BOSTON AREA
BEEKEEPERS ASSOCIATION

# Beekeepers School

BABA Beekeepers School 2025

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# BABA Beekeepers School

## Week Two Setup

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# What is Covered in this Module

- Week 3 Recap
- Announcements
- Agenda

# Welcome to Week 4

## Week Four

- *Week three Recap*
  - Sourcing and Selecting Bees
  - Packages and Nucs
  - Installing Bees
  - Inspections and Using a Hive Tool
- *The focus was on procuring bees, installing them, and getting into them for the first time*

# Presentation Materials

## Presentation Materials Available

- *Presentations can be accessed at this link* https://managedmentoring.com/baba-bee-school

## Presentation Access Going Forward

- *Each week the presentations will be added to that page*
- *As we start each week, the weeks lessons will be available*

# This weeks Agenda

## Colony Growth and Operations

- *This week we focus on* ***things you will see in the colony operation***
- *We overview* ***feeding and growing a hive to full size***
- *We will overview the equipment needed as you progress*
- ***We will finish with colony operations and anatomy***

# Q&A

- **Questions?**

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We See You!

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## Photo Collage of Beekeeping Visuals

Lesson | Things you will see

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# What is Covered in this Module

- Beekeeping Visuals
- New Bees, Drones Bees, Workers, Brood
- Honey Stores and Pollen, Capped Honey
- Brood in all Stages (BIAS)
- Bridge and Burr Comb
- Sting Reaction
- Things you will not see
- The Rainbow Pattern

# Workers

## Worker Bees

- *Primary bee in the hive*
- *Shades of color*
  - Colors vary by race
- *Size and Shapes vary*
  - Dimensions and shapes vary from race to race.

## Location

- *Throughout the hive.*
  - Sometimes they rest in the upper area of the nest

## Behavior

- *They are busy all through the day and night performing the duties of the hive*
- *Older bees leave the hive and forage for resources*

# Drones

- **Drones**
  - *Large Barrel Shape*
  - *Large Eyes*
  - *Blunt Abdomen Shape*
  - *Appear in abundance in early spring to mid summer*
  - *Kicked out of the hive in fall*

- **Location**
  - *Throughout the hive. They are often looking to rest (hang out) or feed*
  - *Often found in the periphery of the brood nest so they can seek food*
    - Will be found in the outskirts during quiet times

- **Behavior**
  - *Often leave the hives in the early morning for mating*
  - *Will come and go a few times during the day*

# Queen

- **Queen**
  - *Long Abdomen and prominent thorax*
    - Thorax may or may not be painted like this image
  - *Abdomen protrudes*
  - *Often moves in a distinct way given her length*

- **Location**
  - *Throughout the hive but mostly in the brood nest*
  - *Mostly in the area with Nurse bees*
  - *Can be anywhere in the hive space*

- **Behavior**
  - *Normal duty for a queen is to lay eggs in the brood nest*
    - Typically found going from cell to cell laying eggs on brood comb
  - *Will sometimes flee to cover when hive is opened*

# New Bees

- **New Bees**
  - *Pale appearance – downy fur*
  - *Light cream color abdomen*
  - *May look wet or have an albino appearance in early hours*
  - *Hairs may have a matted appearance*

- **Location**
  - *Found in the brood nest*
  - *Will be located around the area of comb that contains capped brood*

- **Behavior**
  - *Often found walking on comb – interacting with workers for food*
  - *Common behavior is to clean the cell they emerged from as a first activity*

# Worker Comb

- **Worker Comb**
  - *Worker comb is initially light ivory-gold in color*
  - *In time it turns to a tannish-brown color and deepens to a mahogany brown with age*

- **Location**
  - *Throughout the hive, and of course where the queen lays an egg*
  - *Often centered in the lower two boxes in a conventional setup*

- **Worker Comb**
  - *Wherever the queen lays an egg, is where worker comb can be found.*
    - Any normal cell can become worker comb.
      - Including comb in honey supers

# Capped Worker Comb

- **Worker Comb/ Brood**
  - *Smaller sized cells (in contrast to drone comb)*
  - *Capped comb is covered with paper bag colored wax capping*
    - Color varies based on the age of the colony
      - New colonies are often have straw-colored wax

- **Location**
  - *Found in the brood nest*
  - *Will be in the center of the nest*
    - Mostly in the middle of the bottom boxes, sometimes off to the sides
    - Covered with Nurse Bees

- **Worker Comb**
  - *More abundant in the spring and during the nectar flow*
  - *Will be present in some form at almost all times*
    - Should be uniform in appearance and proximity; no spotty distribution

# Drone Comb

- **Drone Comb**
  - *Specially enlarged cells*
    - Workers will purpose build it for drones or enlarge existing comb
    - Can be transformed for nectar and honey storage if bees prefer

- **Location**
  - *Can be anywhere in the hive, but often is found in the periphery*
  - *May be built in the margins*
    - Sometimes build under frame bars or over the top bars

- **Drone Comb**
  - *Larger dimension to accommodate the size of drones.*
  - *Capped with a domed cover*

# Capped Drone Comb

- **Capped Drone Comb**
  - *Bullet shaped domes*
  - *Built over larger dimension cells which accommodate the growth of the drones*

- **Location**
  - *Found in the brood nest*
  - *Will be around the periphery of the nest.*
    - Could be built in the margins, on top of frames, off the bottom of frames.

