

# MOSQUITO INVESTIGATION NOTEBOOK

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Name

Date

# Mosquito Investigation Notebook

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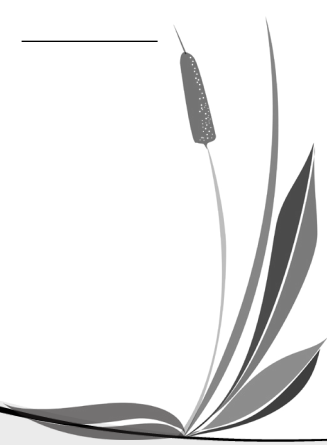
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## GET YOUR NOTEBOOK

Download the *Mosquito Investigation Notebook* and check for new investigations at <https://strategies.org/mosquito-notebook>



# INTRODUCTION

A notebook is a tool used by professional scientists and volunteer scientists (also called citizen scientists). As a tool, it is used to help accomplish a task. That task involves gathering and organizing observations, information, and data to solve a problem or answer a question.

## **This is your science notebook**

Your mission is to learn about, investigate, and contribute to science research on mosquitoes. To do this, you will need to think and work like a scientist. That means you need a notebook to record your questions and answers, develop and use diagrams and graphs, record and analyze data, write explanations and support your ideas, and gather, evaluate and communicate information.

## **Your Mosquito Investigation Notebook provides a space to:**

- Learn mosquito science
- Collect relevant vocabulary
- Make drawings
- Generate questions
- Write about your ideas and experiences
- Plan investigations
- Record and analyze observations and data
- Construct explanations

Your goal is to begin this important research with some background information on mosquitoes in the front of your notebook. The notebook will grow as your work progresses. There will be many observations, investigations, and activities along the way.

## **Have fun and be safe!**

The one thing about mosquitoes that you probably know from experience is that they bite humans. Anytime you are outside with mosquitoes around:

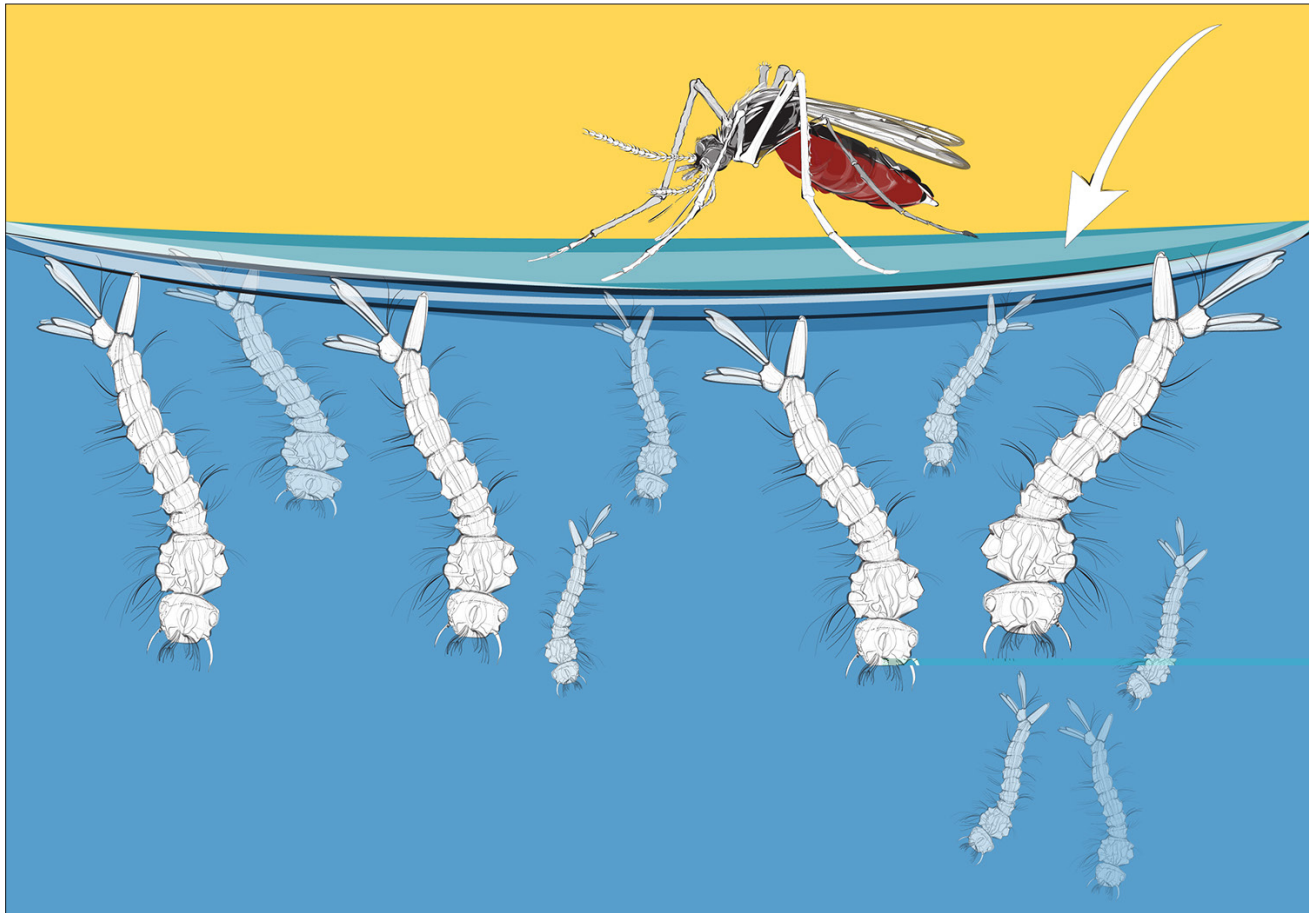
- Protect yourself by wearing a long-sleeved shirt, long pants, and closed-toe shoes.
- Use an approved insect repellent (for example, one containing DEET or Picaridin).
- Always follow guidelines from your local officials.

