



Science Background

1. Introduction to GO MHM
2. Mosquito Vectors of Disease
3. Satellite Data and NASA Connections
4. Prior Knowledge Quiz
5. Describing your mosquito habitat site using the GO MHM App
6. Using the app for the first time

Lunch and Fieldwork

Hands-on session and Tour of GO MHM

7. Using the macrolens

8. Identifying specimens

9. Breakouts- Small Group Work
10. Education and Training Resources/ Bingo and digital games



Know Your Mosquito Larvae



Knowing your mosquito larvae involves...

- recognizing the gross morphological characteristics of mosquito larvae.
- learning the morphological features used in identifying a larva specimen.

You will investigate and identify the larvae of three genera of mosquitoes:

- *Anopheles*
- *Aedes*
- *Culex*

These three genera are of interest because they contain species that can transmit pathogens to humans and cause disease.

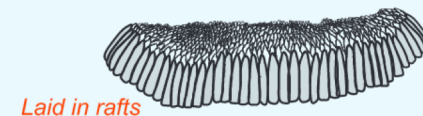
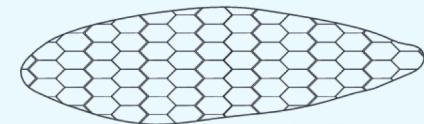
To know the larvae of these three genera, you will examine morphological features on the terminal abdominal segments (8-10).

Anopheles

- *Anopheles* mosquito larvae are found in a wide variety of habitats. Many species of *Anopheles* prefer open-water pools with little vegetation, but others have adapted to other habitats.
- *Anopheles* species lay individual eggs supported by floats on the water surface or on moist soil immediately adjacent to fluctuating water bodies.



Anopheles gambiae
Credit: James Gathany
Source: CDC



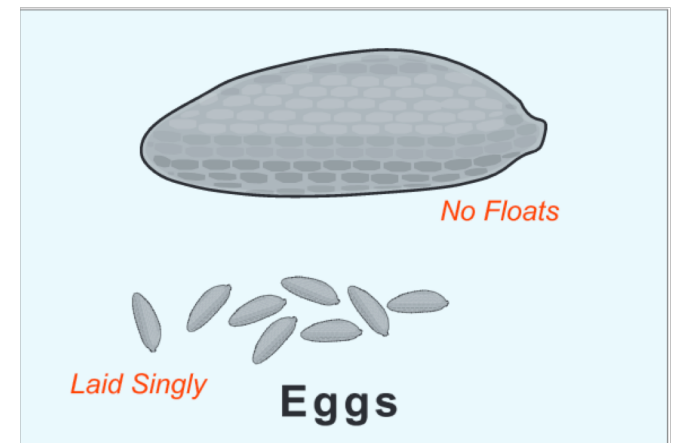
Aedes

Aedes aegypti and *Aedes albopictus* are **container breeding mosquitoes**.

Aedes aegypti lay their eggs in water found in artificial containers- such as flowerpots and water jugs. The females lay the eggs along the edge, just above the water level. When the water level rises, it moistens the eggs and they then begin to develop.

Aedes albopictus also lay their eggs in artificial containers but, in addition, will use natural containers such as a tree hole or a coconut shell.

Other species of *Aedes* mosquitoes breed in floodplains after rain events, in irrigation ditches, in woodland pools, brackish swamps and salt marshes.



Culex

Culex mosquitoes breed in stagnant water found in:

- Sewage systems
- Drainage systems
- Septic tanks
- Containers: tires, buckets and rain barrels
- Open surface water habitats: swamps, marshes, bogs, rice fields, pastures

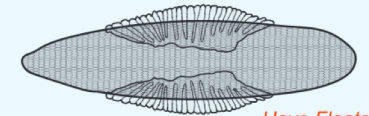
They prefer to lay eggs in rainwater barrels, storm drains, and septic tanks. Eggs are laid in rafts that float on the water surface.