- **Drone Comb**
  - *Prevalent at the time of nectar flow onset*
  - *Built during mating seasons; typically, spring and early summer*

# Emerging Brood Comb Areas

- **Emerging Brood**
  - *Developing bees will emerge from their cocoons by chewing threw the wax cappings*
  - *They often exhibit a pattern of 'center-out' >*

- **Location**
  - *Center of the nest*

- **Emerging Brood**
  - *Logically accompanied by new young bees*
  - *Typical for bees to start preparing the center section for the queen to lay new eggs*

# Nectar Storage

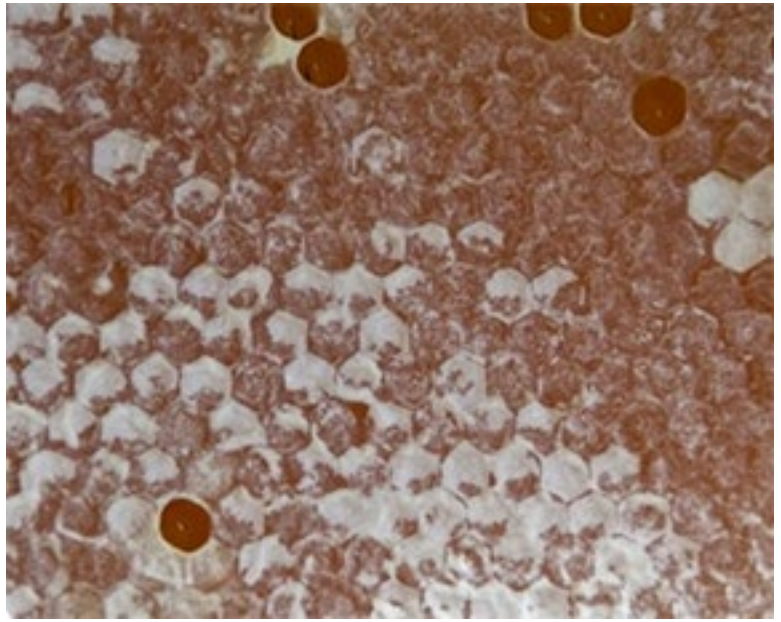
- **Nectar Storage**
  - *Nectar is collected by the foragers*
  - *Light Liquid Deposited in the cells*
  - *Eventually dried by the bees into a thick viscous liquid – appearing like glass >*

- **Location**
  - *Throughout the hive*
  - *Especially on the outer frames*
  - *Is actively dried by the bees and then capped as honey*

- **Nectar (food) Storage**
  - *During forage windows nectar is collected by plants*
  - *When beekeepers feed bees sugar solution it is stored much in the same way as nectar from nature*

# Capped Honey

- **Capped Honey**
  - *Honey sealed in the cell, capped over by a wax coating.*
  - *May look different depending on how it is prepared by the bees*
    - Wet Capping
      - This is a capping where they honey under the cell comes into contact with the wax, creating a dark liquid look under the capping
    - Dry Capping
      - The capping maintains a bit of air space under the wax and displays as a white wax over the capped honey



- **Capped Honey**
  - *Freshly covered honey has a new wax appearance.*
    - The appearance will change with age and when bees walk over the surface.

# Honey Storage Comb

- **Honey Storage Comb**
  - *Begins with placement of nectar.*
  - *Nectar is dried through evaporation of moisture.*
  - *Once dried, out, it is capped*

- **Location**
  - *In the outer spaced beyond the brood chamber*
  - *Can also be in the corners of brood comb and near to bees being reared.*

- **Honey Comb**
  - *Honey over the nest can be called a 'honey dome'*
    - The queen often does not cross over the honey dome to rear bees.
    - This often results in the queen staying out supers

# Pollen

## Pollen

- *Multi-color granules packed into cells*
- *Often coated with a shiny surface (light honey coating)*
- *Color varies based on plant source*

## Location

- *Typically found in proximity to the brood nest*
- *Often found in a loop around brood patches*
- *Frequently stored in bulk (full frame side) alongside the brood nest.*

## Pollen Stores

- *Abundantly gathered in spring, and in fall*
- *May be scarce in dearth periods*

# Queen Cups

- **Queen Cups**
  - *Queen cups are the precursor to bees building queen cells*
  - *They are a shallow cup that is sometimes bowl shaped and other times more formed like the image shown here*

- **Location**
  - *Can be found throughout the frames in the brood nest*
  - *Often built in the outer edges in the frames or anywhere vertical surfaces develop in the comb (holes for example)*

- **Queen Cups**
  - *Very typical in every hive*
  - *Not indicative of queen problems. Bees just build them to have them*
  - *They are cups when they are not 'charged' with an egg*

# Queen Cells

- **Queen Cells**
  - *Vertical wax pinky shaped queen cells*
  - *Typically have a mottled appearance (Mr. Peanut texture)*
  - *Start out as queen cups; enlarged once queen is being reared by the bees*

- **Location**
  - *Often found in the periphery of a frame*
  - *Lower edges, or outside*
  - *Especially where holes are developed in the comb from the bees for passage ways*
  - *Sometimes on comb face*

- **Queen Cells**
  - *Swarm Cell: Cell in preparation for Swarming*
  - *Supercedure: Cell for queen replacement (Something wrong)*
  - *Emergency: Cell created when queen is no longer present*

# Open Queen Cells

- **Open Queen Cells**
  - *Queen cell with the end chewed off and open*
  - *This signifies that the queen has emerged and is in the hive somewhere*

- **Location**
  - *Often found in the periphery of a frame, lower edges, or outside*
  - *Especially where holes are developed in the comb from the bees for passageways*
  - *Sometimes on comb face*

- **Open Queen Cells**
  - *Open queen cells indicate that a queen has emerged*
  - *Sometimes they even have the end flap present*

# Burr & Bridge Comb

- **Burr / Bridge Comb**
  - *Excess wax deposited throughout the hive*
  - *Bees will sometimes place wax in errant places*
    - Especially when they have wax bees during nectar flow
    - Bridge comb to help move from one surface to another

- **Location**
  - *Found in places where bees space is violated*
  - *Gap areas bigger than ¼"*
  - *On top bars*
  - *On hive box interiors*
  - *Between frames*

- **Burr /Bridge Comb**
  - *Each colony behaves differently. Some build a lot, some do not build at all*
  - *Mind the gaps around your frames to keep this in check*
  - *Recommend maintenance – keep cleaned up*

