



Anopheles Genus

VMCA Adult Mosquito Identification Course

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The genus of *Anopheles* Behavioral Characteristics

Feeding:

- Mostly on mammals
- Occasionally bites birds & reptiles

Female activity:

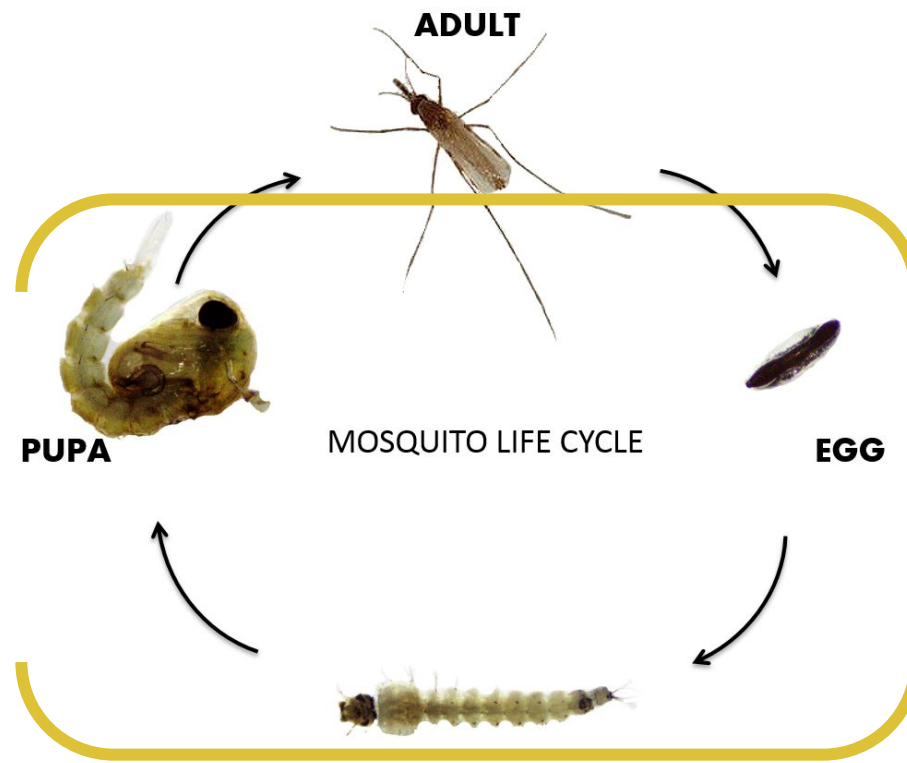
- Mostly active at night or dusk
- Daytime: resting in cool, damp places

Winter Season:

- Hibernating-like state over winter
- Often resting in sheltered environments
 - e.g. Attics, outbuildings

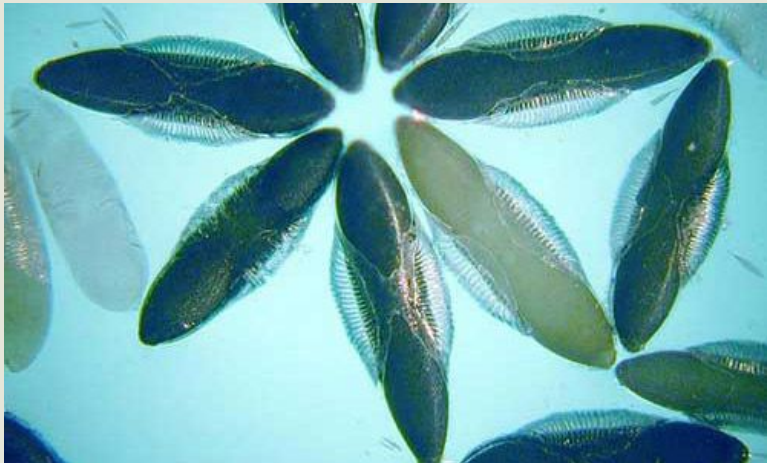
Potential Vectors for:

