MOSQUITOES!

Their Biology and Ecology

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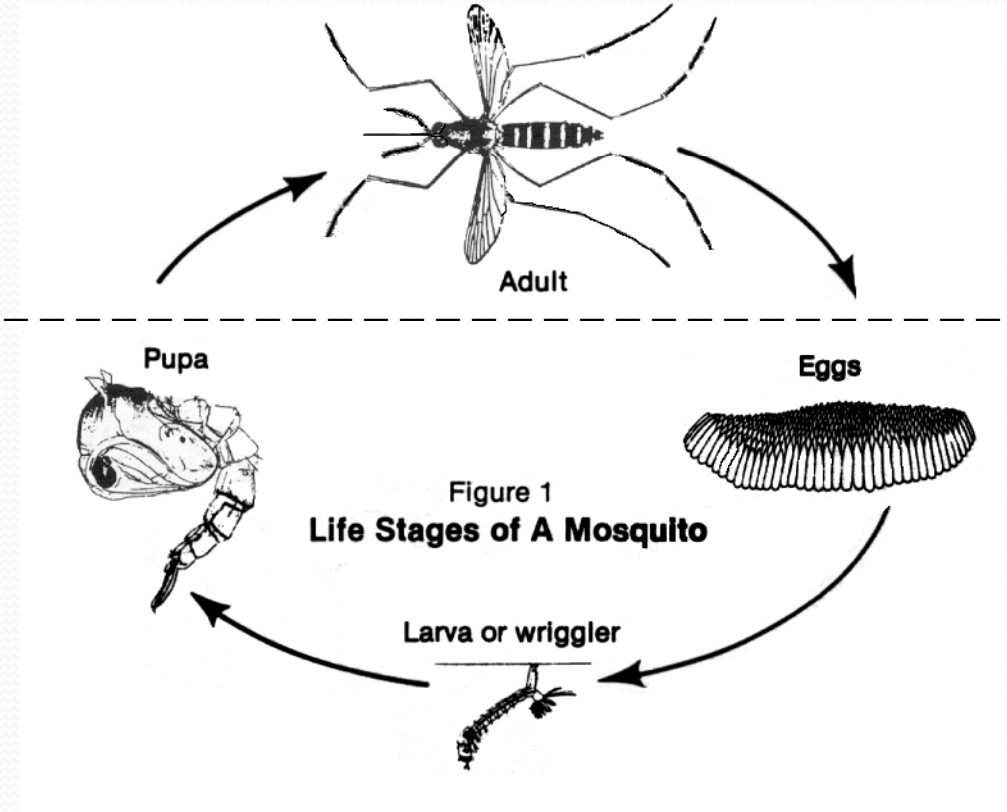
Mosquito Biology

- 60- plus species in Maryland in 10 genera
  - 10 or more can vector disease
  - Many cause annoyance problems
- Many different habits and habitat requirements
- Quick life cycle; many generations per season

