

NCBA BEE SCHOOL 2026

Class #2

Barker's Beekeeping Supplies – Todd Barker

Bee Biology – Ed

Break – Taking a look at the array of equipment around the room to get a hands-on feel for the size, shape, weight, and styles of beekeeping stuff

Beekeeping Equipment & NCBA Bee School Recommendations & How You Get Live Bees - Brian

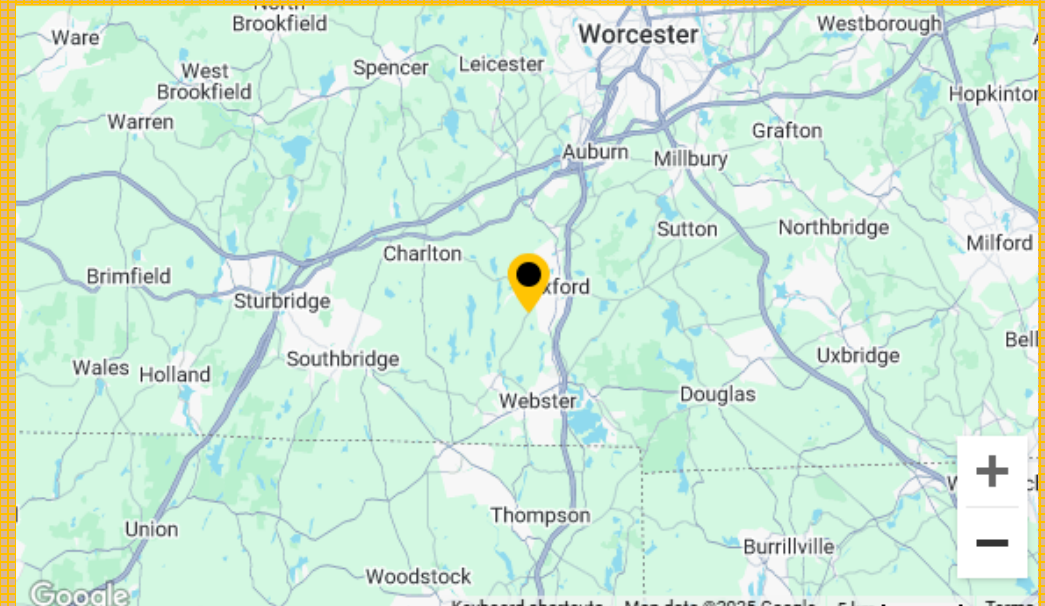




BARKER'S BEEHIVES & SUPPLIES

Location & Hours

Barker's Beehive's & Supplies
93 Dudley Road
Oxford, Massachusetts 01540
[\(508\) 797-7412](tel:(508)797-7412)
barkersbeehives@gmail.com



Goals for Honeybee Biology

Know a little about:

- Where are you at in your bee and biology knowledge?
- Pollinators – many native bees in New England
- Three members of the colony and their tasks
 - Queen - Female
 - Worker - Female
 - Drone - Male
- Development timeline of a honeybee and their lifetime functions
 - Egg
 - Larvae
 - Pupa
 - Adult
 - Job Responsibilities
- Honeybee Anatomy
 - Head
 - Thorax
 - Abdomen
- Bee Behavior
 - Seasons, Cycles, and how Bee Biology Fits Into Your Beekeeping
 - Reproduction (Queen Mating Flights)
- Know a bit about the “races” of honeybees

BEEES OF NEW ENGLAND

- Brought to the east coast of North America in 1622 it would be 231 years (1853) before the honeybee reached the west coast – just before the Civil War in 1861. Disease, hostile competitors, harsh climates, and geographical barriers blocked the advance of honeybee and human alike.
- Their greatest advantage was each other. The honeybee provided honey, wax, and propolis for human consumption and market, they pollinated the European seeds and saplings that the immigrants brought with them, and they changed the environment making it more acceptable to the imported livestock by helping to spread white clover and other English grasses.
- Settlers provided shelter, encouraged swarming, planted large tracts of plants that are highly utilized by honeybees, and aided the honeybees' travels over barriers like treeless plains and mountain ranges.

Common Bees of New England

Bumble bees
(*Bombus* spp.)



Honey bees
(*Apis mellifera*)



Metallic sweat bees
(*Agapostemon* spp.)



Long-horned bees
(*Melissodes* spp.)



Mason bees
(*Osmia* spp.)



Leaf-cutter bees
(*Megachile* spp.)



Cuckoo bees
(*Nomada* spp.)



Cellophane bees
(*Colletes* spp.)



Eastern carpenter bees
(*Xylocopa virginica*)



N = native, E = exotic, NE = both native and exotic species of this group live in New England
G = nests below ground, C = nests in cavities above ground, C = lays eggs in nests of other bees, H = uses man-made hives, D = uses bee hotels

Did you know?

1. >350 species of bees live in New England
2. Most bees are solitary. they don't have a colony or make honey
3. Male bees cannot sting, and most native bees are not aggressive
4. Specialist bees collect pollen from only a few species of plants

How to help bees:

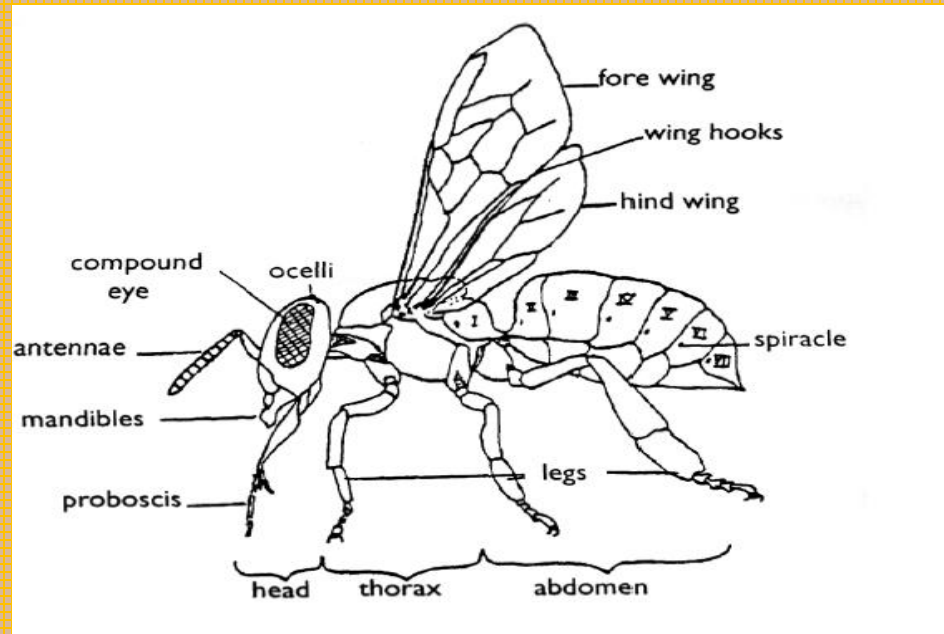
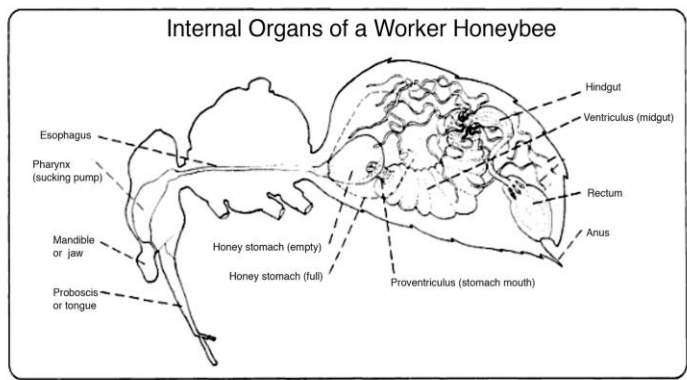
- Grow native plants
- Leave some ground unmulched
- Don't apply pesticides
- Don't mow as often