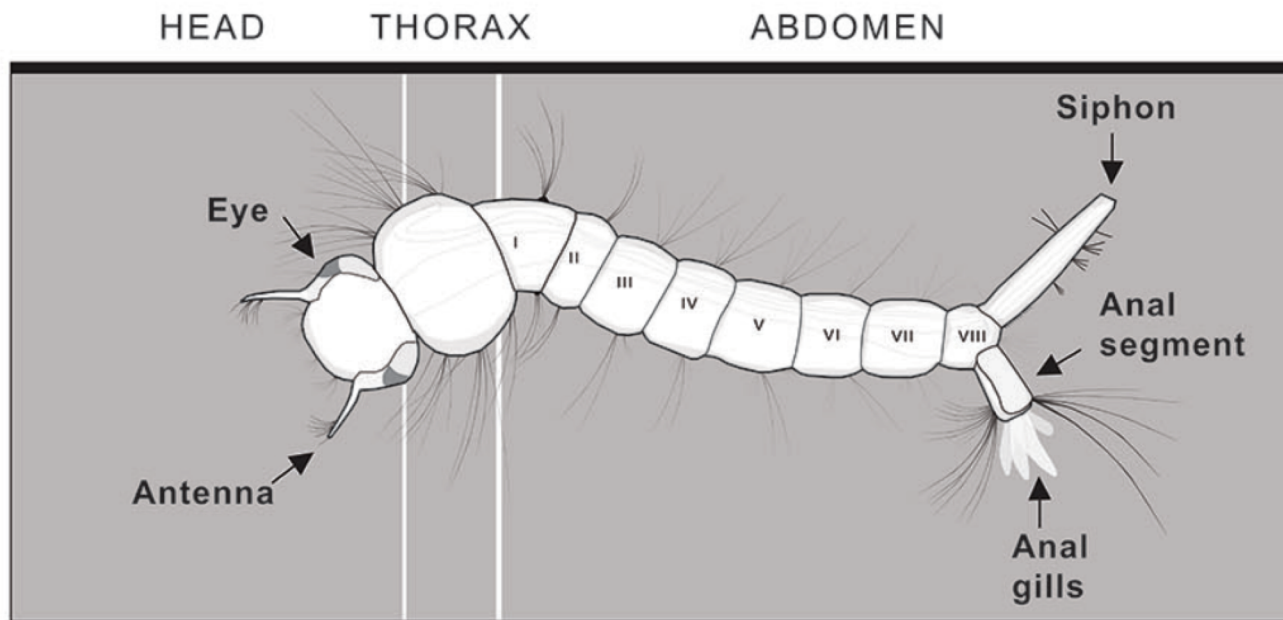
Culex quinquefasciatus

Credit: Jim Gathany

Source: CDC

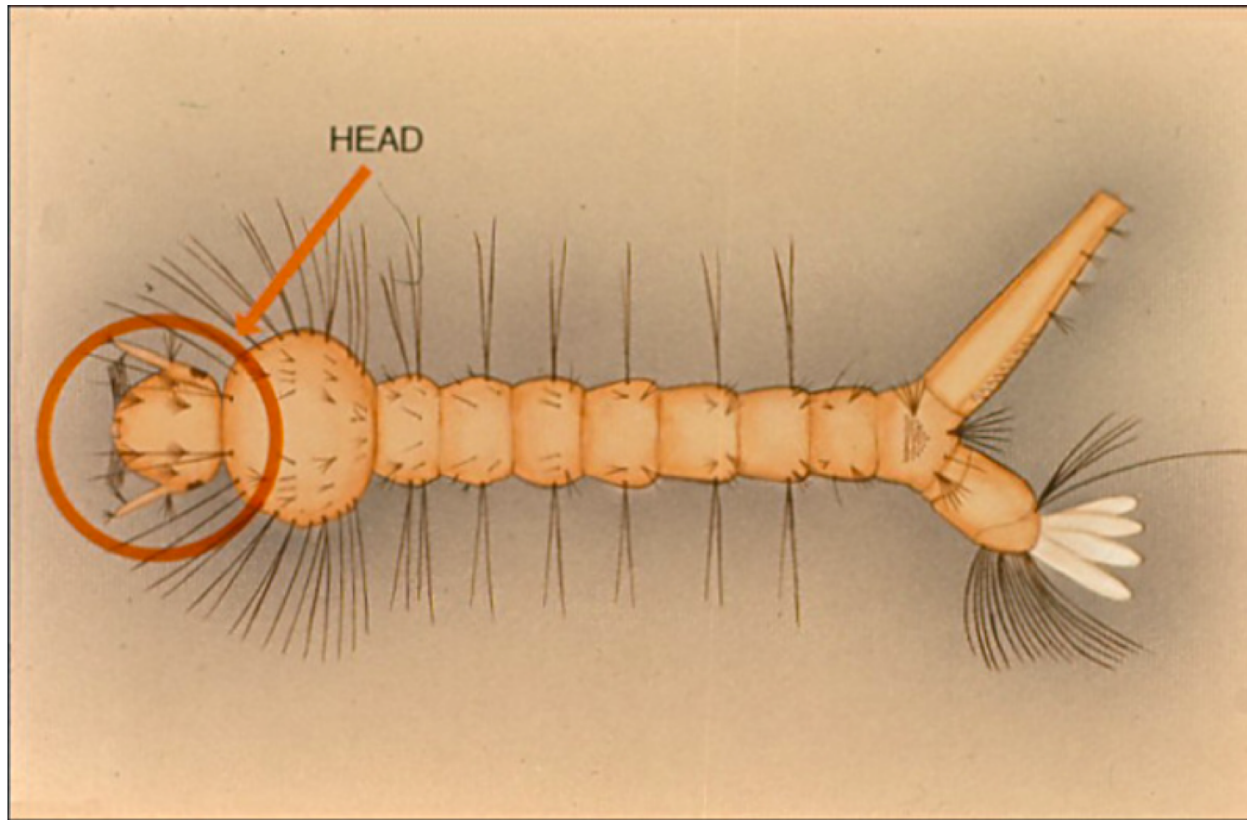


MOSQUITO LARVA ANATOMY



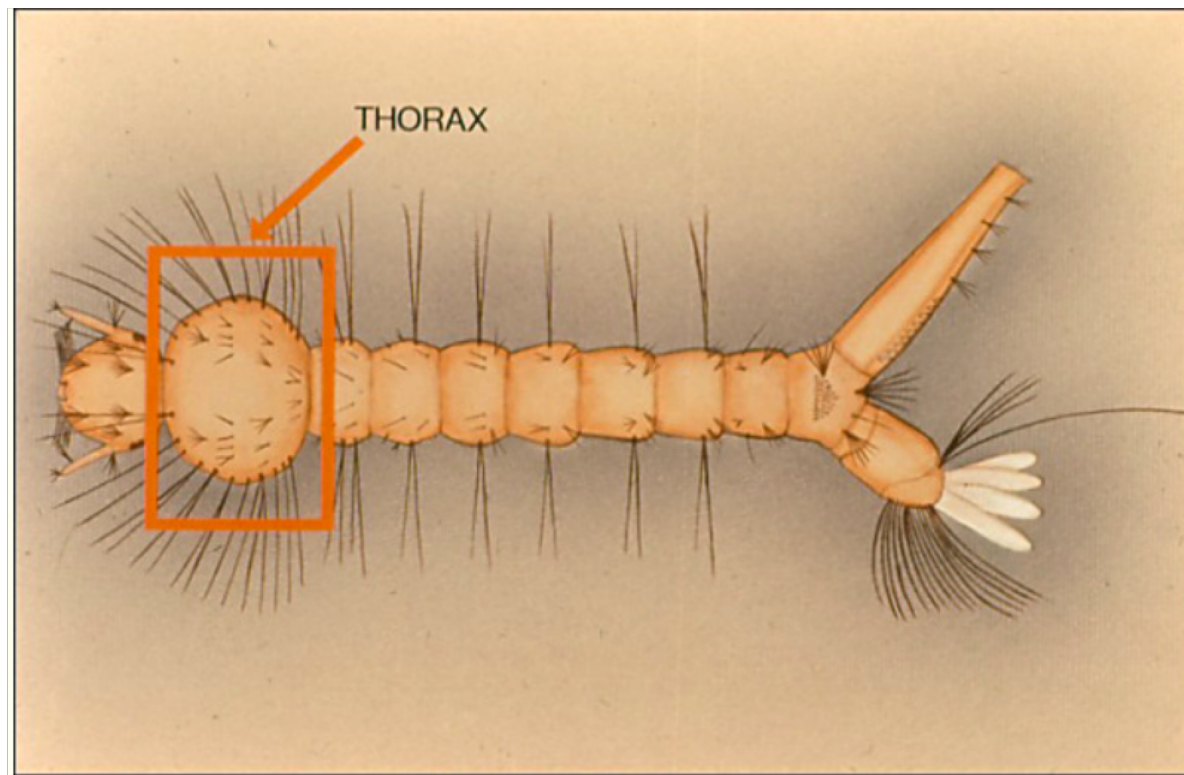
GENERAL ANATOMY

Head: the head is round or slightly oblong and slightly flattened