- *Plasmodium* spp. – parasite that causes malaria in humans
- *Dirofilaria immitis* – parasite that causes heartworm disease in dogs & cats

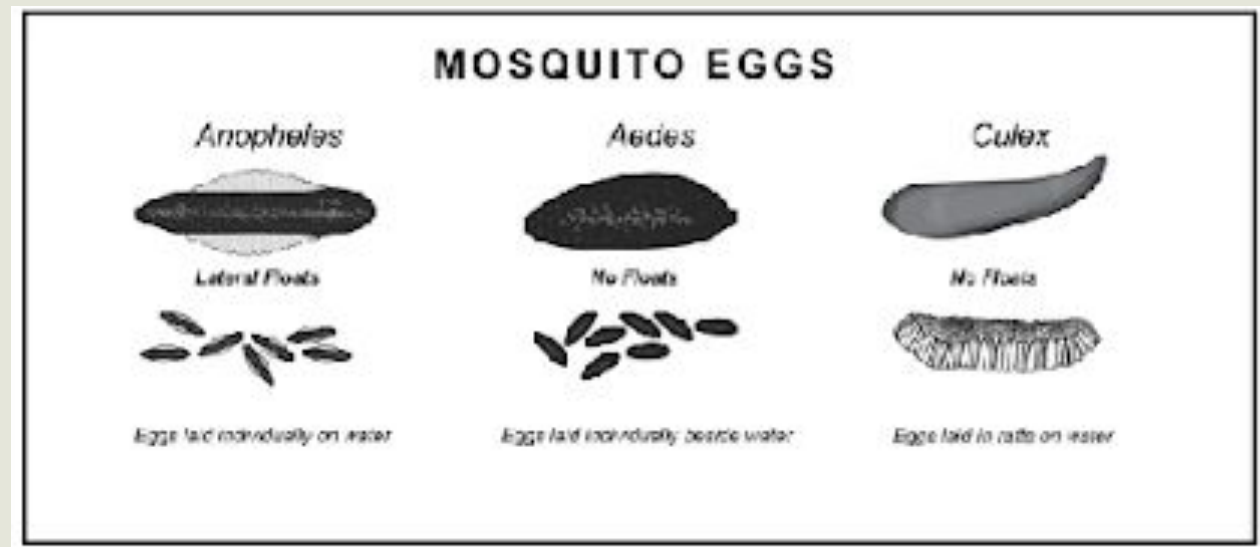


Anopheles spp. – Immature Stages of Life Cycle

Anopheles Eggs – laid singly on water, with *floats*