HONEYBEES ARE SOCIAL INSECTS

- Unlike most bee species who are solitary or small group colonies, Honeybees live in large, well-organized family groups
- In nature, they nest in trees, caves, walls of barns, homes, etc.
- They build multiple comb layers hanging vertically with just enough space between the layers for them to move around – 1/4"-3/8" bee space. Combs are a collection of cells made of beeswax.
- Cells are used to store nectar/honey, pollen and to raise brood.
- They have one queen (normally)
- They make and store honey to survive the winter
- They collect and store pollen as a protein source (bee bread)

Insects have a hard outer covering called an exoskeleton, rather than an internal skeleton like vertebrates (humans). The exoskeleton, which is made of a material called chitin, helps to protect the internal organs of the insect and helps prevent desiccation (drying out). In order to grow, the insect must shed the exoskeleton.



There are three eyes, called **ocelli**, located at the top of the head between the bee's two larger compound eyes. The ocelli detect light but can't focus or arrange an image like the larger compound eyes and assist in navigation

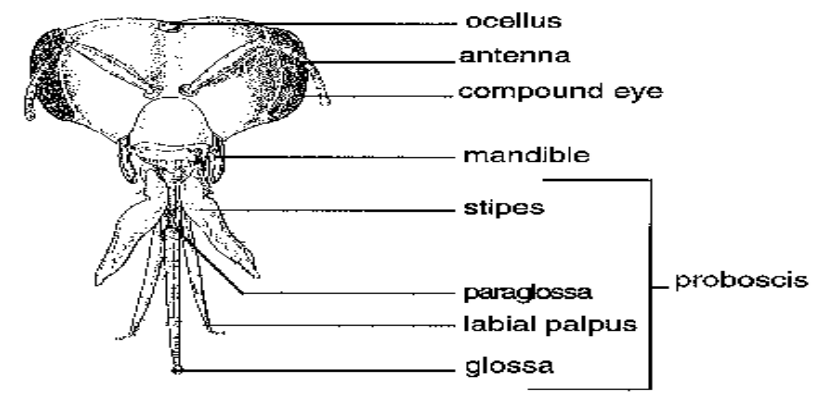
The **compound eyes** each have almost 7,000 hexagonal facets. Each facet is like a mini-eye, containing its own lens. Bees see further into the ultraviolet spectrum and less into infrared than humans – seeing many plants in unique ways

Honeybees use their antennae to learn about their environment: Tiny sensory hairs on each antenna allow them to smell, taste, feel air movements and to communicate with one another

A bee's curved, spoon-shaped jaws, called the **mandible**, are built for many uses: They can be used to ingest food, manipulate wax to build the hive cells, feed the young or queen, and even fight

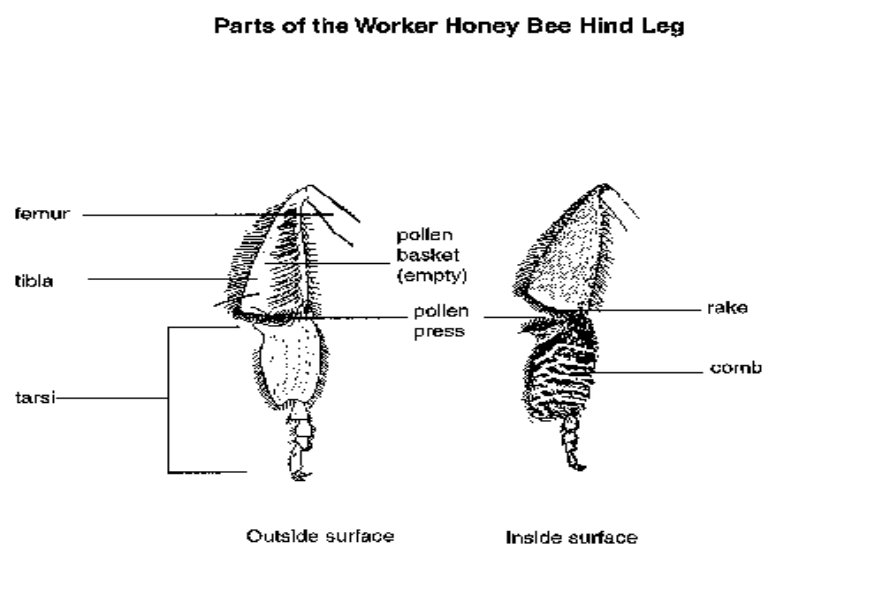
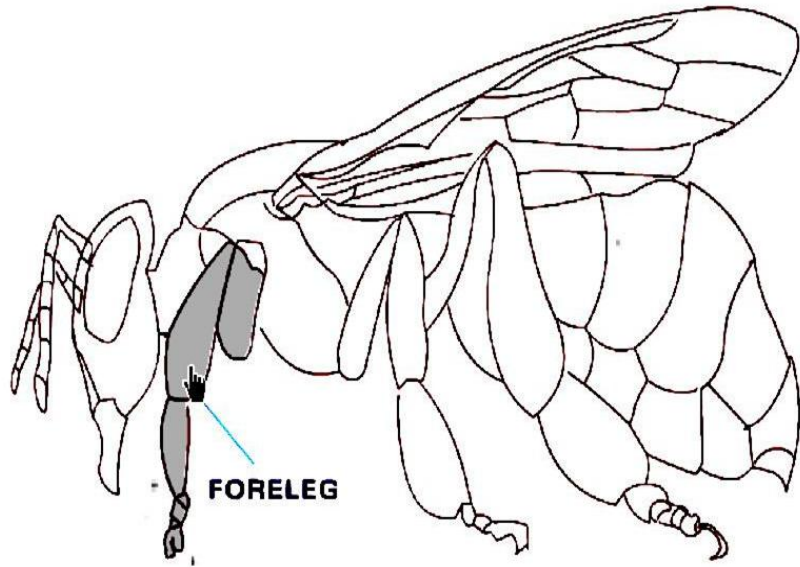
The long **proboscis** at the front of the bee's head is used to ingest liquids such as nectar, honey or water. The proboscis is tipped with a spoon-shaped **glossa**

Honey Bee Head and Mouthparts (Hairs not shown)