**For more guidelines on protecting yourself,** visit the Centers for Disease Control (CDC) at <https://www.cdc.gov/dengue/prevention/prevent-mosquito-bites.html>



*Photo courtesy Otrell Edwards, Esq.*

# Meet the Mosquito



Do you recognize the creature at the top of the picture? It is standing on the surface of the water (the surface is marked by the arrow).

**Here is a big hint:** it is absolutely the deadliest creature on the planet.

Look at those things hanging down below the water surface. What are THOSE things?

## **What Are Your Scientific Questions About the Drawing?**

Write your scientific questions about the drawing by finishing the following sentences:

1. I wonder \_\_\_\_\_

\_\_\_\_\_

2. I also wonder \_\_\_\_\_

\_\_\_\_\_

*More questions on Page 3*

## More Scientific Questions About the Page 2 Drawing

3. What if \_\_\_\_\_

\_\_\_\_\_

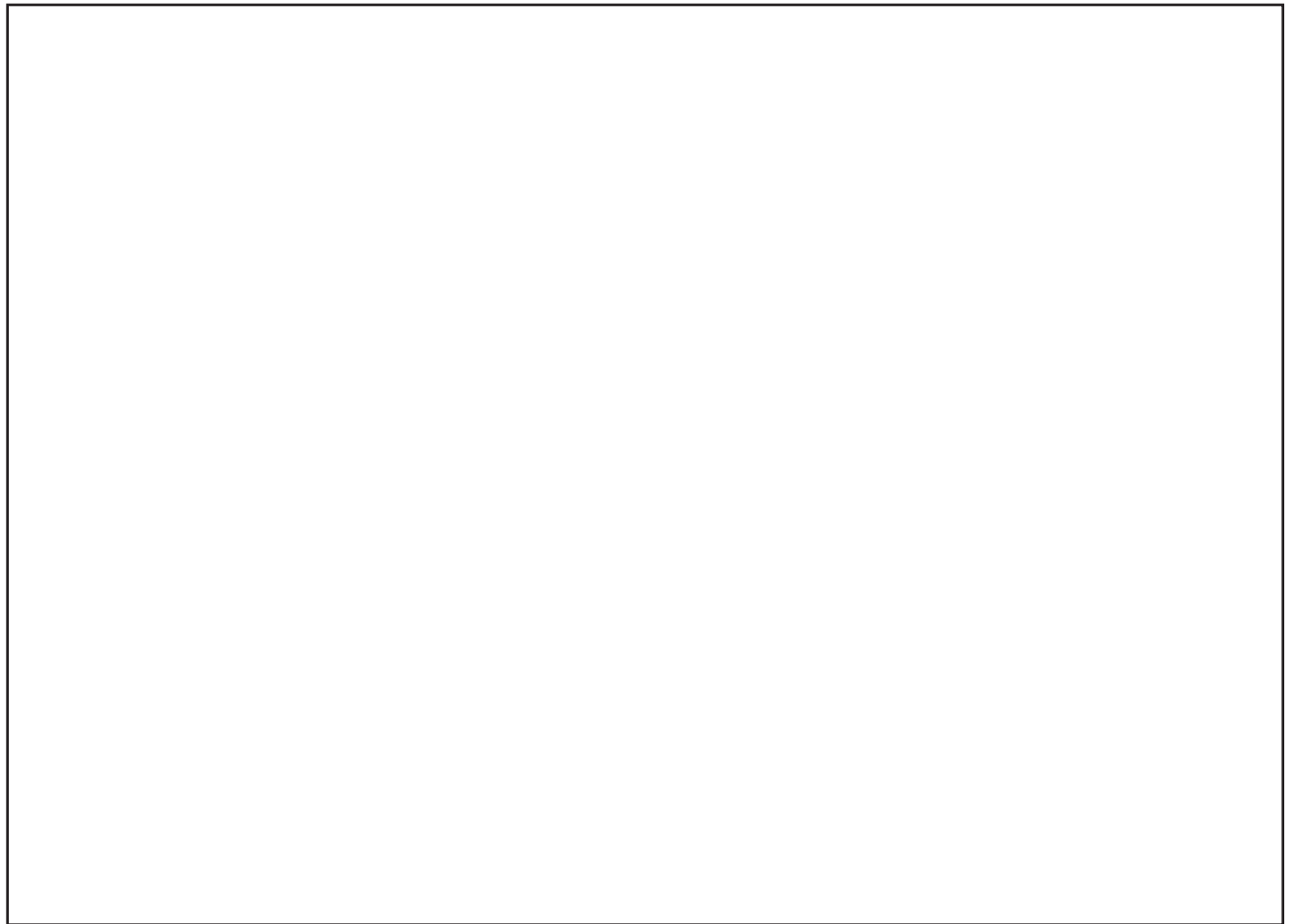
4. Is it possible that \_\_\_\_\_

\_\_\_\_\_

5. They remind me of \_\_\_\_\_

\_\_\_\_\_

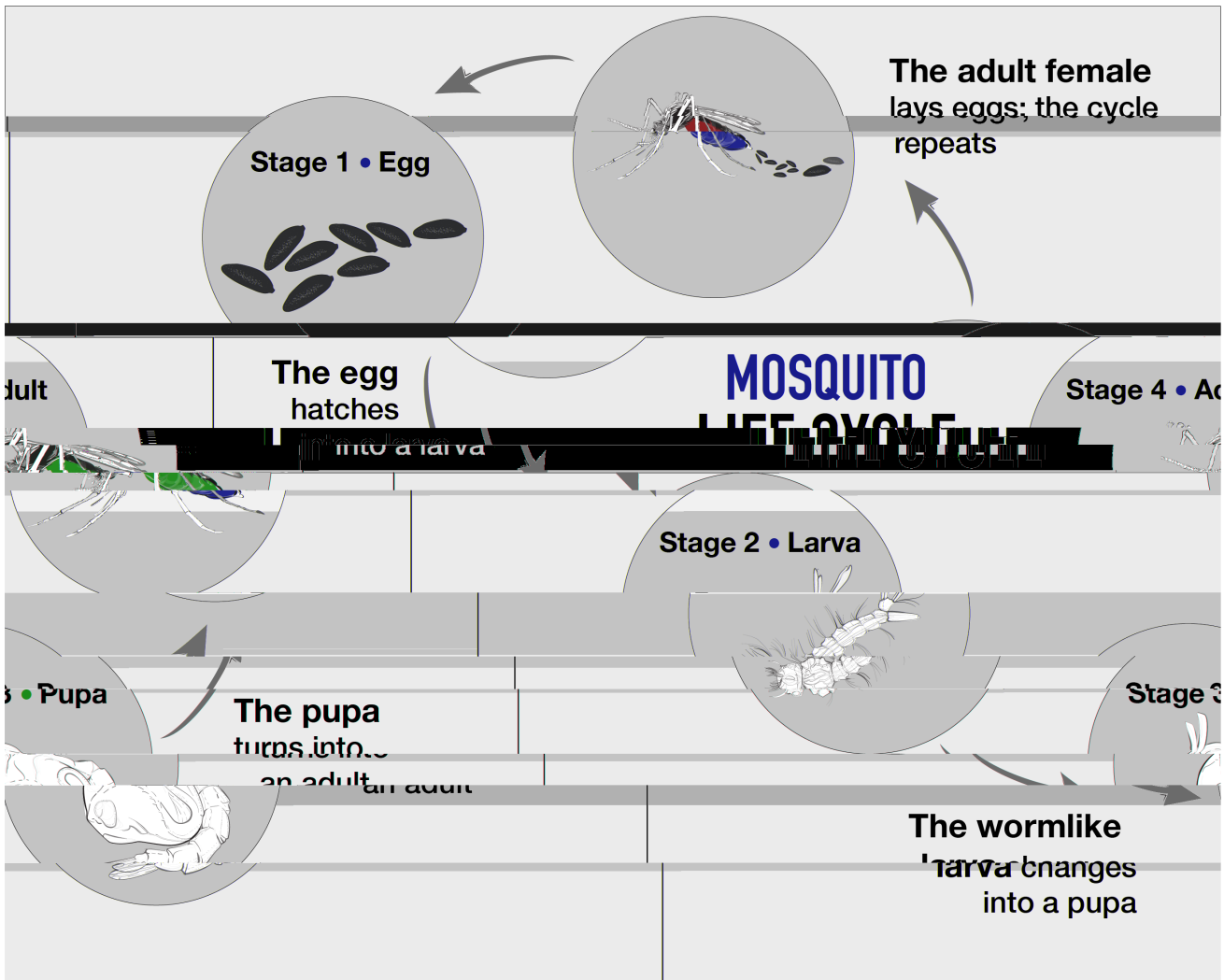
## Sketch Something Inspired By Your Scientific Questions