# Poor Comb

Bonus Lesson – Wonky Comb

# Incoming Pollen

## Incoming Pollen

- *Multi-color granules carried on the foragers legs*
- *The bees will carry it in and pack it into the cells*

## Location

- *Front entrance*
- *You will also see bees with their pollen baskets full walking around on the comb*

## Pollen Colors

- *The colors of the pollen are going to vary*
- *Yellow, red, orange, mustard green, sometimes blue, and other colors are possible*

# Guard Bees

## Guard Bees

- *Guards will be at the entrance*
  - Display an 'posture'
  - If alarmed, they will release a chemical that will alert other bees to defend the colony resources
- *Work the entrance and surrounding area*

## Location

- *Found on the landing board and any openings (Ie. upper entrance)*
- *Will also fly around the periphery of the hive*
- *They likely will fly the apiary and sometimes an even larger domain*

## Typical Behavior

- *Will patrol the entrance and inspect arriving bees*
- *Will respond to a 'call to alarm' chemical release (pheromone)*
- *Will patrol the area surrounding the hive*


# Bees Scenting

- **Scenting Bees**
  - *Bees with their heads down, abdomens up*
  - *Actively fanning their wings*
  - *Back abdomen tip tilted down with a light white slit (Nasanov gland) open to the air*

- **Location**
  - *Found on the landing board and any openings (Ie. upper entrance)*
  - *May also be on the top of the hive if the hive is open*

- **Typical Behavior**
  - *They are distributing a scent that attracts nestmates to their location*
  - *They do this when they want the bees to gather with them*

Scenting Bees

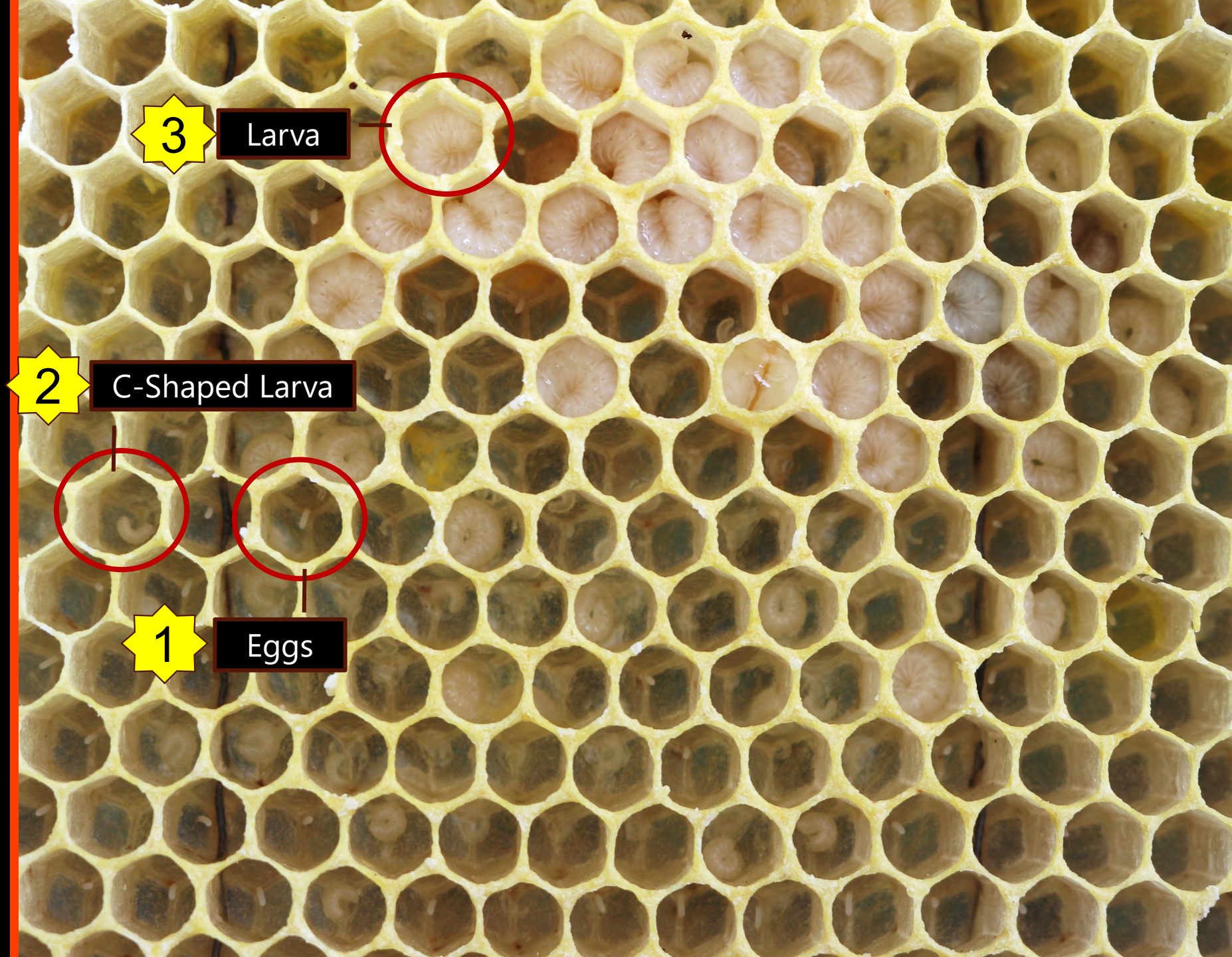
# Bearding

- **Bearding**
  - *A compensation mechanism for the bees*
    - They use it for heat control
      - Less bees inside, less heat
  - *They use it for congestion relief*
    - Less bee inside, more room to work

- **Location**
  - *Found on the front of the hive*
  - *Also found suspended in clumps of bees hanging under the colony*

- **Typical Behavior**
  - *This is seen in the summertime, especially when hot*
  - *It is also common for the bees to do this when they are drying nectar*