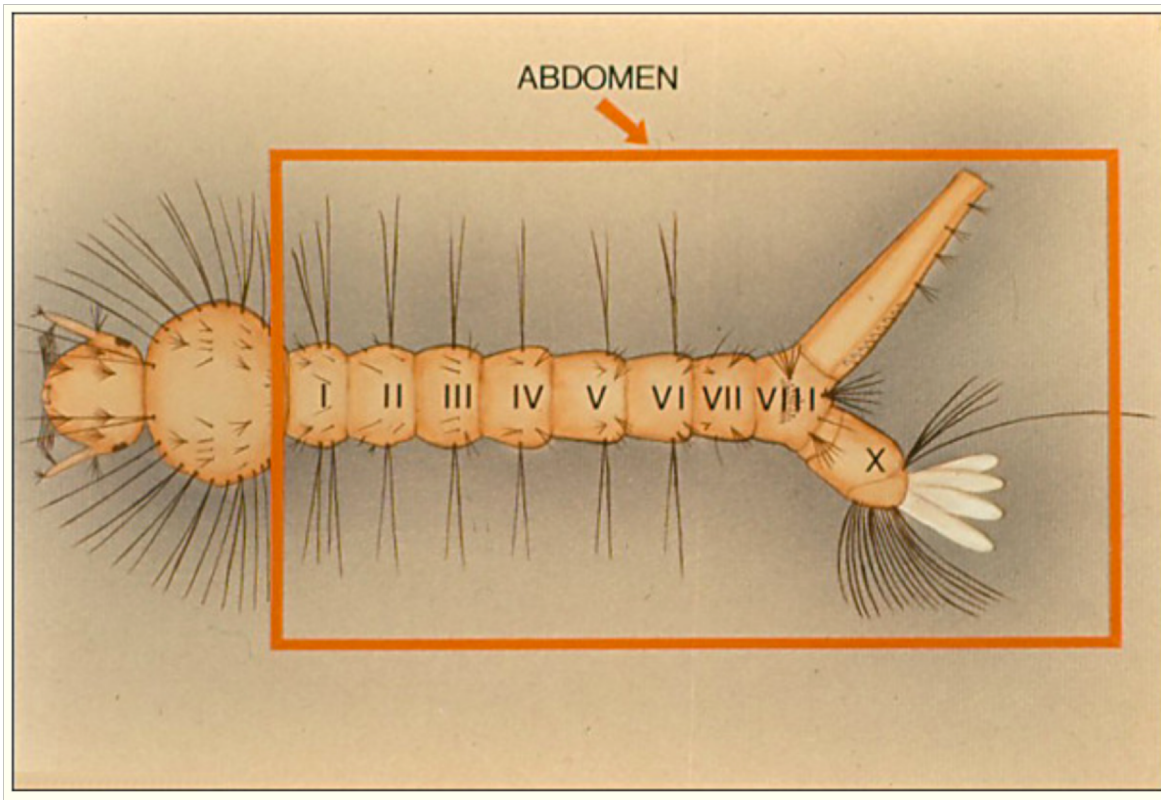
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Thorax: appears distinct from the head, separated by a very narrow neck



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Abdomen: segmented section behind thorax