Eggs of the *Anopheles quadrimaculatus*

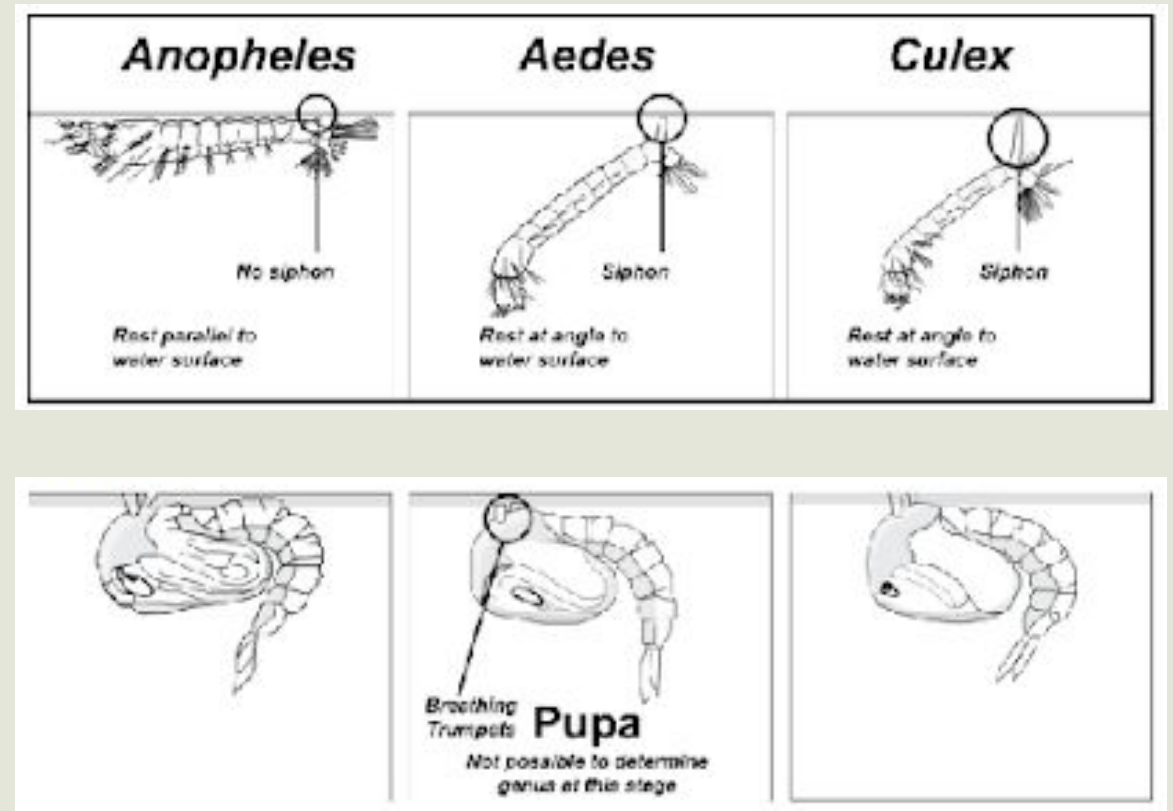


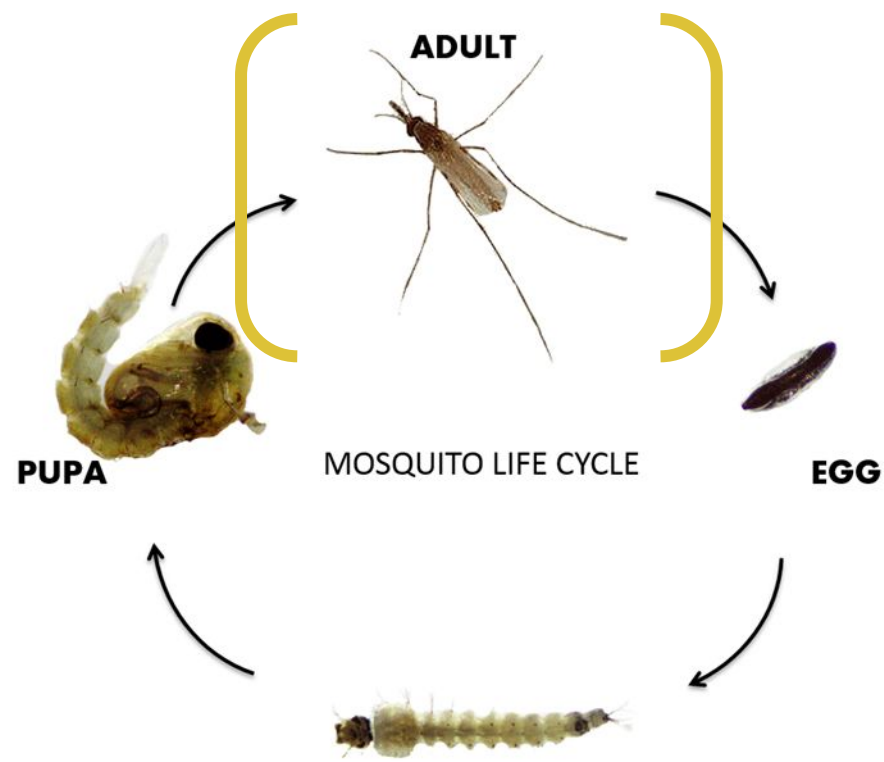
Anopheles Larva & Pupa

- *Anopheles* larvae:
 - **No siphon**
 - Rest parallel to water surface



Anopheles quadrimaculatus larva (left) & pupa (right)