# Background Builders

## 1. MOSQUITO LIFE CYCLE STAGES

Did you know that mosquitoes go through a multistage (many steps) life cycle?



### VOCABULARY ALERT

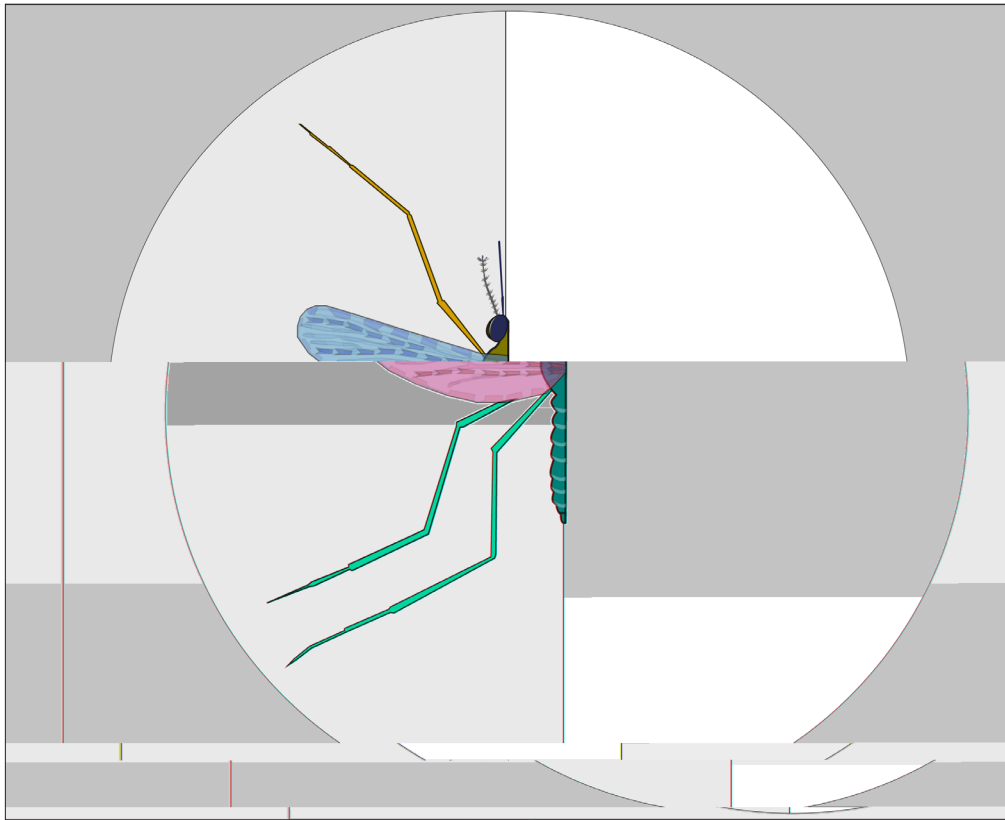
**Larva:** The form of a mosquito that hatches from the egg. It is shaped like a worm, so it differs greatly from an adult. It does not have legs or wings. It wriggles through the water. The plural form of this word is larvae.

**Pupa:** The non-feeding stage of development in the life of a mosquito between larva and adult. It is shaped like a comma, with no legs or wings. The plural form of this word is pupae.



## 2. Meet an Adult Mosquito

You are probably most familiar with this state. We will start here and work our way backwards.



**But wait! Only half of the mosquito is shown in the drawing above. Draw the other half!**

**Did you notice the needle-like attachment** coming out of the top of the mosquito? This is the proboscis. That is what allows the mosquito to eat and to suck blood. It only has one of those. Although you may wish to make it “fatter” in your drawing, you should not draw a second one.

**Next, based on your background knowledge,** label the parts on this adult mosquito: wings, antennae, mouth, and legs. The three main body sections include the head, thorax, and abdomen.