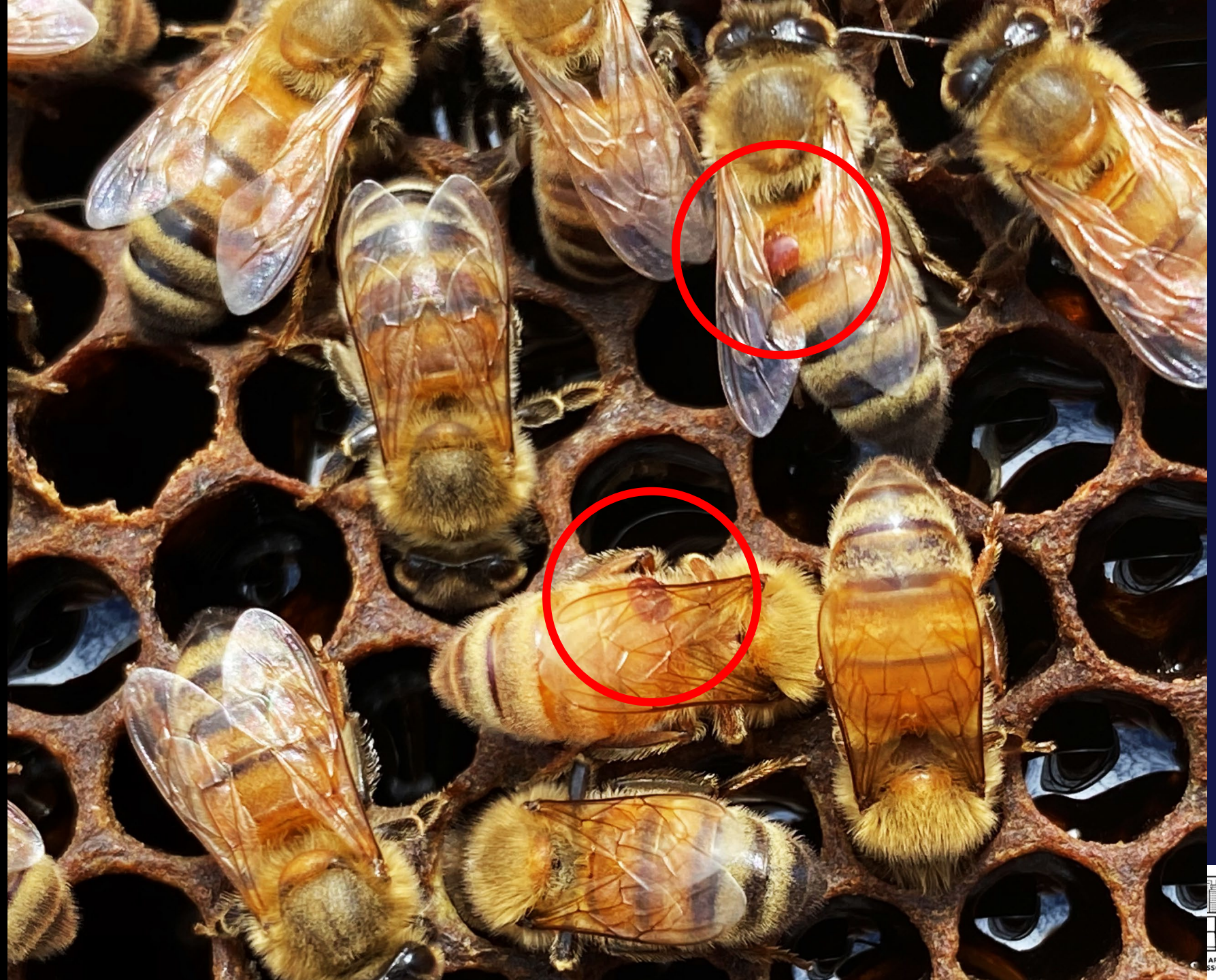
# Brood in All Stages (BIAS)



# Brood in All Stages (BIAS)

*graduated age depiction*

# Things you likely will *NOT* see



# Queen Failure

***Look for 'bullet' drone brood***

- *Mix of spotty capped worker cells and drone brood placed in worker cells, making a bullet tip*
- *High population of drones*

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Note: Most of the Bees were shaken off of the frame
The Rainbow Effect


The Rainbow Effect

# A great brood frame

*Look for the rainbow*

- **Good brood frame characteristics**
  - Honey in the corners, Halo of pollen, surrounding newly capped brood, Nurse bees abound, good patterns

# Sting Reaction

- **Stings cause reactions**
  - *Should be local and topical*
    - Redness, swelling, itching >normal
  - *Reactions that are a concern*
    - Reactions remote to the sting site
      - Stung on lower arm, different symptoms remote from the arm
      - Difficulty breathing, swallowing, hives etc.

# Q&A

- **Questions**

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# BABA Beekeepers School

## April Second Half - Recap

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# What is Covered in this Module

- Spring Sugar Solution
- Filling Internal Feeders
- Feeding in the Spring
- Avoid Overfeeding
- Volume and Timing
- Providing Water