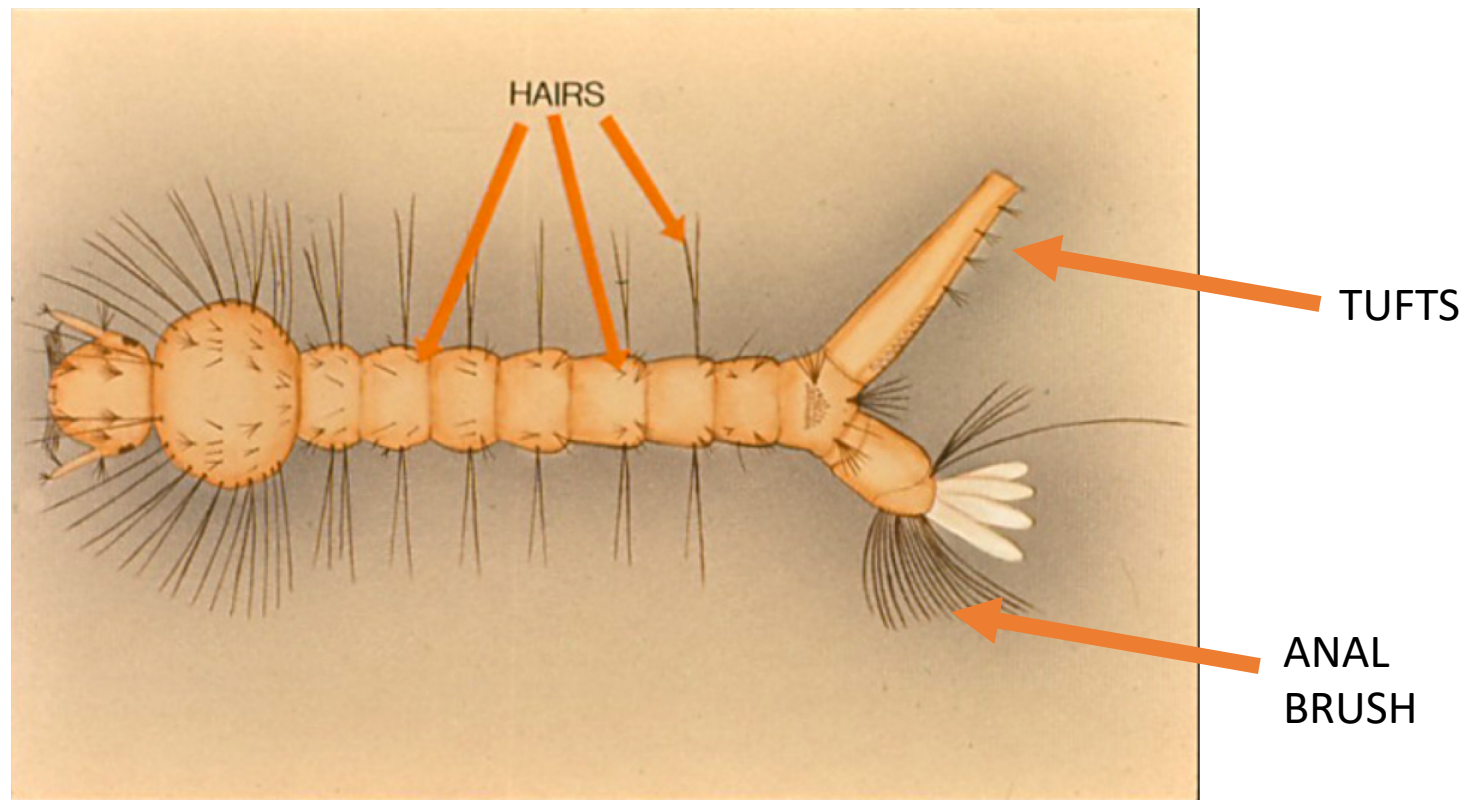
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The abdomen has 10 segments, but not all are distinct. In *Aedes* and *Culex*, the ninth segment is not distinct; in *Anopheles*, the tenth.

The four white protrusions on the anal segment are anal papillae which perform osmotic regulation of the organism.

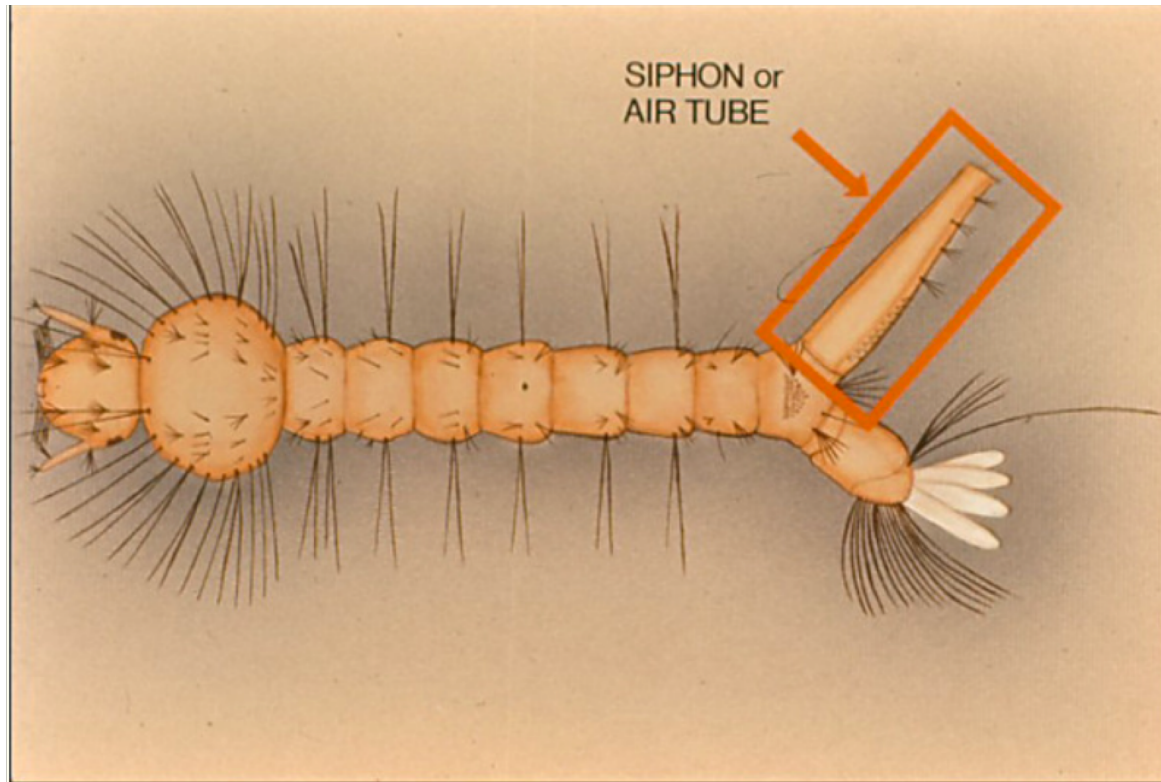


Hairs: the number, position and arrangement of hairs on the larva can be diagnostic.