- How many wings does a mosquito have? \_\_\_\_\_
- To what section of the mosquito’s body are the wings attached? \_\_\_\_\_
- How many antennae does a mosquito have? \_\_\_\_\_
- How many sections (or main body parts) does a mosquito have? \_\_\_\_\_
- How many legs does a mosquito have? \_\_\_\_\_
- To what section of the mosquito’s body are the legs attached? \_\_\_\_\_
- Mosquitoes are insects. Therefore, all insects must have this number of these characteristics:  
Antennae = \_\_\_\_\_ Body sections = \_\_\_\_\_ Legs = \_\_\_\_\_



# Just like you, mosquitoes must eat to survive.

- What do you think mosquitoes eat? \_\_\_\_\_
- You might have written that all mosquitoes drink blood. Only some mosquitos will bite an animal to get blood. Blood is NOT their food. They need blood because it is important to the development of eggs. So, which mosquito gender (male or female) bites to get blood? \_\_\_\_\_
- All mosquitoes (males and females) must eat or drink something to get the energy they need to survive. What do you think all mosquitoes might eat? \_\_\_\_\_
- Mosquitoes depend on plants for food and eat nectar (plant juice). Can you name any other insects that eat nectar? \_\_\_\_\_



Photo courtesy of James Gathany, CDC Public Health Image Library (PHIL), with identification number #7861. <https://phil.cdc.gov/details.aspx?pid=7861>.

- Is this a picture of a male or female mosquito? \_\_\_\_\_
- Explain how you know. \_\_\_\_\_

*(HINT: If you printed this in black ink, the colors are missing: the thing the mosquito is standing on is beige, the background is green and the lower abdomen of the mosquito is red.)*

# 3. Meet the Other Three Life Cycle Stages

## More about the life cycle

Mosquitoes go through a complete metamorphosis, which includes four stages: egg, larva, pupa, and adult. You just learned about the adult stage, now let's look at the other three.

### VOCABULARY ALERT

**Metamorphosis:** in biology, the process of changing from an immature form to an adult form in two or more distinct stages.

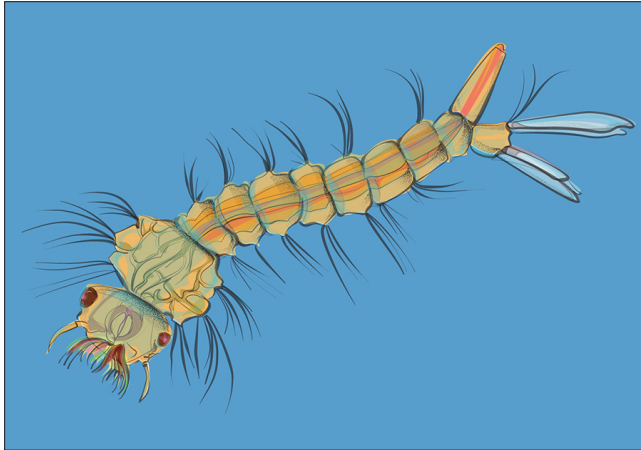
### Answer these questions to learn more about life cycles

- As with many organisms, the **first stage** of the life cycle of a mosquito begins when an adult female lays an \_\_\_\_\_.
- Based on the picture on **Page 4** with adult standing/larvae hanging below water) where in the environment do you think she lays them? \_\_\_\_\_.
- Why do you think she needs to lay her eggs in that type of environment?
- The female mosquito lays eggs directly in standing water (water that is not flowing) or just above the surface of the water.  
Why do you think the water must be “standing” (not flowing)? \_\_\_\_\_
- She can lay up to 300 eggs at a time. Some species lay their eggs one at a time; some species lay them in groups that look like a raft. Either way, mosquito eggs are very small; you would need a magnifying glass to see them.  
Why do you think that mosquitoes lay so many eggs at a time? \_\_\_\_\_

# Make some scientific observations

After a few days, the eggs hatch into larvae - the second stage. You have already seen that stage in the first picture in this notebook (on **Page 2**). Depending on the species and air/water temperatures, the larvae will soon (within days) turn into pupae, the third stage.

Below is a drawing of a larva (the second stage); on the right is a drawing of a pupa (the third stage).



**Larva**



**Pupa**

List two ways the larva and pupa look alike	List two ways the larva and pupa look different
1.	1.
2.	2.

A larva needs food to eat and air to breathe. A larva has a mouth; it eats microorganisms that live in the water around it. Most species, or kinds, of mosquitoes have a special tube called a siphon located at the other end of its wormlike body. The siphon looks like a straw; it must be at the surface of the water for the larva to get air.