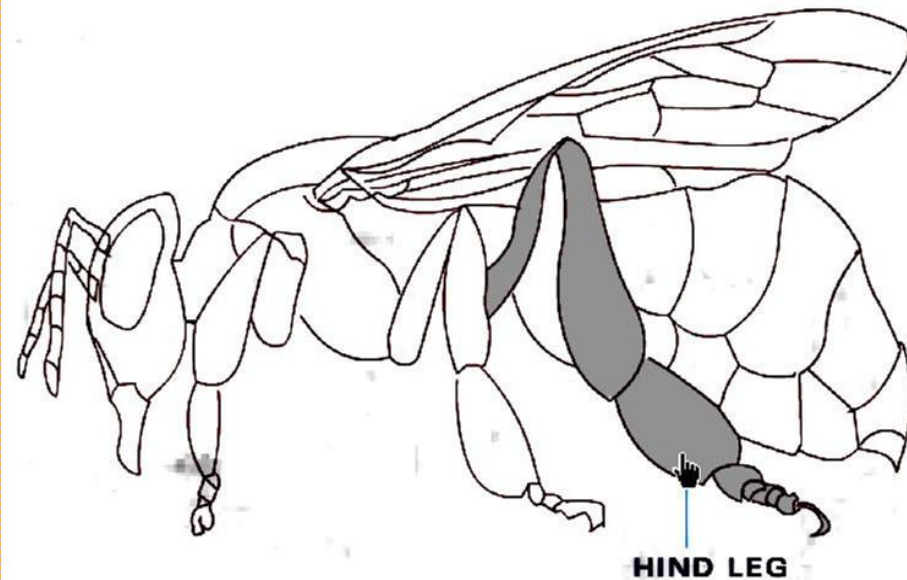
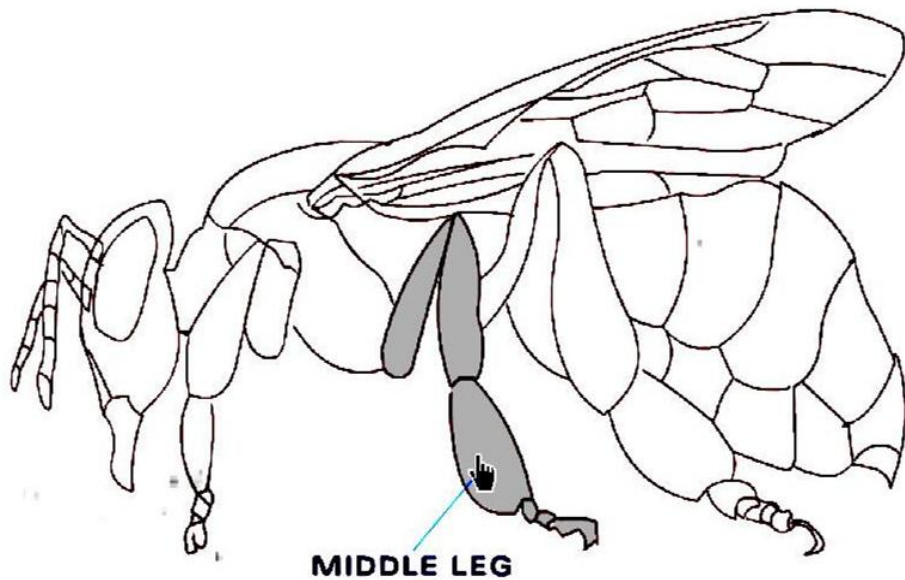


Head and Overall Anatomy

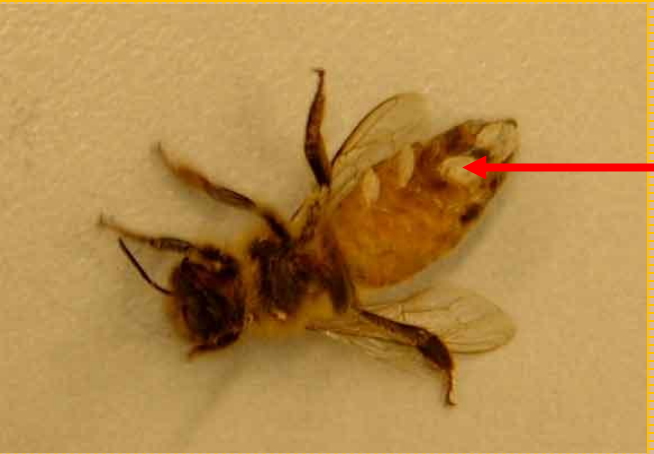
THORAX



Like all insects, there are 6 legs. The legs of the bee are primarily used for walking. However, Honeybee legs have specialized areas such as the antennae cleaners on the forelegs, and the pollen baskets on the hind legs.



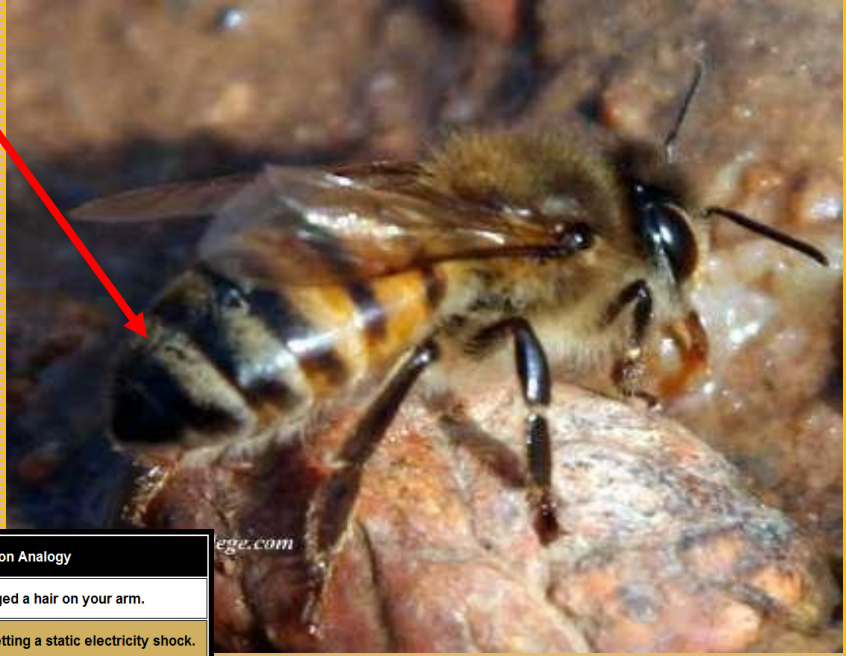
ABDOMEN



Wax Gland(s): Four pairs of glands, sometimes called mirrors, are specialized parts of the body wall. During the wax forming period in the life of a worker, the glands greatly thicken and take on their glandular structure.

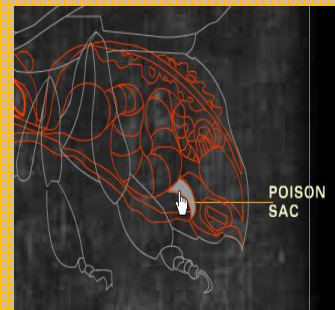
The wax is discharged as a liquid, hardens to small flakes or scales, and sits in wax pockets. The wax scale is then transferred to the mandibles where it is chewed into a compact, pliant mass. After the worker bee outgrows the wax forming, the glands degenerate and become a flat layer of cells.

Workers have a Nasanoff gland at the end of their abdomen. This **Nasanoff gland** is used by the guard bees at the hive entrance to disseminate a scent that guides young bees back to the entrance during early flights.



Sting Rating	Hymenopteran	Comparison Analogy
1.0	Sweat Bee	Like a tiny spark has singed a hair on your arm.
1.2	Fire Ant	Like walking on a carpet & getting a static electricity shock.
1.8	Bullhorn Acacia Ant	Like someone fired a staple into your cheek or hand.
2.0	Bald-Faced Hornet	Like getting your hand mashed in a revolving door.
2.0	Yellowjacket	Like extinguishing a cigar on your tongue.
2.0+	Honey Bee	Like a burning matchhead that lands on your skin.
3.0	Red Harvester Ant	Like using a drill to excavate your ingrown toenail.
3.0	Paper Wasp	Like spilling a beaker of hydrochloric acid on a paper cut.
4.0	Pepsis Wasp	Like dropping a running hair drier into your bubble bath.
4.0+	Bullet Ant	Walking on hot charcoals with 3 inch rusty nail in your heel.