# Mixing Sugar Solution

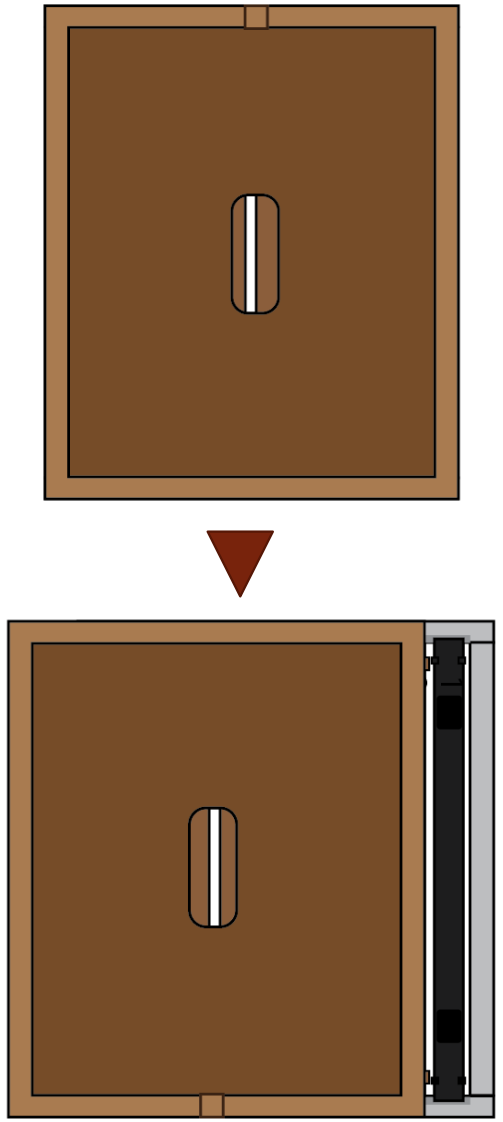
## Spring Feed is a 1:1 Ratio

- *One part water and One part Sugar*
  - By weight or volume, it does not matter
- *Making up your solution*
  - Mix warm water and sugar until the sugar is dissolved
  - Move into vessels that are conducive for conveyance and pouring
  - Make up only what you will use in the short term
    - If it is left to long, especially in warm weather, it will grow mold, ferment, and spoil
    - Bees will not take to cold or spoiled solutions

# Feeding the bees

*Minimal interruption*

- **Feeding 1:1 solution in the inner feeder**
  - Have everything ready; staged
  - Light the smoker, put your gear on.
  - Lightly smoke the entrance
  - Wait a 5 count, remove the roof, smoke in hole.
  - Using your hive tool, pry up the inner cover
  - Move the inner cover to expose the feeder, but leave it covering the top bars
  - Fill the feeder.  Slide the inner cover back.
  - Return the roof, being careful not to crush any bees



# Feeding in spring

*Feeding during the nectar flow*

- **What of feeding during a flow?**
  - Keep doing it.
    - *It is said that bees prefer nectar over sugar solution*
    - *Sometimes the bees will not take syrup and sometimes they will.*
      - In spring, with an active nectar flow, they may ignore it altogether.
  - Why are we feeding in the first place?
    - *Sugar solution and/or nectar provides carbohydrates*
    - *Bees need significant carbs to build comb and fill reserves*

# Feeding in spring

*Feeding during the nectar flow*

- **What of feeding pollen?**
  - What about pollen substitutes/supplements?
    - *It is not necessary.*
    - *There is plenty of pollen at this time of year*
    - *Natural pollen is far superior then what you'll feed, especially in the spring.*
  - If you insist
    - If you do put pollen patties on, keep them small – deck of cards sized.
    - Just place it on the top frame, **right over the brood nest.**
      - Make sure the inner cover sits flush on the rim of the hive body

# Internal vs. Top Feeder

- **Temperature Dependent**
  - Internal feeders are close to the bees and they keep it warm-ish, which keeps it viable for use
    - *If you put a top feeder on too early in the spring the syrup will chill, and the bees may not take it*
  - Rule of thumb: Switch to a top feeder when the weather is warm enough for you to be comfortable in a T-Shirt during the day
    - *Even if there are some cool nights, the sun will warm the liquid in the morning and make it viable for the bees to pull down from a top feeder*

# Switching from Inner to Top Feeder

*Mann Lake Style*

- **We recommended the a top feeder**
  - Can feed from the top of the hive, no need to open
  - We recommend you switch to this **when the weather is consistently warmer**
    - *It is the right time if you consider the weather will not chill the food so much that the bees will not take it.*
    - *It replaces the inner cover and sits directly on the hive*
  - Use of the feeder
    - *Take the outer cover off*
    - *Fill with liquid; careful not to spill*
    - *Return cover*
    - *Do not overfill. Recall that you have to take it off to inspect the bees*

Photo Credit
Mann Lake Co.

Note: *You can put your inner cover above it.*
***Be sure to close off the notch and hole though to prevent robbing***

# Mann Lake Feeder

*It can get heavy…*
*Syrup can go bad…*

# Arizona Ice Tea Jugs

# Too much of a good thing

- *It is possible to over feed bees*
  - When this happens, the bees will store excess in the brood area
  - This will stunt the colony as the queen will have no place to lay
- *Inspect for over feeding*
  - When you see your brood nest loaded with nectar/sugar solution slow down or pause your feeding.
  - Bees recover from this quickly, and you can resume feeding – just slow down what you are giving them.
- *What does it look like*
  - Nectar in the cell looks like hard, black shiny glass

# What does it look like?

*Backfilling the brood area*

# Way too much of a good thing

*This beekeeper wanted to know why their hive swarmed*

The poor queen was isolated to the top of the frame in this case.

# When and How Much?

- **Quart a week, then check progress**
  - Assume you are putting bees in the box when the best nectar flow period is going.  Do you need to feed?
    - *Feed in light amounts, unless they stop taking it and it spoils*
  - If you are feeding, how much and how often
    - *Gallons are not required.  We saw what the problem is there.*
    - *If you are going to feed, consider how big the colony is and how much could they really need!*
    - *A quart to start, then up it if they are not backfilling.*
    - *Be patient or risk problems from overfeeding*
    - *As the nectar flow tapers off (<July 4th) then you can feed more if they are behind.*

# Where to get Sugar

- **Supermarkets, Wholesale Stores, other**
  - Some simply by sugar at their local grocery stores
  - Other opt to head to the sugar isle at their local Costco, Walmart, Restaurant Stores, Sams Club, Beekeeping supply houses, and more.
    - *They sell larger quantities, often at discounted prices*
    - *Some of them offer a large enough discount to possibly even warrant a membership*
  - Each community is different, and some have luck at local bakeries.