## VOCABULARY ALERT

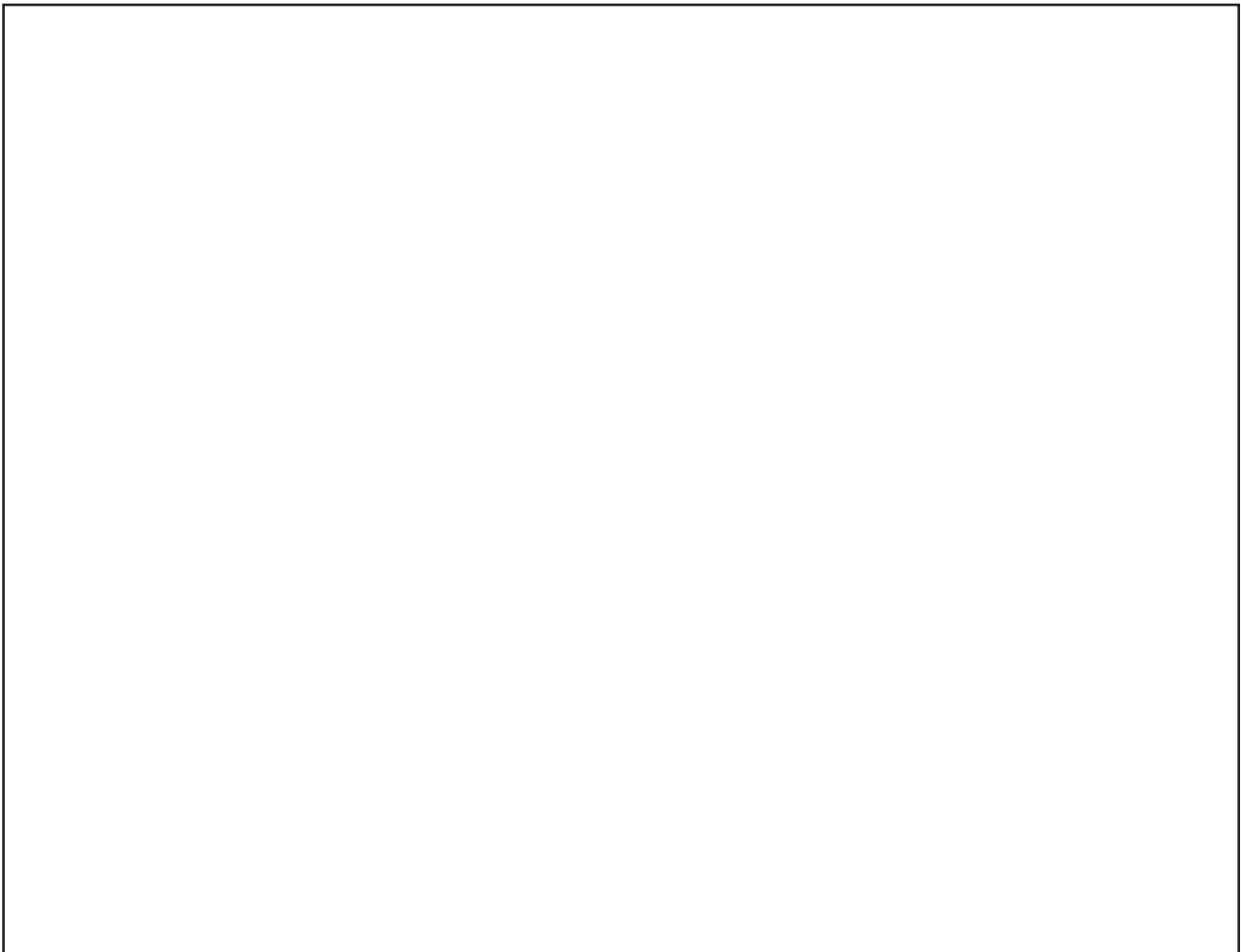
**Siphon:** *The siphon is a breathing tube. Because mosquito larvae spend their time underwater, the siphon breaks the surface of the water and allows them to breathe air.*

# Make some more scientific observations!

Look again at the picture on **Page 2**. Notice that some of the larvae are not floating at the top of the water with their siphon at the surface.