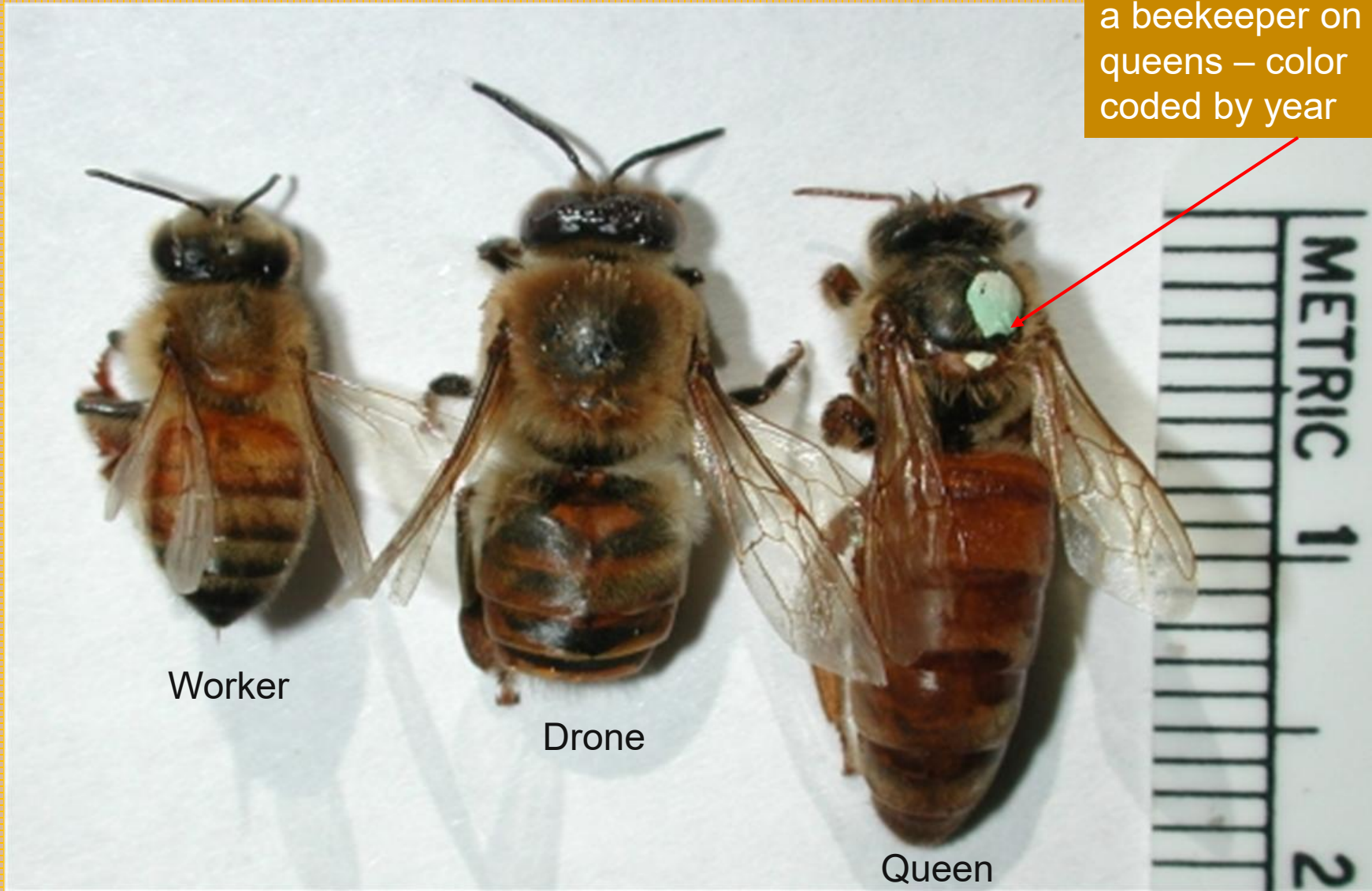
And finally – the part you’re most interested in...



On the end of the female bee’s abdomen is the **ovipositor (stinger)**. The ovipositor of the worker bee is barbed so that it remains imbedded into whatever the honeybee stings. In its struggle to free itself, a portion of the bee (stinger, venom sac, ganglia) is left behind, which damages her enough to kill her. The venom sac continues to contract by reflex action, continuously pumping venom into the wound for several seconds. The queen’s ovipositor is slightly barbed and is “reusable”: It is used to kill rival queens within the hive.