Mosquito Life Cycle

All stages below the dotted line are aquatic

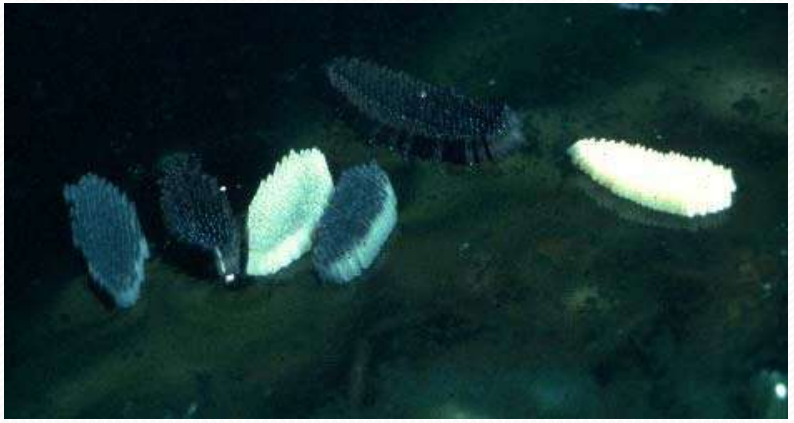


Complete Metamorphosis

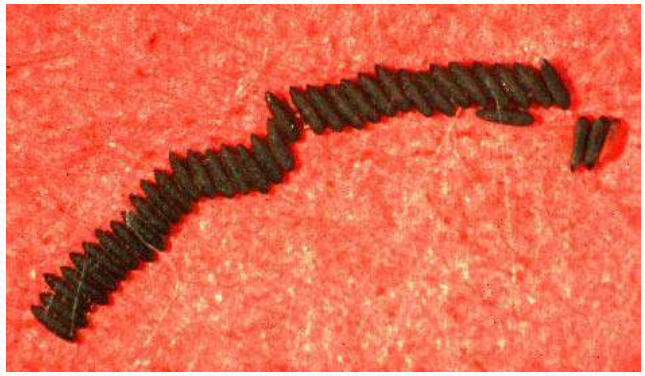
Eggs

- Laid either in rafts, or singly on water surface or on dry ground

Culex laying egg raft



Egg rafts may contain up to 300 eggs



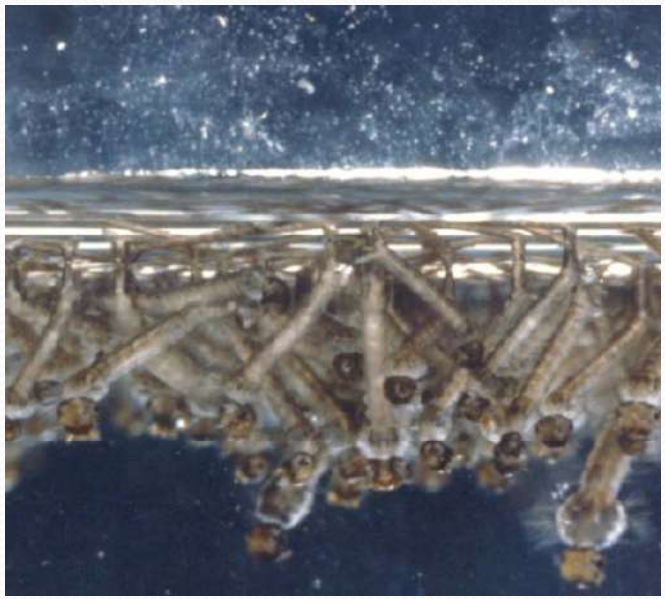
Eggs laid singly, *Aedes* or *Ochlerotatus*

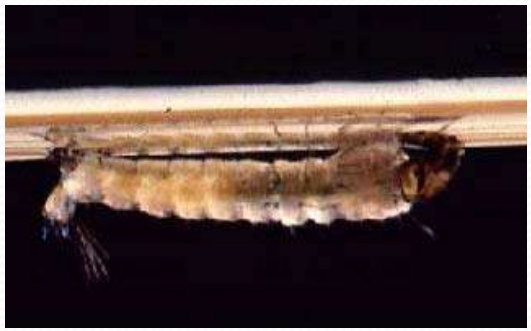
Larvae

- *Must* live in water
- Must breathe air, usually at the water surface
- Very active; light- and movement-sensitive

Notice the long siphon tubes on these larvae, probably Culex

Some species' larvae will congregate together in a 'knot' or 'ball' in their breeding habitat