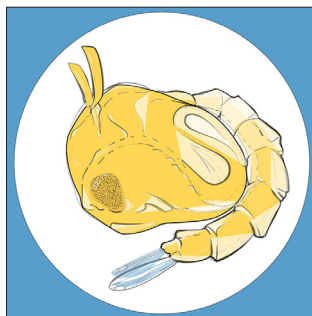
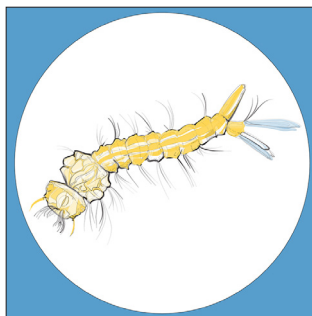
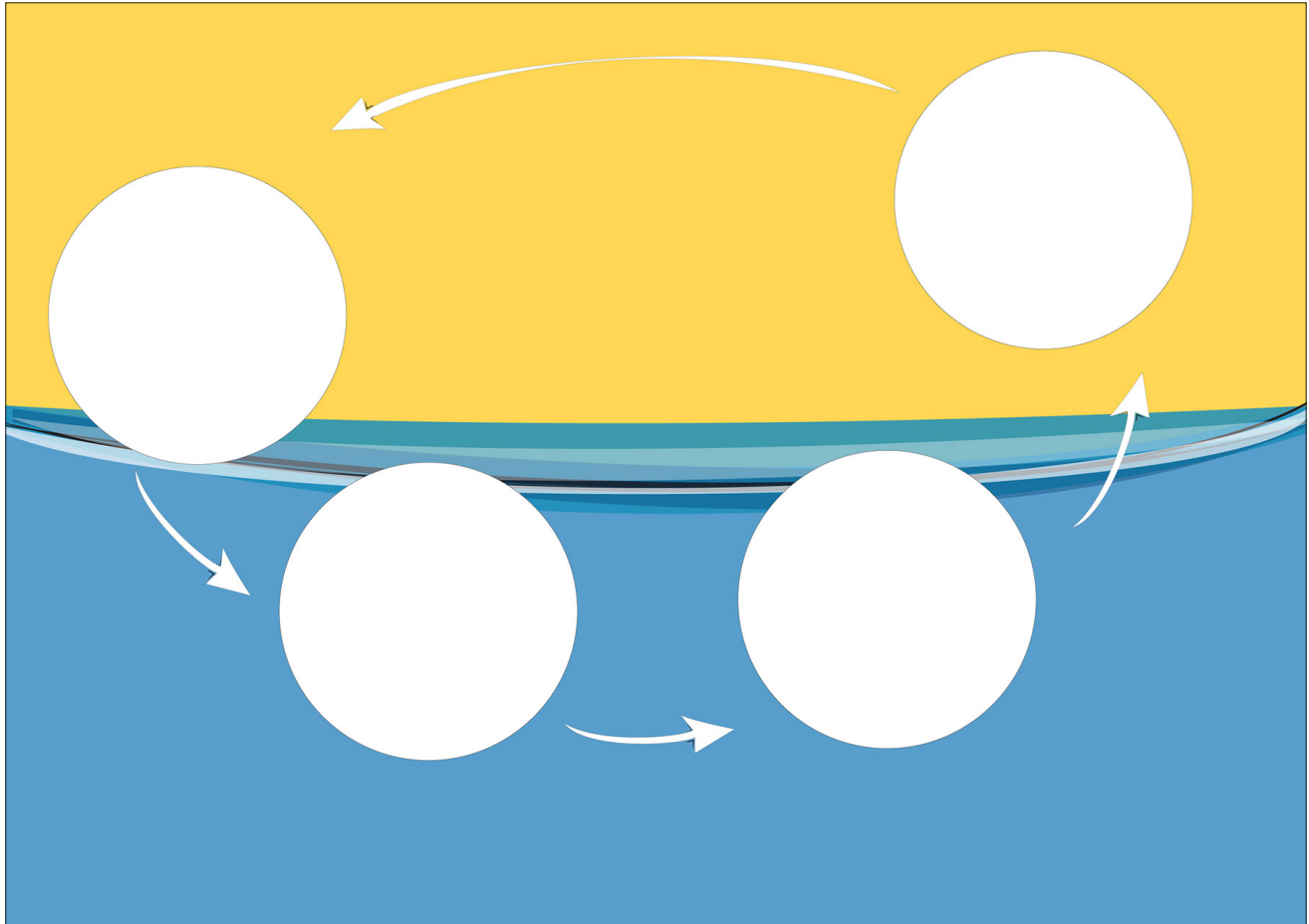
- Why do you think larvae would leave the surface and drop down into the water?
- After just a few days as a larva (depending on species of mosquito), it develops into a pupa. Pupae also live in the water. During this short stage it forms the body parts that will allow it to survive in the air as an adult. A pupa does not eat.  
If they do not eat, how do you think they survive?

**Practice your scientific drawing skills by drawing a pupa and a larva in the box below.**



## 4. Putting the Life Cycle Together

The diagram below represents the mosquito life cycle, with arrows showing the sequence of stages and empty circles representing the actual stages. The four circles below the diagram show what the mosquito looks like in each of the four stages. But those circles at the bottom are not in the proper order of development.



**Where on land, or in the water, do mosquitoes develop?**

Draw a line from the circles at the bottom (with the images of the mosquito) to the empty circle on the diagram in which you would find that stage of the mosquito.