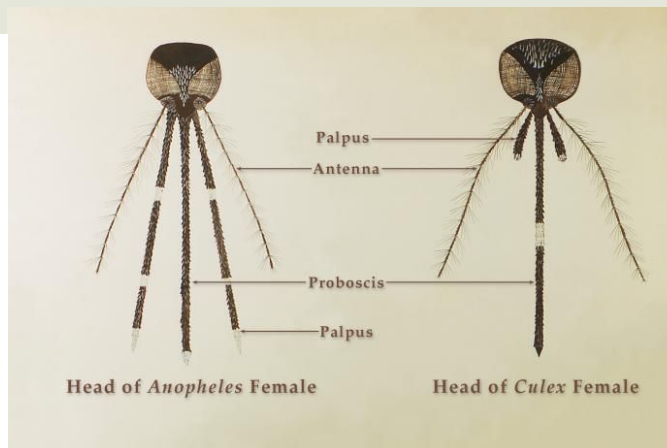




Adult Stage of Life Cycle
The species of *Anopheles* found in
Virginia

Common Morphological Characteristics *Anopheles* spp.

- **Easily** distinguished by:
 - **Long palps** – just as long as proboscis
 - Anopheles Long “Phel”-ers
 - **Posture when feeding/resting** – head, thorax, & abdomen at an angle to surface
- Rounded Abdomen
- Size: Medium – Large



Common Regional *Anopheles* Species of Mosquitoes

An. crucians complex



An. punctipennis



An. quadrimaculatus group



Anopheles crucians complex – Common

- *Anopheles crucians* complex – a group of ≥ 7 species
 - Some can be identified as larvae, most cannot be differentiated
 - Similar biology
 - Nearly indistinguishable as adults
- *Anopheles crucians* complex made up of:
 - *An. bradleyi*
 - *An. crucians*
 - *An. georgianus*
 - At least 4 other species that have not formally been distinguished
- Species within the complex are typically grouped together

- Breeding Habitats:

- Freshwater swamps, marshes, ponds & woodland pools – *An. crucians* & *An. georgianus*
- Salt marshes & brackish, coastal pools – *An. bradleyi*