# How Long am I going to feed?

- **Two full boxes built out, and then some**
  - At least until the two boxes are fully built out
    - *Then, depending on when this is done, you may want to try to have them build comb in a medium honey super*
  - Ballpark finish date > July
    - *Estimates of how long this takes is not hard and fast.*
    - *Each colony grows like a child – at a different rate.*
    - *Ideally, we will get colonies built out before the summer dearth in early to mid July.*

# Giving Bees Water

*Reminder*

- **Water is critical for bees**
  - *If there is no natural nearby water source, provide water*
    - We recommend a bucket with holes and floaties
    - Place in 30 yards or so from the hive
  - *Feed water at the entrance*
    - You can provide water at the entrance
    - The only good use for a boardman feeder
  - *Early has an added benefit*
    - Do this early and bees will come to your water source, not your neighbors
    - Consider some salt or fragrant oils.
      - Enough salt so that the water has just a touch of salty taste to you.

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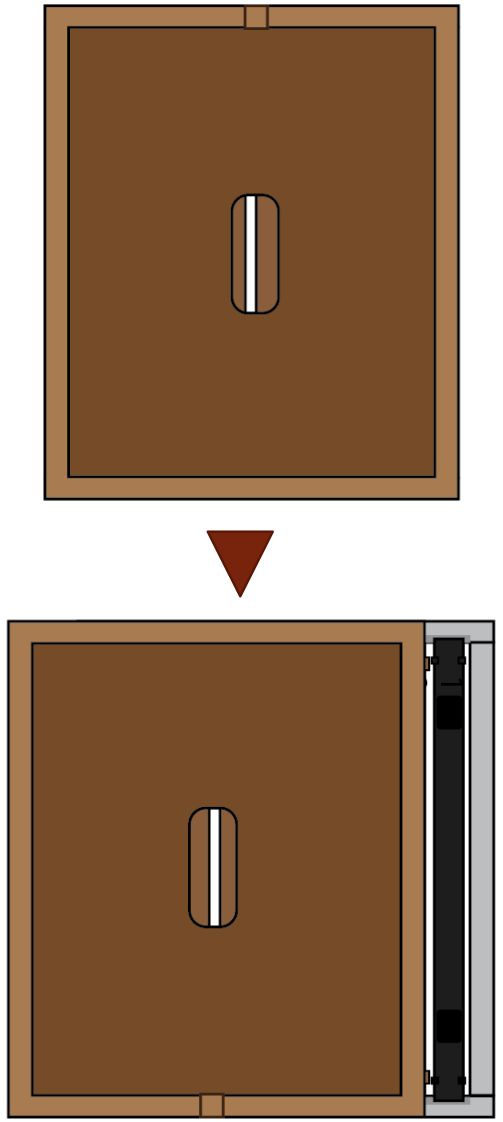

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# When and How Much?

- **Quart a week, then check progress**
  - Assume you are putting bees in the box when the best nectar flow period is going.  Do you need to feed?
    - *Feed in light amounts, unless they stop taking it and it spoils*
  - If you are feeding, how much and how often
    - *Gallons are not required.  We saw what the problem is there.*
    - *If you are going to feed, consider how big the colony is and how much could they really need!*
    - *A quart to start, then up it if they are not backfilling.*
    - *Be patient or risk problems from overfeeding*
    - *As the nectar flow tapers off (<July 4th) then you can feed more if they are behind.*

# Where to get Sugar

- **Supermarkets, Wholesale Stores, other**
  - Some simply by sugar at their local grocery stores
  - Other opt to head to the sugar isle at their local Costco, Walmart, Restaurant Stores, Sams Club, Beekeeping supply houses, and more.
    - *They sell larger quantities, often at discounted prices*
    - *Some of them offer a large enough discount to possibly even warrant a membership*
  - Each community is different, and some have luck at local bakeries.

# How Long am I going to feed?

- **Two full boxes built out, and then some**
  - At least until the two boxes are fully built out
    - *Then, depending on when this is done, you may want to try to have them build comb in a medium honey super*
  - Ballpark finish date > July
    - *Estimates of how long this takes is not hard and fast.*
    - *Each colony grows like a child – at a different rate.*
    - *Ideally, we will get colonies built out before the summer dearth in early to mid July.*

# Giving Bees Water

*Reminder*

- **Water is critical for bees**
  - *If there is no natural nearby water source, provide water*
    - We recommend a bucket with holes and floaties
    - Place in 30 yards or so from the hive
  - *Feed water at the entrance*
    - You can provide water at the entrance
    - The only good use for a boardman feeder
  - *Early has an added benefit*
    - Do this early and bees will come to your water source, not your neighbors
    - Consider some salt or fragrant oils.
      - Enough salt so that the water has just a touch of salty taste to you.

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# Q&A

- **Questions**

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# BABA Beekeepers School

## Other Beekeeping Equipment

Lesson | Other Equipment

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# What is Covered in this Module

- Equipment for managing the pests of honeybees
- Additional Management Equipment for the Operation
- Honey Harvesting Equipment
- Additional Kit Considerations

# Add-On Equipment

## Additional Equipment for the Journey

# Lesson Progression

- **Follow up after lessons 1, 4, and 5**
  - Lesson 1: Langstroth Equipment
  - Lesson 4: Other Beekeeping Equipment
  - Lesson 5: Protective Equipment
- **A Quick Note**
  - There are additional things that you need to buy:
    - *Now, Soon, Someday, Maybe, and if you are so inclined*
    - *These include, but are not limited to:*
      - Additional beekeeping hive equipment
      - The basics of harvesting honey, and products of the hive
      - Equipment for Management

# Varroa Monitoring Kit



## Mite Monitoring Kit

- *A tub for collecting bees for sampling*
- *A measuring cup (1/2 Cup Size)*
- *Varroa Easy Check Device*
- *Rubbing Alcohol or some other suitable liquid*
  - Blue Windshield washer fluid is another alternative…



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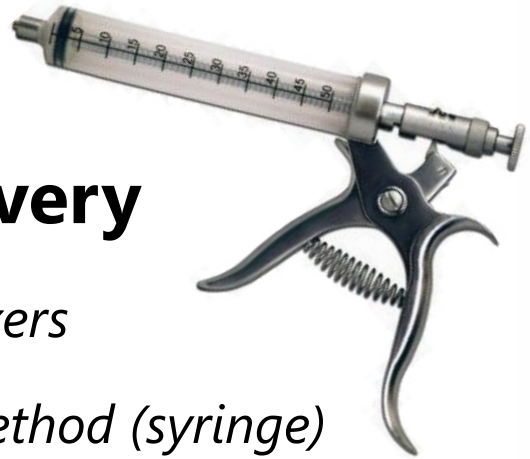
# Varroa Mite Treatments


## ❑ Treatment Options are Personal Preference

- *They are also highly dependent upon factors and conditions*
  - We will cover details about treatments in an upcoming lesson. Make a purchase by June.