# 5. Explore Mosquito Habitats

## Where Might You Find Mosquitoes in this place?

In your upcoming research, you will need to find mosquito larvae. In the following three pictures, find and circle places you would expect to find them. Then complete the box below the picture.



Find five larvae breeding places	Why do you think larvae might breed in these places that you've listed?
1.	
2.	
3.	
4.	
5.	

# Where Might You Find Mosquitoes in this place?



Find five larvae breeding places	Why do you think larvae might breed in these places that you've listed?
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# Where Might You Find Mosquitoes in this place?



Find five larvae breeding places	Why do you think larvae might breed in these places that you've listed?
1.	
2.	
3.	
4.	
5.	

# How about mosquitoes in your own home?

In the space below, draw pictures of two items around your own home that could be used by female mosquitoes to lay eggs. Explain why she would use that item.

Drawing	Why would she lay her eggs here?
1.	
2.	

# Background Building Summary

## Your research is just beginning!

You have learned a few basic facts about mosquitoes. You know about their life cycle, where they lay their eggs, why water sources are important to them, the three stages of their life cycle that you rarely see, why mosquitoes bite, what all mosquitoes eat, and where to find them.

**What questions do you now have about mosquitoes that you would like to explore?**

1.

2.

3.

4.

5.

**You have completed the first state of your mission.** Your notebook already contains information about mosquito biology, related to vocabulary, drawings, and questions that you have gathered. You have built background knowledge and skills needed to go further in your mosquito investigation.

### Share what you've learned!

Be sure to share the work that you've done with others, for example, parents, grandparents, and friends. And be sure to check the **GLOBE Mosquito Investigation Notebook page** for additional investigations: <https://strategies.org/mosquito-notebook>

# Keep Building Your Notebook

Here are some ways that you can continue to build your *Mosquito Investigation Notebook*, add to your knowledge, and improve your science skills.

- **Discover** additional mosquito investigations at <https://strategies.org/mosquito-notebook>
- **Check** the GLOBE Observer website for other resources related to mosquitoes. Go to <https://observer.globe.gov/do-globe-observer/mosquito-habitats/resource-library> for additional information, along with educational games and videos.
- **Build** your background on mosquitoes by reading or listening to books that feature stories and information about mosquitoes. Here are book suggestions to get started; find more at your local public library or on our list at: <https://www.worldcat.org/profiles/MissionMosquito/lists/3869345>

***Zika Zine: The Story of Three Aedes Mosquitoes and the Zika Within Them*** by Lisa S. Gardiner, <https://scied.ucar.edu/zikazine>

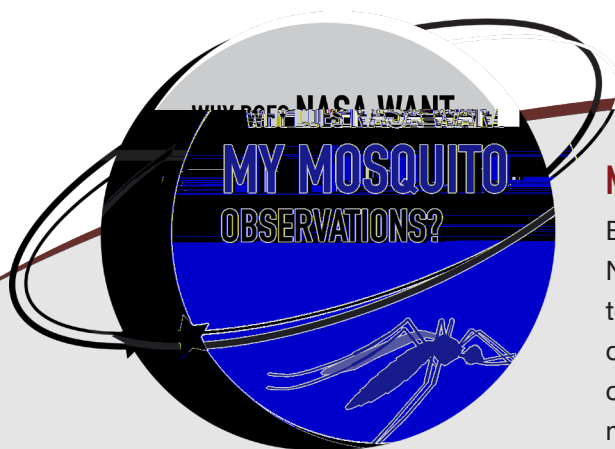
***Mosquitoes Don't Bite Me***, by Pendred Noyce

***Fever 1793***, by Laurie Halse Anderson

***The Fever: How Malaria Has Ruled Humankind for 500,000 Years*** by Sonia Shah

**NASA GLOBE Observer:** The most important tool in your mosquito research is the GLOBE Observer free mobile app. Future investigations will involve using it to document mosquito habitats. GLOBE Observer is part of the international GLOBE Program and is designed for volunteer scientists (like you) who wish to contribute to Earth system science research. **Note:** the app requires you to create an account using an email address, so it must be downloaded by individuals 13 years of age or older.

**Download the app** at <https://observer.globe.gov/about/get-the-app>. The app includes step-by-step instructions. You can also learn more by going to <https://observer.globe.gov/do-globe-observer/mosquito-habitats/taking-observations>



## Mosquitoes can't be seen from satellites in space

But the warm, moist conditions they prefer can be observed by NASA satellites. Climate and weather conditions can suggest to scientists where to expect spikes in mosquito populations during the year, but your mosquito observations at ground level can verify those population changes. By reporting possible mosquito habitats using the **GLOBE Observer** app, you are helping NASA scientists doing broad scale satellite-based research with local ground-based observations.