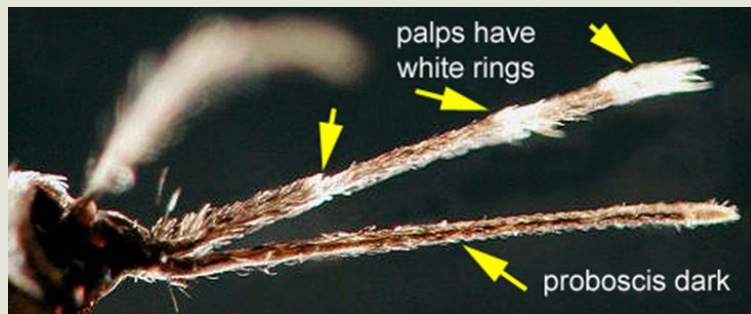


Anopheles crucians complex – Common

- **Identifying Characteristics**

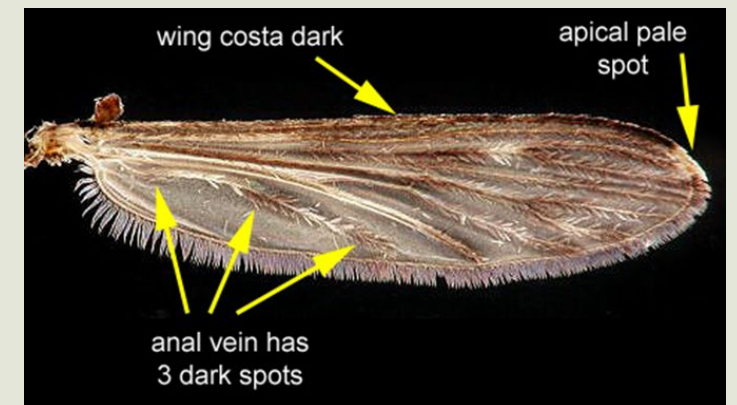
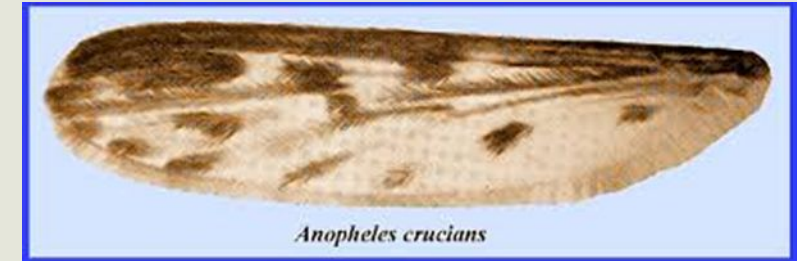
- Banded palpi

- Dark palps ringed with pale scales



- **Wings:**

- Solid dark costa with pale scales at outer tip
 - Spotted appearance – alternating patches of dark & light scales along veins
 - Specifically – anal vein has 3 dark spots





Anopheles punctipennis - Common



- “Punks”
- Breeding Habitats:
 - Slow-moving streams, puddles, ponds & pooled pockets of water within streams
 - Man-made containers:
 - Esp. rain-filled barrels & watering troughs
- Identifying Characteristics:
 - Palpi unbanded
 - Scutum (of thorax) – gray median stripe bordered by brown
 - Mohawk
 - Wings:
 - Costa is dark with two patches of pale scales:
 - One patch – breaks up the dark edge
 - Other patch – at outer tip (like *An. crucians*)
 - Anal vein has 2 dark spots



Anopheles quadrimaculatus group – Common

- “Quads”
- Previously considered a single species ☐ now ≥ 5 species – all close resemblance
 - Can only be distinguished by slight differences in number + coloration of bodily scales & setae
- *Anopheles quadrimaculatus* group made up of:
 - *An. quadrimaculatus*
 - *An. smaragdinus*
 - *An. diluvialis*
 - *An. inundatus*
 - *An. maverlius*
- These species are treated as one group
- Breeding Habitats:
 - Permanent bodies of water with aquatic vegetation
- Most important mosquito species in the southeastern United States involved with the ***transmission of malaria*** (prior to disease eradication)



Anopheles quadrimaculatus group – Common

- **Identifying Characteristics**

- Palpi – **only** dark scales
- Darker body – **more brown** than black
- Wings:
 - **No patches of pale** white scales
 - Four distinct patches of dark scales
 - Located at junctures of veins

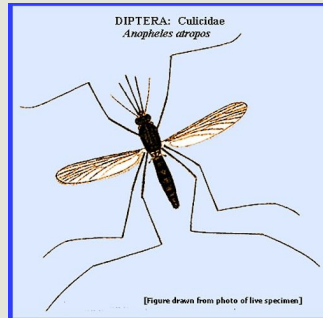


Uncommon Regional *Anopheles* Species of Mosquitoes

- *An. atropos*

- “Salt-marsh *Anopheles*”
- **Identifying Characteristics:**

- ✓ Palpi unbanded
- ✓ Dark halteres
- ✓ Wings entirely dark scaled, 4 indistinct dark spots



- *An. barberi*

- “Barber’s treehole *Anopheles*”
- **Identifying Characteristics:**

- ✓ Small, grayish-brown mosquitoes
- ✓ Pale scales around eyes
- ✓ Wing scales dark, but lack dark spots