BEE CASTES

Note that the dot is placed by a beekeeper on queens – color coded by year

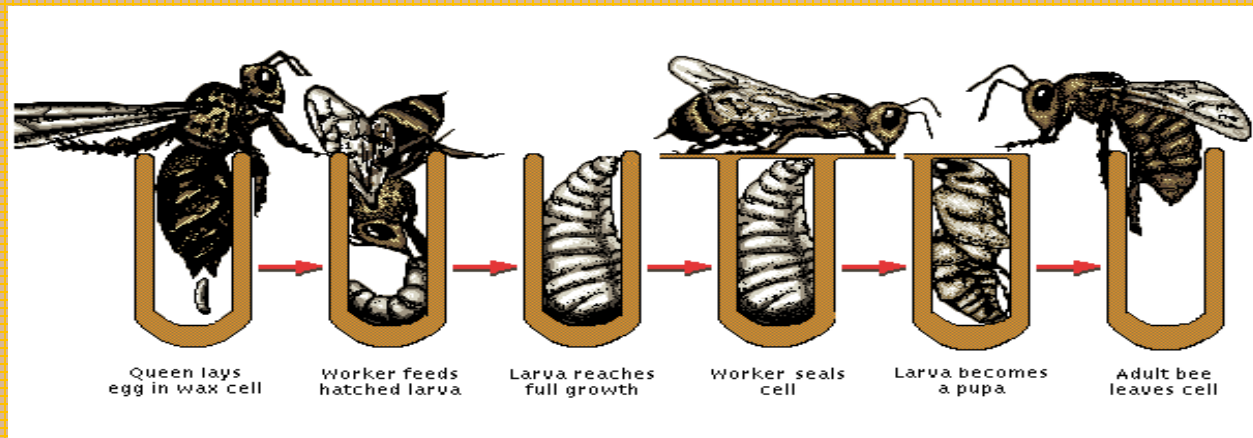


Worker

Drone

Queen

THE LIFE CYCLE OF HONEYBEES

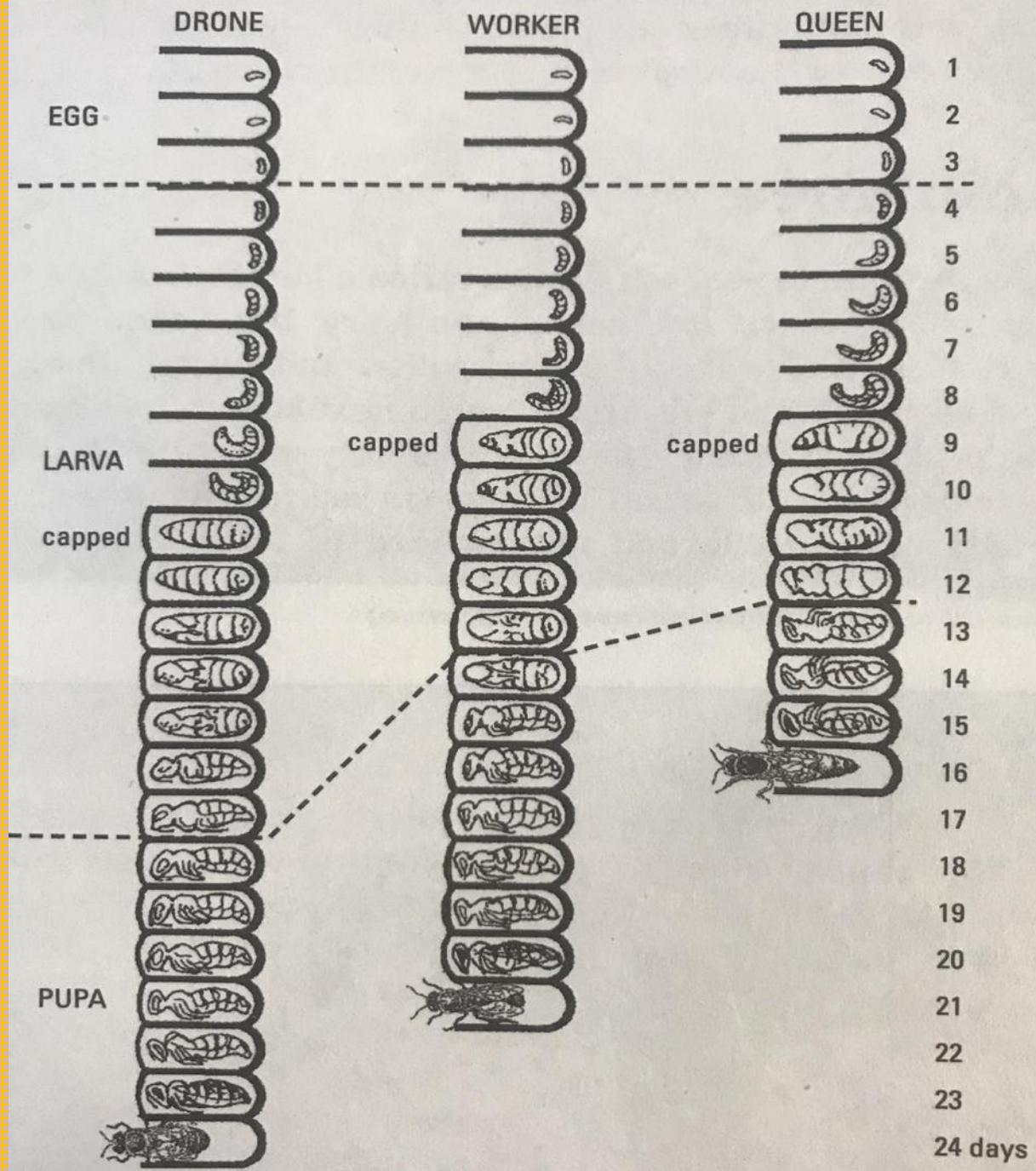


Developmental Stages of Honeybees

	<u>Queen</u>	<u>Worker</u>	<u>Drone</u>
Egg	3	3	3
Larval Stage	5.5	6	6.5
Pupal Stage	7.5	12	14.5
Total	16	21	24

16 – Can Drive
 21 – Can Drink
 24 – Bad Choices

The Honey Bee Life Cycle



METAMORPHOSIS
ONCE THE CELL IS
CAPPED

THE DAYS MATTER

16 – Can Drive

21 – Can Drink

24 – Bad Choices

THE QUEEN

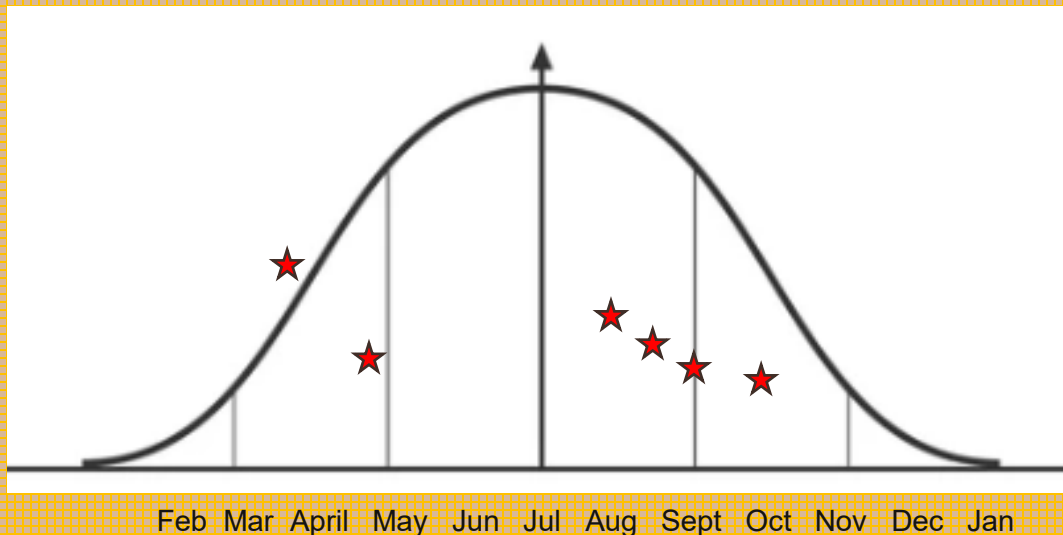


- Years that end with 1 and 6 use a white dot.
- Years that end with 2 and 7 are yellow dot
- Years that end with 3 and 8 are red dot
- Years that end with 4 and 9 are green dot
- Years that end with 0 and 5 are blue dot

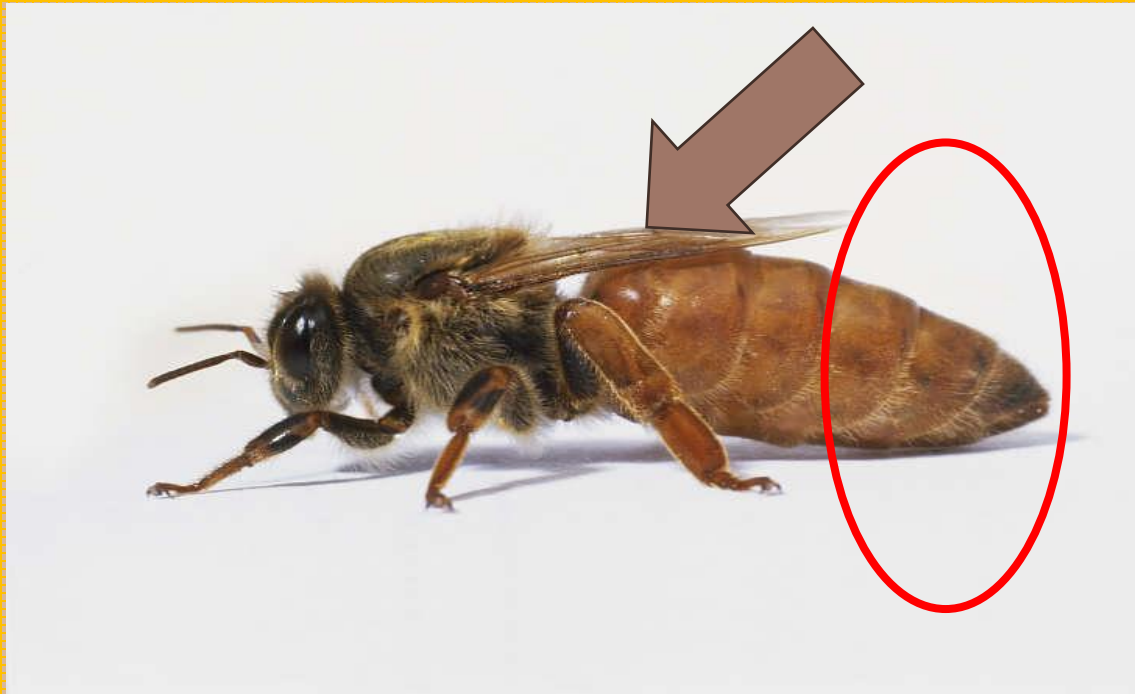
THE QUEEN

Beehive population ebbs and flows with the seasons.