# Oxalic Acid Wand or Vaporizer




## ❑ Oxalic Acid Delivery

- *Wands and/or Vaporizers*
- *Oxalic Acid Dribble Method (syringe)*
- *ApiBioxal Oxalic Acid*
  - The only product approved for use with beekeeping operations

*Requires the requisite protective envelope for protecting the person administering*

# Hive Beetle Traps

- **Hive Beetle Traps come in many form factors**
  - *These work by filling with oil*
    - The hive beetles try to escape into the device from the bees and get stuck in the oil
  - *We will cover hive beetles in an upcoming lesson*
    - Depending on where you are they may be a problem or they may not.  If they are you must take action

# Paint Markers / Queen Clip & Marking

- **Queen Clip**
  - *Queen catchers come in a number of variations*
- **Paint**
  - *Paint Markers are common*
    - Other use simple model paint or other alternatives
- **Queen Marking Tube**

# Hive Lashing Straps

- **Every hive should be strapped down**
  - *We recommend these types of straps*
    - They are **simple to open**
    - They hold very well and last for seasons
    - They provide reasonable utility for lashing hives for transportation
  - *Bear Territory*
    - If you are in bear territory, you might be better suited with ratchet straps

# Ratcheting Tie Down Straps

## Heavy Duty Ratchet Straps

- *Difficult to open sometimes*
  - Not a fan of these, but many beekeepers use them.
  - They are cumbersome to use
  - They provide superior utility and protection for transportation and bear defense
    - We have seen instances where they have proven strong enough to hold hives together well enough to keep bears out of beehives.

# Hive Metal Benches


## ❑ Metal Hive Benches

- *These provide quite a bit of utility for setting hive boxes on during inspections*
  - They hold up well in the weather
  - They can support the weight
  - In a pinch they can be deployed as hive stands
  - There are many uses for these in a bee operation

# Queen Excluder

- **Used to sequester queens to a specific space**
  - *The primary use of this device is to keep the queen out of the honey supers.*
    - It is placed above the brood boxes, and under honey supers. It prevents the queen from placing brood in honey boxes.
  - *Beekeeping techniques use this for many utility purposes*
    - One example: If you have a very crowded boxes and want to restrict the queen to one so she is easier to find, you can place a queen excluder between the two. Whichever has egss in a few days has the queen…

# Simple Shim (sometimes called an Imirie Shim)

## Multiple Uses

- *One of the more common uses of a shim is to provide space for treatments over the top bars of honeycomb frames*
- *Another use is to provide temporary entrances in a stack of hive boxes for the bees to enter partway up the stack*

# Bee Brush

## ❑ Bee Brush

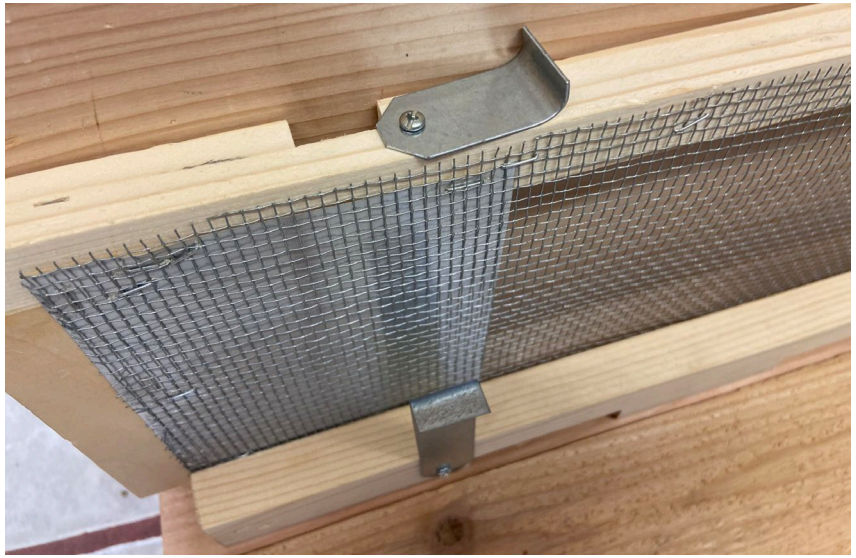
- *Commonly used tool to 'flick' bees off a frame*
  - Sold in bee supply catalogs, they come in many shapes and sizes.
  - Some premium one indicate they have softer bristles and such.
    - □ Buy what suits you. In our experience, even the moderate cost ones are usually suitable for the job.

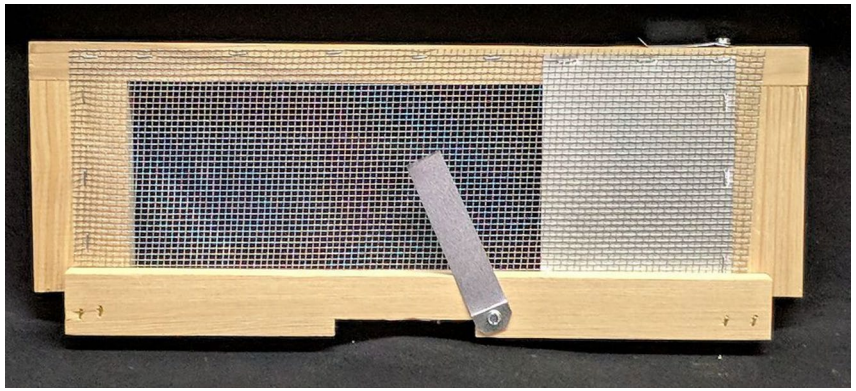
  - *Tip!* Flick, don't brush or sweep.
    - □ Flick the bees off when using this, do not sweep across the frame like you are wiping crumbs off a table. That motion 'smooshes' bees. Flick at them and they will jump off.