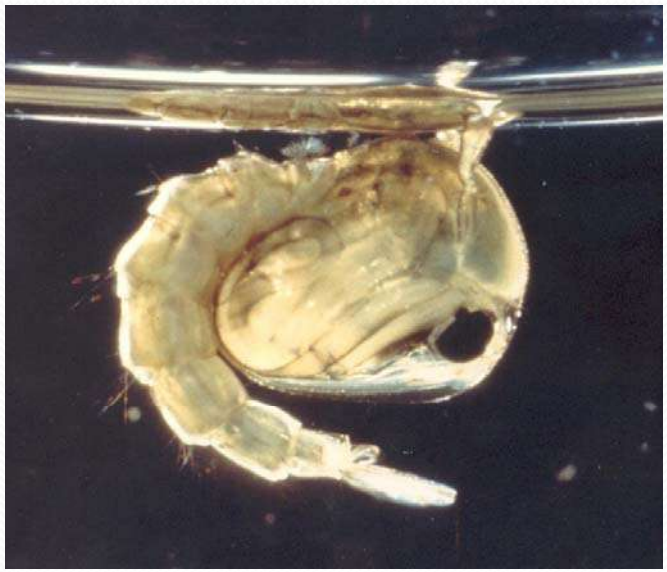




Anopheles larvae lack a siphon tube

Pupae

- The 'resting' stage – undergoing their complete transformation into the flying adult
- Very active – tumble through the water when disturbed
- Must breathe air, usually at the water surface
- Do not feed!

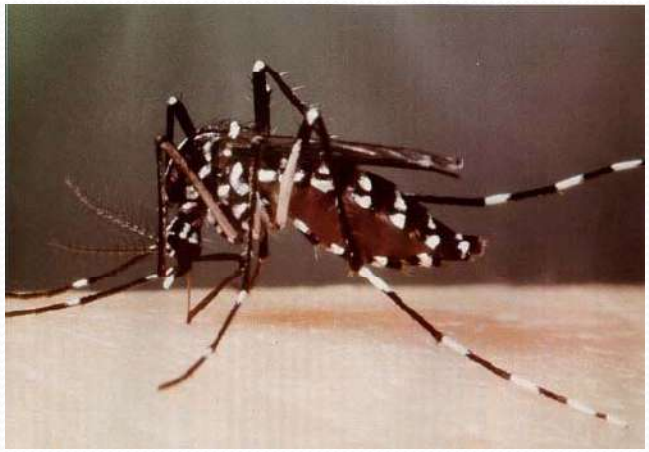


Adults

- Both male and female feed on nectar or plant juices – energy for flight
- Only females bite – need blood (protein) for egg development
- Wide variety of flight ranges, host preferences and habitats

Ochlerotatus bloodfeeding – notice her pointed abdomen

Aedes albopictus, the Asian tiger mosquito



Anopheles feeding – notice the 'headstand' position she takes

Where To Lay Eggs…

Just a sampling of potential egg-laying habitat









Types of Breeding Areas

- Permanent or semi-permanent water
  - *Culex* and *Anopheles*

- Floodwater
  - *Aedes*, *Ochlerotatus* and *Psorophora*

- Treeholes and man-made containers
  - *Aedes*, *Ochlerotatus* and *Culex*

Mosquito Habits

- **Flight Range**

Aedes albopictus - less than 200 yards
The Asian tiger mosquito

Culex and *Anopheles* - 1 to 2 miles

Ochlerotatus , various - 5 to 50 miles

Mosquito Habits

Host Preference examples:

- **Birds** - *Cs. melanura, Cx. erraticus*

- **Mammals** - *Ps. columbiae*

- **Reptiles & Amphibians** – *Cx. territans*

Many species will feed on any vertebrate, leading to disease transmission from birds to mammals.

SURVEILLANCE METHODS

LARVAL

Larval Dipping

Pipette

Sieving

ADULT

BG Sentinel traps

CDC light traps

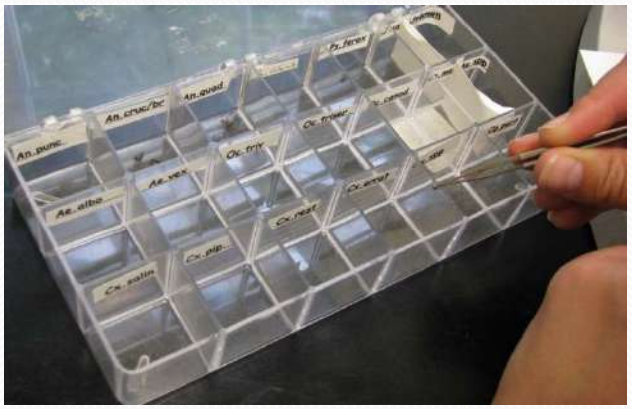
Landing Counts

Gravid traps

Trapping -The BG Sentinel

Cartoon courtesy of Fairfax County Health Department

Trapping & Disease Surveillance



Mosquitoes are trapped, identified to species, then some are sent to DHMH for virus testing

CONTROL METHODS

SOURCE REDUCTION

Getting rid of standing water

BIOLOGICAL CONTROL

Fish eat mosquito larvae

CONTROL METHODS

LARVICIDING

Killing larvae in the standing water where they develop

CONTROL METHODS

SOME LARVICIDE PRODUCTS

PRODUCTS HOMEOWNERS CAN USE

CONTROL METHODS

ADULTICIDING

This is the most recognizable form of mosquito control – and the **only** one many people know about!