- When nectar flow begins (dandelions) the colony starts to grow
- When dearth occurs, they stagnate or decline
- As weather cools and resources decline winter bees hatch and prepare for winter



- Epigenetics
 - All female bees have the potential to become a queen
 - Trigger is feeding only royal jelly vs royal jelly then bee bread and honey
- One queen (normally)
- Function: laying eggs + Pheromone Communication
- Can live 2 – 5 years
- Can lay 1500 – 2000 eggs a day at height of season
- Produces air-borne pheromones that keep an orderly functioning colony
- Stinger does not have barbs – only uses it to kill rival queens



- Before an old queen dies, or departs to start another hive (swarm), the hive will create a new queen by turning a larvae less than 3 days old into a queen.
- The nurse bees feed the larva a diet of only royal jelly made from a gland on their heads.
- In only 16 days a new queen emerges. **She seeks out and destroys any rival queens, because there can be only one queen per colony.**



Feeding a female larva Royal Jelly for the entire larval stage.

QUEEN CELLS

THE QUEEN'S MATING



- When just a few days old, a new queen takes a maiden flight to the DCA (drone congregation area), she then mates with up to 50 drones, storing their sperm for the rest of her life of 2-5 years.
- Optimal Average Mating is 16.5 Drones
- She produces chemical scents (pheromones) which regulate hive activity.
 - Queen Moving Over a Frame – [Link to You Tube](#)
 - 12-Min Queen Bee Video (10 min mark – mating)
 - Queen Mating With Drone – [Link to You Tube](#)
 - First 20 seconds shows a mating...
 - Queen Laying 1egg in cell –[Link to You Tube](#)
 - Very quick video in B&W



WORKER BEE

- Female has ovaries but is not fertile
- 40,000 to 60,000 in colony
- Structured functions through her life
- Lives about 4 – 6 weeks in the summer (40 days)
- Lives about 4 – 5 months in the winter
- Stinger has barbs and stays in her victim – one use – one sting - and she dies!



Life Cycle and Roles for Worker Honeybees

Day 1-2
Nurse Bee
feeding new bees

Day 6-11
Wax Building for
new comb

Day 12-17
Guard Bee

Day 18-40
Forager - bringing nectar, pollen, and water back to hive...





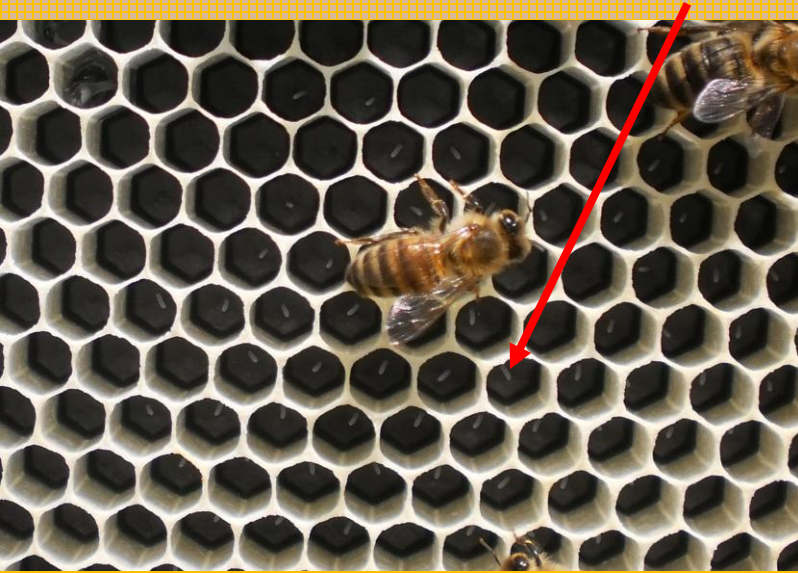
White larvae in a pool of royal jelly.

Larvae are fed royal jelly for 3 days.

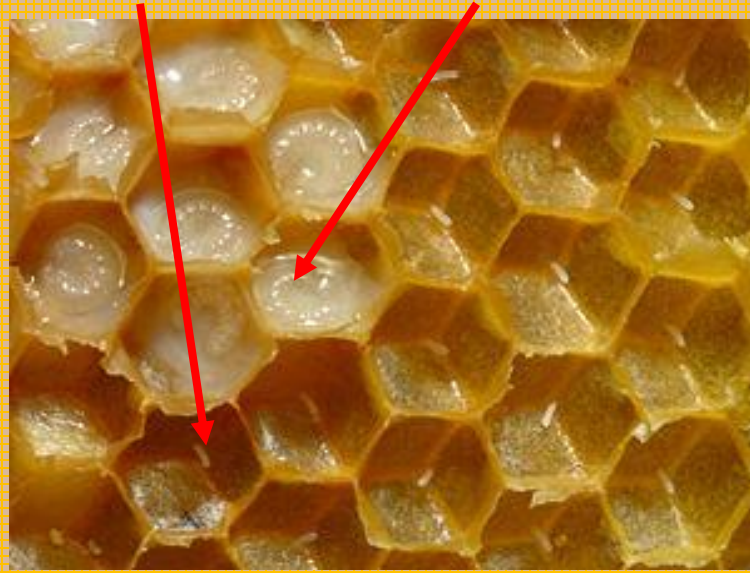
After that they are given bee bread (a mixture of honey and pollen) and various jellies.

Only the queen eats royal jelly her whole life ...and some honey also.

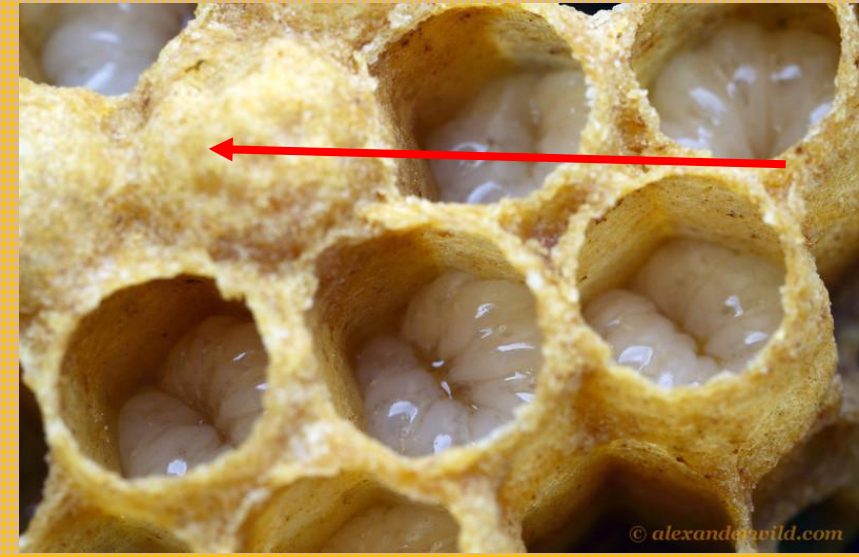
EGGS



EGGS & LARVAE



CAPPED PUPAE



She is metamorphosing.