- *An. perplexens*

- Breeding Habitats: Limestone springs Freshwater swamps
- **Identifying Characteristics:**
 - ✓ Palpi unbanded
 - ✓ Wings similar pattern to *An. punctipennis*
 - *An. perpl.* – Frontal pale patch is very small
 - Recent studies: sizes of pale spots vary for both species → hard to differentiate; distinct differences in eggs → more reliable way to identify



- *An. walkeri*

- Breeding Habitat: Freshwater swamps
- **Identifying Characteristics:**
 - ✓ Banded palpi
 - ✓ Pale halteres
 - ✓ Wing scales dark, with 4 dark spots (Similar to *An. atropos* & *An. quadrimaculatus* group)



Thank You!



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References

Slide 2:

1. ©2022 Official City of Jacksonville and Duval County Government Website Mosquito Control Anopheles crucians Complex <https://www.coj.net/departments/neighborhoods/mosquito-control/anopheles-crucians-complex.aspx>
2. Copyright © 2019 [Barbara Thurlow](#) Temple Hills, Maryland <https://bugguide.net/node/view/1743123/bgimage>
3. © Lee Elliott, some rights reserved (CC BY-NC-SA), uploaded by Lee Elliott https://www.inaturalist.org/guide_taxa/645745

Slide 3:

1. <https://www.pestterminators.com.mv/pest-library/>
2. CDC PHIL/Dr. Richard Darsie Illustrator: Chester J. Stojanovich
3. Pictorial identification key of important disease vectors in the WHO South-East Asia Region 2020

Slide 5:

1. Anopheles Genus – Life cycle http://vectorinfo.icmr.org.in/Mosquito/An_lcycle.aspx

Slide 6 & 7:

1. Featured Creatures Entomology & Nematology FDACS/DPI EDIS University of Florida Photograph by C. Roxanne Connelly, University of Florida. https://entnemdept.ufl.edu/creatures/aquatic/Anopheles_quadrimaculatus.htm
2. Globe Observer Know your Mosquito! Institute for Global Environmental Strategies p. 2 <https://observer.globe.gov/documents/19589576/dfd06be6-2a7b-49f8-99f4-fc03498c8aee>
3. Featured Creatures Entomology & Nematology FDACS/DPI EDIS University of Florida Photograph by James M. Newman, University of Florida. https://entnemdept.ufl.edu/creatures/aquatic/Anopheles_quadrimaculatus.htm

Slide 9:

1. Copyright © 2009 John R. Maxwell Marlton, NJ, USA <http://bugguide.net/node/view/272672/bgpage>

Slide 10:

1. Florida Medical Entomology Laboratory <https://fmel.ifas.ufl.edu/mosquito-guide/mosquito-genera-and-species/genus-anopheles/anopheles-crucians/>

Slide 11:

1. Walter Reed Biosystematics Unit (2021). *Anopheles punctipennis* species page. Walter Reed Biosystematics Unit Website, <http://wrbu.si.edu/vectorspecies/mosquitoes/punctipennis>, accessed on [25 April 2022].
2. https://en.wikipedia.org/wiki/Anopheles_punctipennis

Slide 12:

1. Walter Reed Biosystematics Unit (2021). *Anopheles quadrimaculatus* species page. Walter Reed Biosystematics Unit Website, <http://wrbu.si.edu/vectorspecies/mosquitoes/quadrimaculatus>, accessed on [25 April 2022].

Slide 13:

1. Walter Reed Biosystematics Unit (2021). *Anopheles quadrimaculatus* species page. Walter Reed Biosystematics Unit Website, <http://wrbu.si.edu/vectorspecies/mosquitoes/quadrimaculatus>, accessed on [25 April 2022].
2. Copyright © 2007 [Graham Montgomery](#) <https://bugguide.net/node/view/114760>