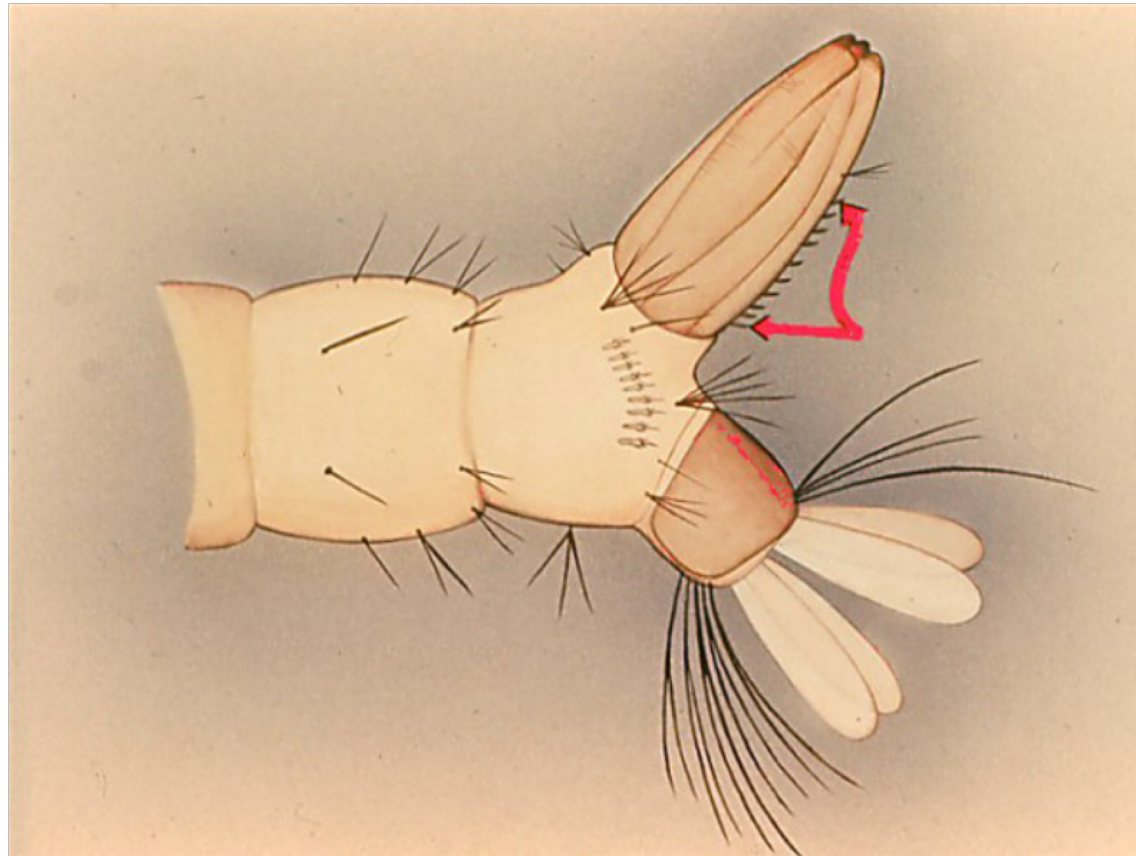
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Siphon: an air tube on the 8th abdominal segment.
All genera – except one- have a siphon.

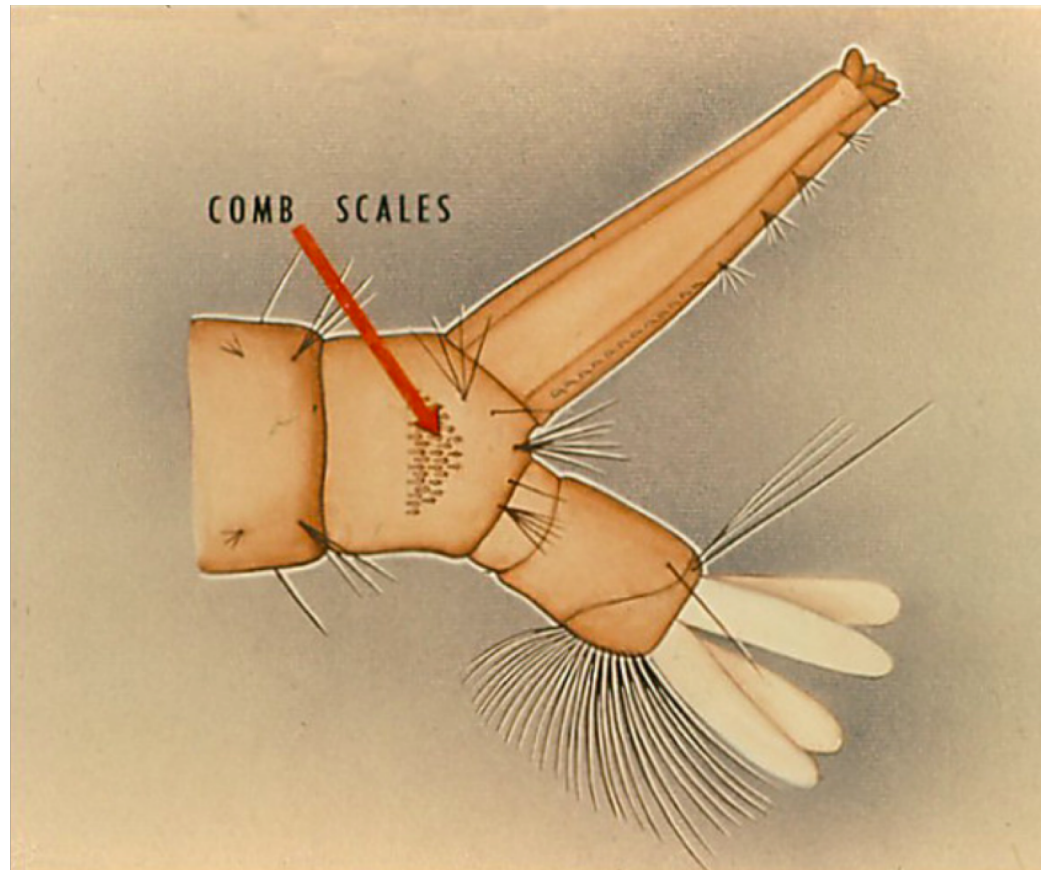


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Pecten: a row of closely set teeth or spines on each side of the siphon.