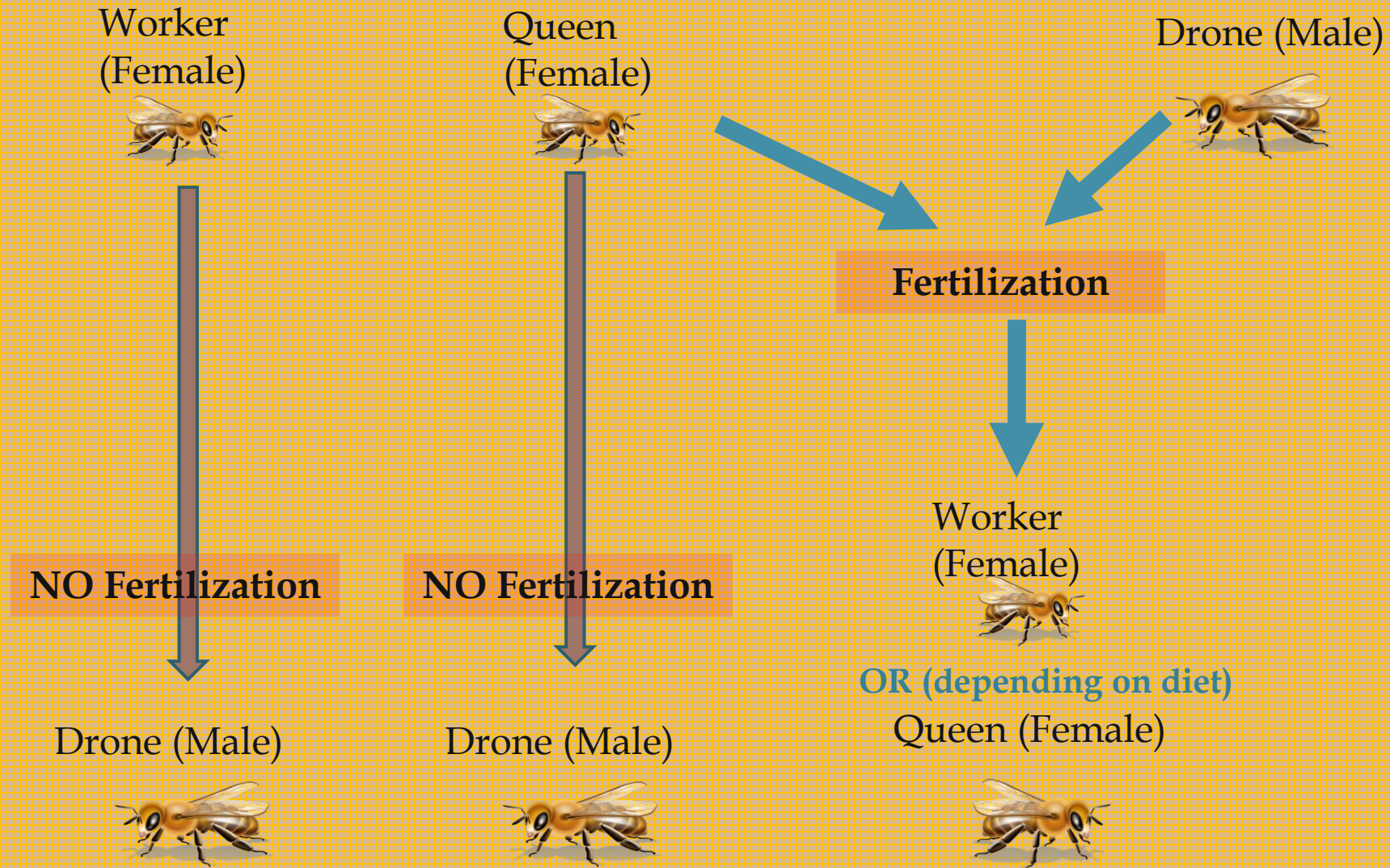


[Quick egg to worker movie](#)



She is just emerging. She must chew her way out.

WHAT TYPE OF EGGS DO BEES LAY?



DRONE



Develops from unfertilized egg = Male

Larger than workers with Large Eyes & Wings

Sexually mature at 2 weeks of age

One function in life – mate with virgin queens
(the good life)

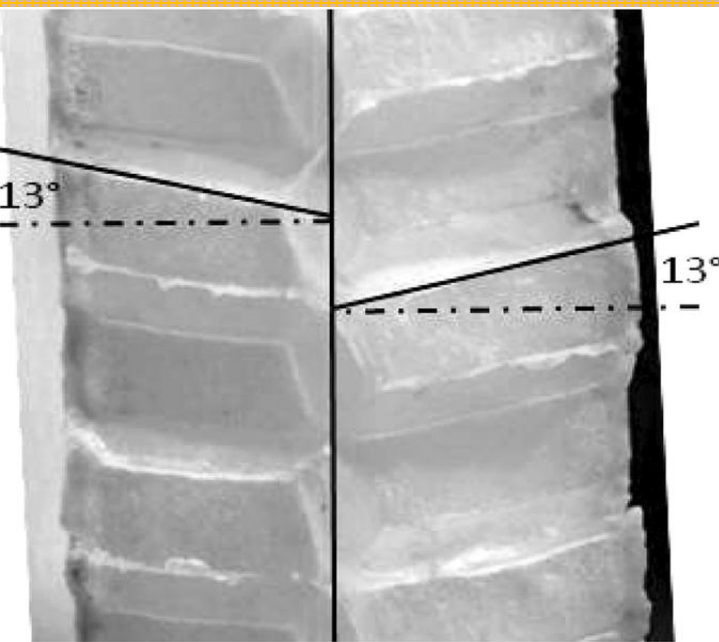
Mates once in drone congregation areas
(DCA), then dies (maybe not such a good life)

No stinger (remember, he only has one
function)

Survivors are forced out of hive in the Fall and
die (not the good life).