Mosquito-Borne Diseases in MD

Endemic Diseases in Maryland

- Eastern Equine Encephalitis
- West Nile virus
- St. Louis Encephalitis
- Dog Heartworm

Possible imported diseases:

- Chikungunya virus (Caribbean, C. & S. America)
- Zika virus (C. & S. America)

Container-breeding Aedes	Culex
• Bite anytime of day	• Bite mainly at dusk & dawn
• Interrupted feeding	• Not skittish biters
• Hard to treat – must have access to private property	• Often in water on public property; can also utilize containers
• Do not come to standard CDC traps – need BG Sentinel traps	• Readily come to baited CDC traps.
• Readily enter homes & cars	• Do not readily enter homes

The Trouble With Tigers

- Aedes albopictus introduced into Maryland in 1987
- Closely associated with human habitation – develops only in bamboo shoots, treeholes & containers
- Capable vector of several diseases, including WNv and Zika
- Incredibly annoying
  - Bites mainly during the day, unlike most of our species
  - Readily enters homes, cars, etc
  - Very persistent and aggressive biter
  - Difficult to eliminate unless egg-laying containers are eliminated
  - Many homeowners stop using their yards once this species is established

Tiger Larval Habitats

Any Of These Places Hold Enough Water To Support Tiger Populations

More Tiger Habitats

Still More Tiger Habitat

Even More Tiger Habitat

Other Problem Species

Oc. sollicitans – annoyance and disease transmission

Anopheles (not ours) – malaria vector

Oc. japonicus - excellent vector in lab

Cx. restuans - vector species

WHAT HOMEOWNERS CAN DO:

- Check yard weekly and tip or remove any water holding containers
- Talk to neighbors about "tiger" breeding areas – <u>problem cannot be fixed by cleaning only one yard</u>
- Work with community officials to educate whole community about "tigers"

Homeowners can use these products in their own yards to treat water in containers. Mosquito Dunks (left) and Mosquito Torpedoes (right) are both available commercially.

WHAT COMMUNITIES CAN DO:

- **Volunteers** – distributing information or doing yard inspections; church groups, scouts, HS students
- **Organize community clean-ups:** help elderly clean gutters/yards; arrange tire pick-up
- **Newsletters** – put information in anything going to homeowners
- **Display booth** – we have exhibits we can lend
- **Stock ponds** – ornamental ponds can be stocked with mosquito-eating fish
- **Covenants/Codes** – put something in codes about creating mosquito nuisance and ENFORCE it!

WHAT AGENCIES CAN DO:

- Inspect yards to find 'tiger' breeding areas.
- Educate the homeowner on methods for eliminating mosquito breeding.
- Leave a door hanger if the resident is not home.
- If inspecting a yard, it's always good to look at neighboring properties (or better yet, get permission to inspect there too).
- Public Education – workshops, talks, games, exhibits, flyers & bookmarks.