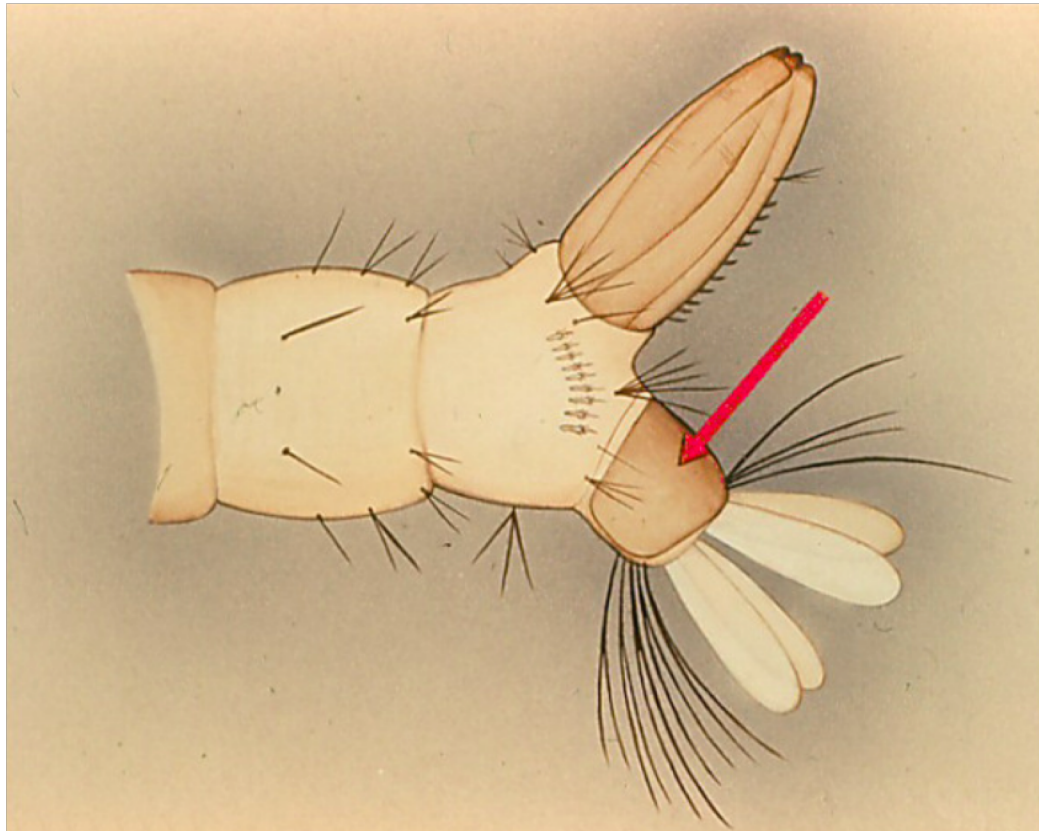


Comb scales: a line or patch of scales found on the 8th abdominal segment in most genera.



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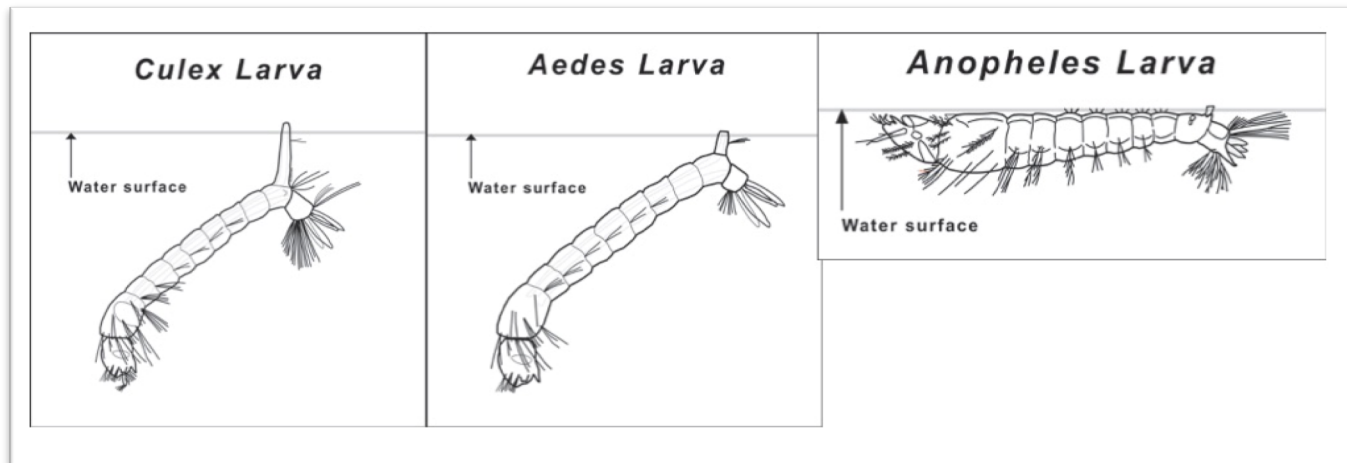
Saddle: a thickened and dark plate that encircles or partially encircles the 10th abdominal segment. It looks like a saddle, hence its name.