Practice Bee / Queen Handling on Drones

TIDBITS ABOUT HONEYBEES

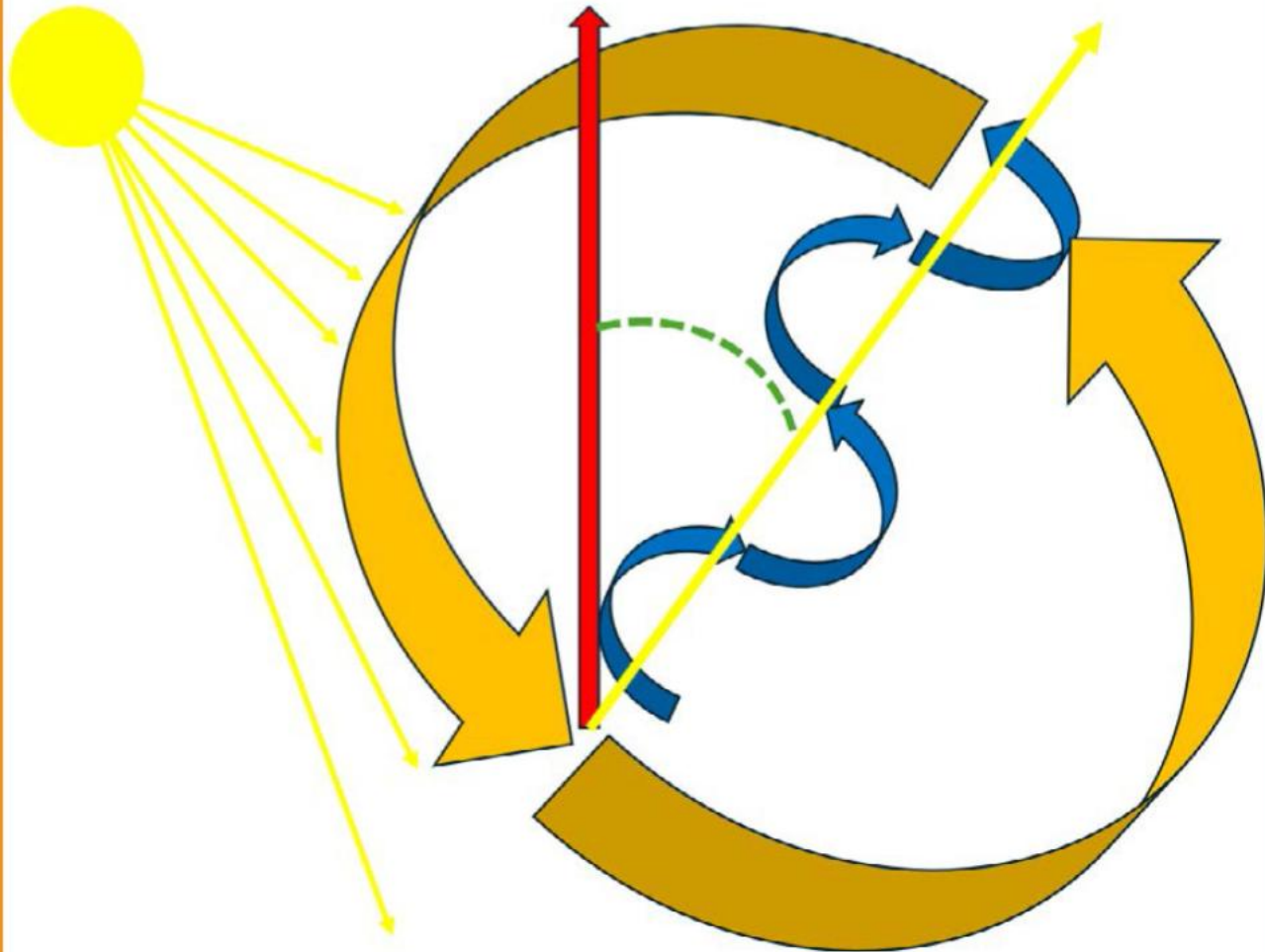


- Queen's can "choose" to lay a fertilized worker egg or an unfertilized drone egg
- Honey – nectar/sucrose to honey stomach and invertase to glucose and fructose – easier to digest and sweeter than table sugar. Nectar may pass through hundreds of bees before becoming honey at >18% water... 1/12th of teaspoon of honey in a lifetime
- The wax-cells tilt up slightly – helps nectar / honey stay in the cell
- Why beeswax is so precious to beekeepers - Each worker bee, when building comb, can produce 8 flakes of wax a day.
 - A hive needs 125,000 wax flakes to build 8,000 hexagonal cells. (about 3600 cells a side for deep frames)
 - About 20lbs of honey are consumed to make 1 lb of wax.
- Pure-breed queens are hard - DCA Drone Genetics.
- Early & Consistent Mite Testing is SO VERY Important:
 - Varroa are **early** on Drones - later on workers

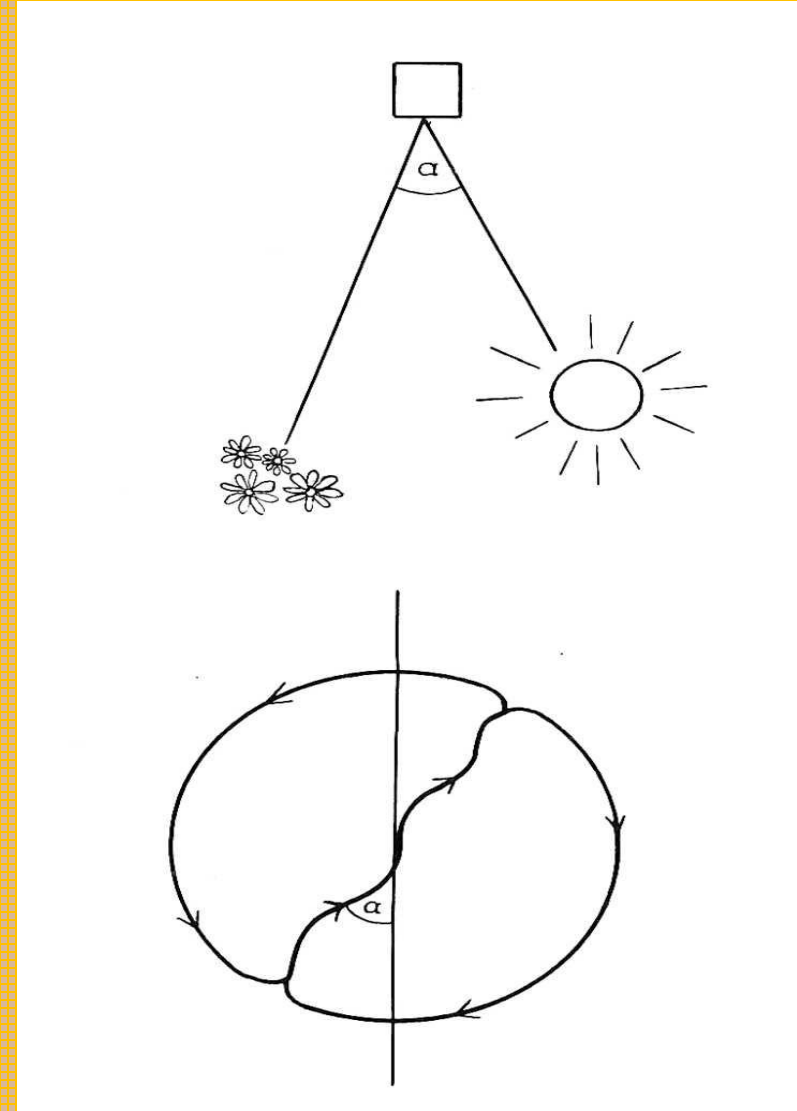
How Do Bees Communicate with each other?...

...THE WAGGLE DANCE!

The Waggle Dance - water, nectar, pollen!



A Worker Bee - Forager will dance - showing direction (using angle to the sun), distance (length of waggle), and quality of resource (number of times she dances).



Races of *Apis mellifera*

- *A mellifera mellifera* – German
- *A mellifera ligustica* – Italian (MOST COMMON –GA)
- *A mellifera carnica* – Carniolan - Yugoslavia
- *A mellifera caucasica* – Caucasian – Caucasus
- *A mellifera scutellata* – African (NEVER)
- *A mellifera caucasica* - Russian
- Hybrid Traits

- Color
- Temperament
- Handling Ease
- Production
- Swarming Tendency
- Winter Hardiness
- Propolizing
- Disease Resistance
- Mite Resistance / Hygienic

- Reproductive Rate / Brood Growth
- Cleanliness
- Population of Hive
- Pollen Hoarding
- Honey Hoarding
- Conservation of stores
- Plant preference
- Tongue Length
- Whiteness of Cappings



BREAK

- Check out the equipment arranged around the room
- Meet and get to know the Beekeepers around the room
- Start asking beekeeping questions
 - Cost, weight, preferences, limitations
- Get your hands-on the equipment and tools – Lift things, hold them...

WRAP-UP

- Q&A
- Next Week – Bring a “Google Map” picture of where you’d like to place your Apiary
- Apiary Site Selection – Mo
- Installing a Package & NUC – Ed and Mo
- Barker’s Beehives