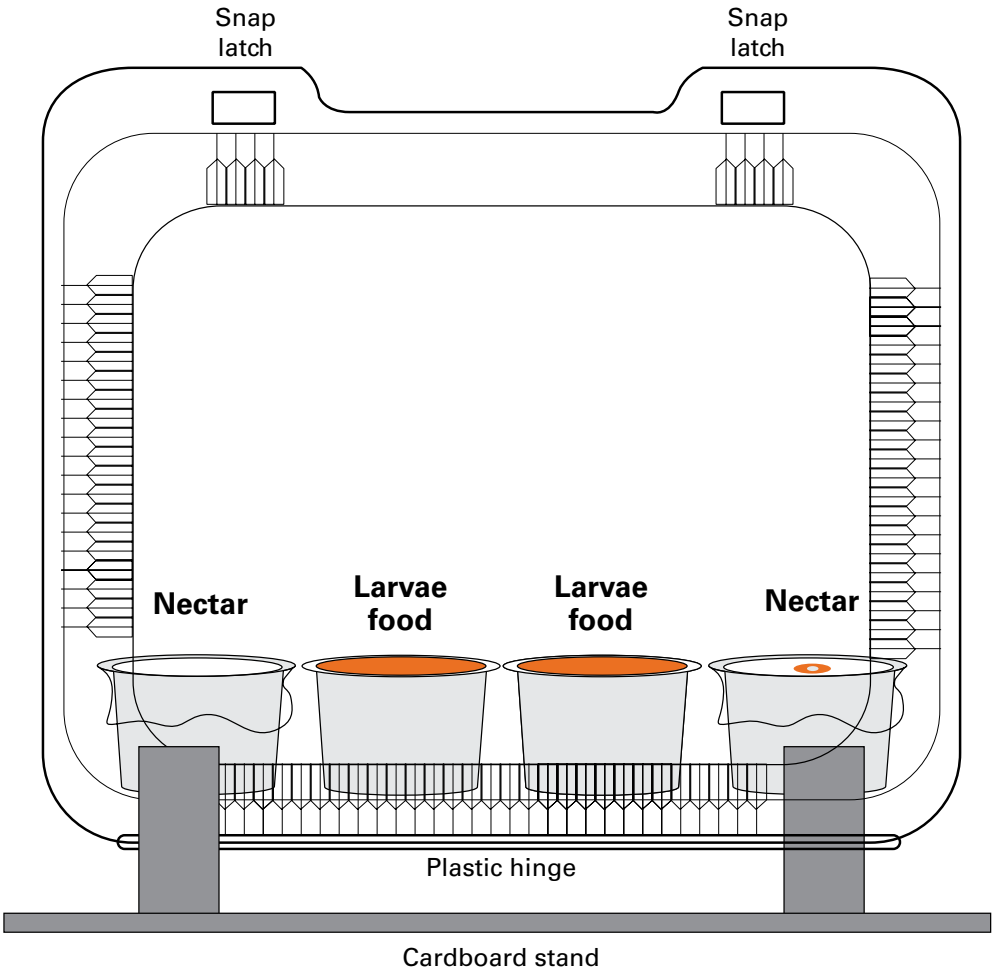
## HUMIDITY

If the air in your classroom is dry during the experiment, add an additional portion cup with a moistened cotton ball to the habitat. Remoisten the cotton ball as it dries out.

# Clamshell Habitat

## MATERIALS FOR ONE HABITAT

- Clear, hinged "clamshell" take-out food container, 8" x 8" x 3" (approximate), available from most grocery stores with salad bars or bakeries. If you wish to make more than one habitat, clamshell food containers are available to purchase in larger quantities (such as Reynolds Easy-Lock Hingeware, item number REY2647) from online vendors.
- 4 clean individual portion cups (such as those used to hold ketch-up in restaurants) and 2 lids
- Distilled water
- Prepared larvae food and nectar (see "Maintaining Cultures," p. 11)
- Hot glue gun and glue
- Pair of scissors
- Plastic report cover
- Red permanent marker
- Sheet of cardboard (see Item 2, below)




## PROCEDURE

1. No modification of the box is necessary.
2. Make a simple base out of cardboard to hold the box upright on its hinged side. OR, allow students to invent a support for the habitat using cardboard, wood blocks, clay, etc., held together with hot glue or tape, as appropriate.
3. Cut a 1" x 6.5" strip of plastic from the report cover. It will serve as the base for the portion cups.
4. Use a hot glue gun at a low temperature to attach the portion cups to the base.
5. Punch small holes (about 1/8-inch diameter) in the center of the two portion cup lids. Draw a ring around the holes using the red marker. (Adult butterflies will be attracted to the red color for feeding.) Place the lids on the two "end" portion cups after each is filled with nectar (see "Maintaining Cultures," p. 11).

## HUMIDITY

If the air in your classroom is dry during the experiment, add an additional portion cup with a moistened cotton ball to the habitat.