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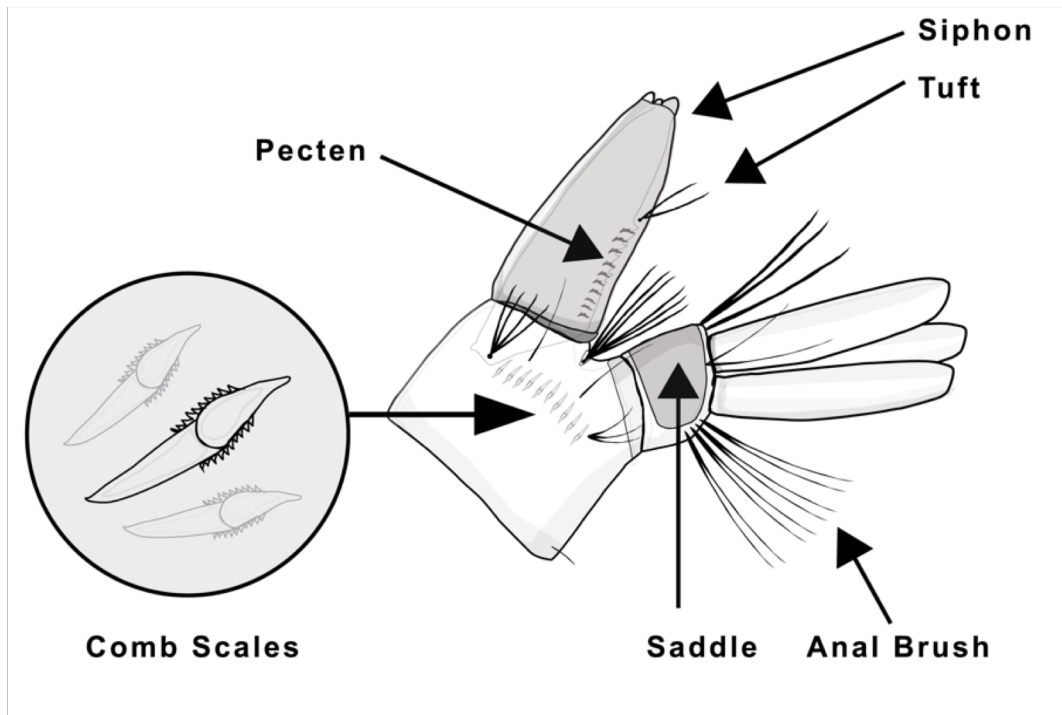
First step in mosquito larvae identification

Place the larvae in cups, vials or plastic bags. Observe them to see how they suspend from the surface of the water. If the larvae are lying flat on the surface, they are from the genus *Anopheles*. This is the only genus of mosquito that lies flat on the surface; all others are suspended from the surface at an angle.



Details of abdominal morphology

*Key features are often found on the anal segment and the siphon.



Siphon: the air tube used by some species of mosquito to breathe. (more on next slide)

Saddle: a dark, thickened band on the anal segment. It can ring the segment, be in two pieces, or appear like it does here, as a saddle

Comb scales: scaly or spiny spicules found in rows or a patch on the abdomen.

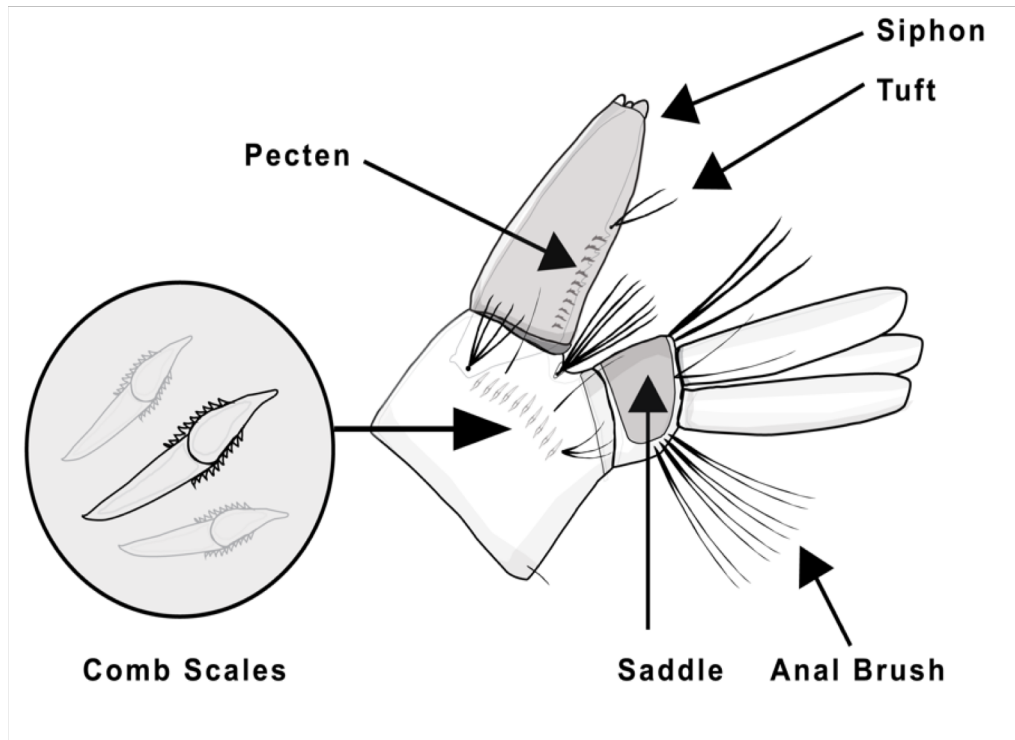
Pecten: an even row of tiny spines found on the siphon.



Siphon

- The siphon is an air tube located on the abdomen of the larva.
- Because the larva hatches from the egg and lives in the water, the siphon allows the larva to breathe.
- Most species, including those in the genera *Culex* and *Aedes*, have a siphon and spend most of their time on the surface breathing.
- *Anopheles* does not have a siphon. Instead, it lays parallel to the surface and breathes through openings on its 8th abdominal segment (spiracles).
- Some species have specialized siphons and attach to emergent plants found in water, using the plant tissue to access air to breathe.