Public Education

Teacher Workshops

Library display

Community meeting

MDA's Open House

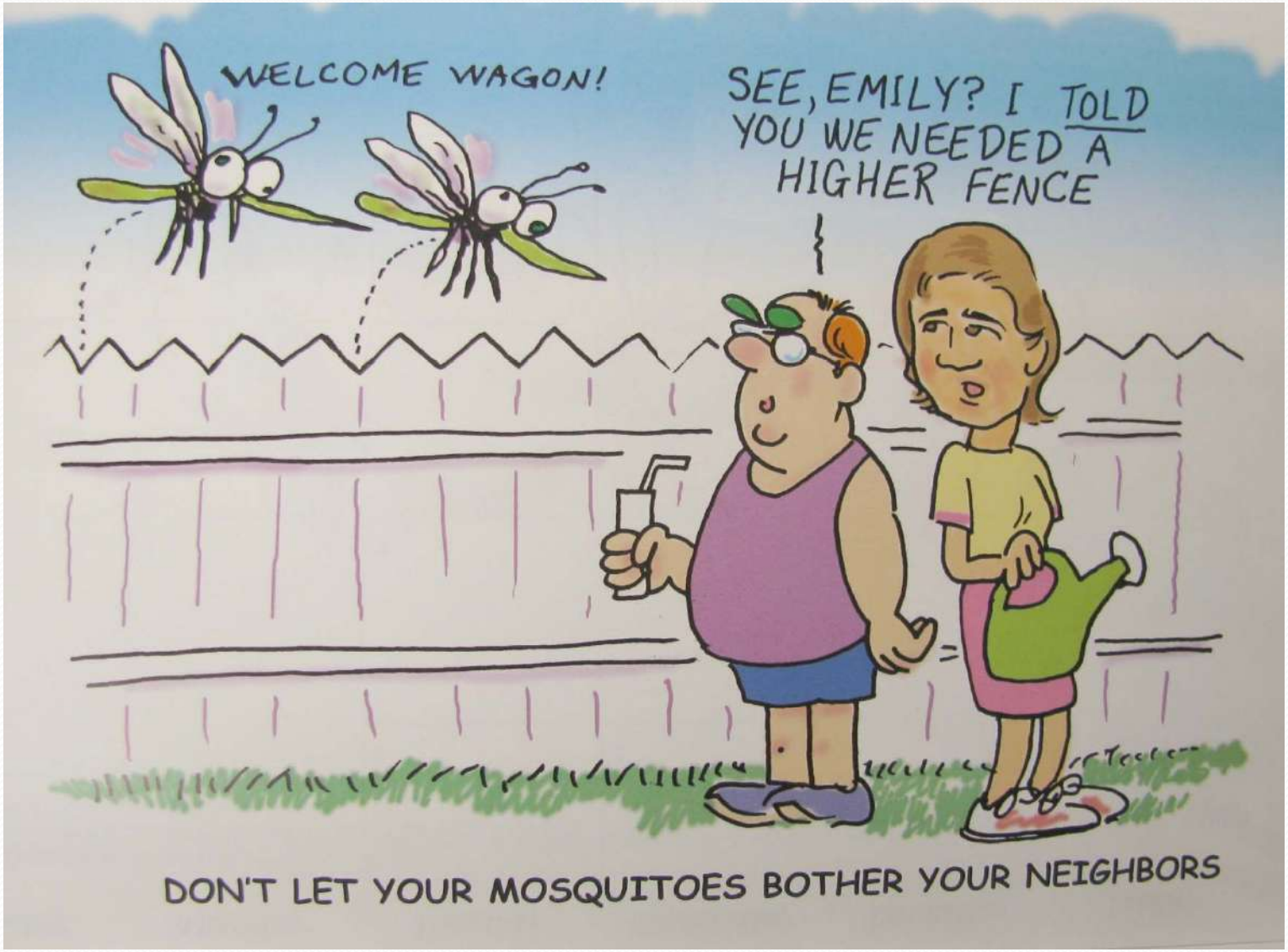
PROBLEMS ENCOUNTERED

- Asian Tiger Mosquitoes – MUST be a community effort – no one wants to take responsibility for their own property

- Budget – constant cuts over 15+ years

- Staffing – as our staff ages, trouble replacing entomologists; hiring freeze

- Spray Objectors – pervasive fear of insecticides in much of the population



Cartoon courtesy of Fairfax County Health Department

QUESTIONS?

Contact Information for MDA Mosquito Control offices:

- Baltimore, Harford counties: 443-875-9551
- Prince George's, Montgomery, Howard, western MD counties: 301-422-5080
- Anne Arundel : 410-841-5870
- Southern Maryland: 301-373-4263
- Eastern Shore: 410-543-6626