Abdominal Hairs



The placement and number of hairs on the abdomen can be diagnostic.

Setae, Brushes, Tufts and Hairs:

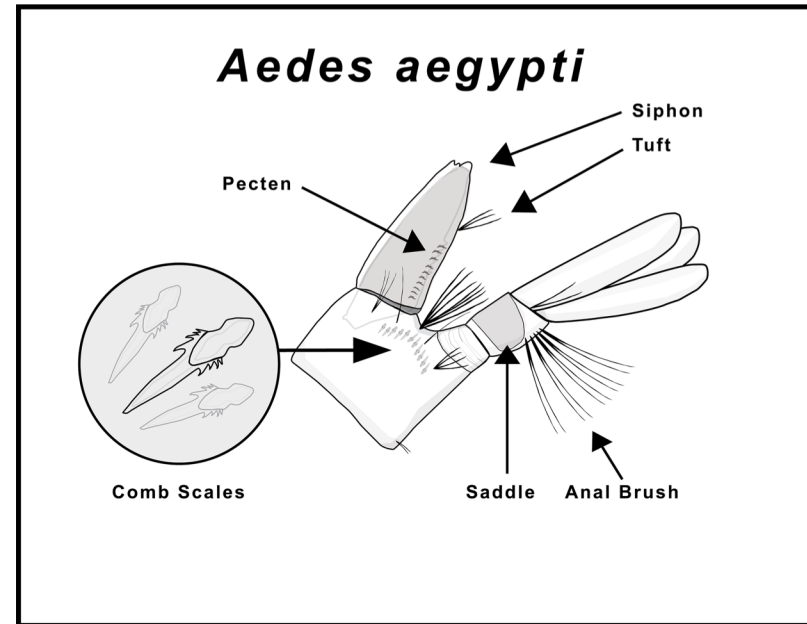
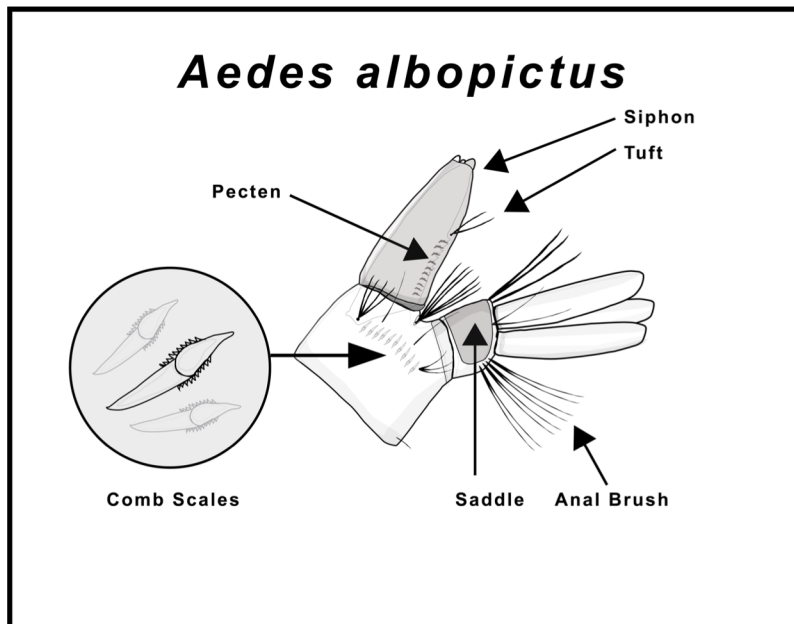
Tuft: more than one hair growing together.

Brush: a clump of tufts

Setae: another word for insect “hair”

Anal Brush: the anal brush is used like a rudder when the larva is swimming

Note: Distinguishing between *Aedes albopictus* and *Aedes aegypti* requires at least 35x magnifier.



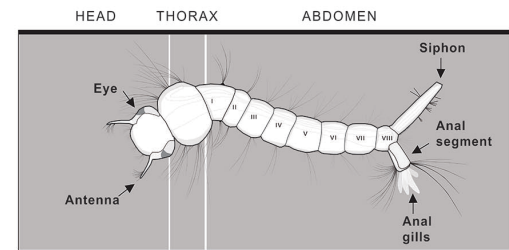
You will need to look at the **comb scales**. Note the differences shown in the diagrams above.

Identifying mosquito genera and species in your area

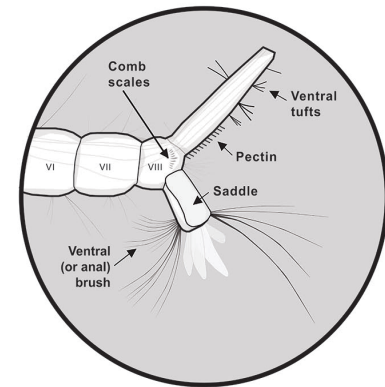
Familiarize yourself with the general anatomy of the mosquito larvae and the key features that distinguish those genera or species that are found in your locality.

Consult with mosquito experts or mosquito identification keys for your locality to identify important species in your region.

MOSQUITO LARVA ANATOMY



GENERAL ANATOMY



IDENTIFICATION FEATURES



Acknowledgements

The **GLOBE Observer Mosquito Habitat Mapper** is a NASA-sponsored project that is the result of the combined efforts of an extended team that includes the Institute for Global Environmental Strategies (IGES); NASA Goddard Space Flight Center, Langley Research Center, and Jet Propulsion Laboratory; Space Science Applications, Inc. (SSAI); the GLOBE Implementation Office (GIO), GLOBE DIS and Brooklyn College.

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This presentation was prepared by the Institute for Global Environmental Strategies (IGES) and does not necessarily reflect the views of the NASA or USAID. For more information, contact the MCCC Principal Investigator, Dr. Russanne Low: Rusty_low@strategies.org

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