# Robber Prevention/Mitigation Screens

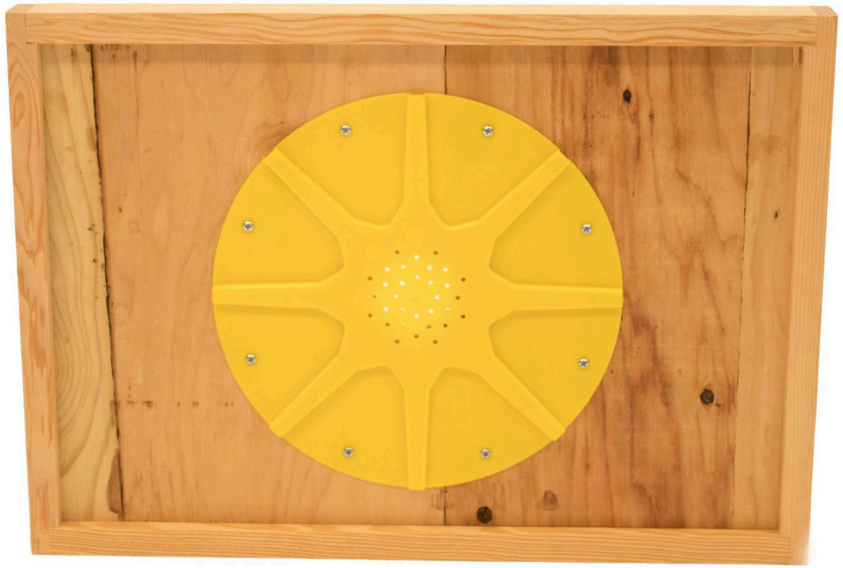
## Many forms

- *From simple to complex; wood or plastic with screening*
  - These employ some tactic to constrain or close off the entrance to thwart robbing
  - Some leave them on on all the time; others install them one the fly; other put them on hives when robbing is most prevalent.





# Honey Harvesting: Escape Boards and Ports



- **8-Way Escape Board**
  - *Same principle, different design*
- **Triangle Escape Board**
  - *One way exit based on bee biology*
- **Porter Style Escape**
  - *Porter Bee Escape through the inner cover hole*

# Honey Harvesting: Fume Board +

- **Fume Board for bee removal**
  - *Load the fabric with a repellant chemical*
  - *The heat from the plastic cap warms the liquid and creates a vapor*
    - The scent of the vaporized liquid repels the bees that are below
- **Repellent Liquid**
  - *Various products are in the marketplace*

# Honey Harvesting: Uncapping Tools


## ❑ Tools to remove cappings

- *Two most popular are the uncapping fork and a simple bread knife*
  - There are more than a half dozen 'devices' out in the marketplace
  - Tip: See our video about the various tools and experiment with what works for you
  - Polling beekeepers over the years, these two win…
- *Other forms abound, included heated knives, rollers, and other form factors. Feel free to experiment with what suits you.*

# Honey Harvesting: Buckets and Filters

- **Harvesting Buckets**
  - *Plain food grade buckets with lids*
  - *Buckets with valves (gates)*
- **Filters**
  - *Stainless steel filters with varying grades of filtration screens*

**Or other alternative setups**

# Honey Harvesting: Extractor

## ❑ Manual or Motorized Extractor

- *2-Frame, 9-Frame, 20-Frame or more*
  - Something that bee clubs often have to loan
- *Considerable investment*
  - Often it is a good strategy to borrow one to learn
    - □ Determine your requirements through direct interaction and then make your sizeable investment after developing your preferences.
    - □ Or simply stay with borrowing the clubs extractor year on year

# Honey Harvesting: Uncapping Tub

## Uncapping Tub

- *These utility pieces are designed to aid in uncapping frames*
  - The wood bar is designed to rest a frame on while uncapping
  - The tank collects the wax cappings
  - Excess honey can be strained off from the built in gates
- *They are pricy, but quite helpful*

# Refractometer


## Measuring Moisture

- *Harvested honey should be at a specific moisture point*
  - Too much moisture and a honey will ferment in time.
- *Refractometers measure moisture*
  - They are simple to use and relatively inexpensive.
  - They are a failsafe, and many beekeepers have never used one.

# Honey Jars, Lids, & Labels

## ❑ Jars and Lids

- *Many beekeepers horde glass jars of all kinds to store honey in.*
  - Purists will buy dedicated jars made in traditional shapes

## ❑ Labels

- *It is a fun endeavor to source and design a local label*

# Swarm Commander / Lures

## Swarm Lure

- *Used to lure scout bees to a swarm trap*
- *Can also be used as an attractant for other management practices*
- *Very effective*
- *Available in different forms:*
  - Spray, Capsule, and Gel
  - Swarm Commander is a popular brand


# Waxmoth Preventative

## Waxmoth Deterrent

- *Para Moth is an industry product*
  - Use this to prevent waxmoth from consuming/destroying honeycomb in storage
- *Waxmoth will come in to comb in storage and chew through it, leaving webbing and rendering each of the frames completely useless*
  - It makes a major mess and sometimes the waxmoth damage woodenware so it has to be addressed

# Certan Waxmoth Deterrent

- **Bacillus Therengensis (BT)**
  - *Mixed into a spray, and sprayed upon honeycomb in storage*
    - Does not impact the bees or the wax
    - If waxmoth larva develop, and begin to consume the comb, they eat the active ingredient, and it harms them to the point of death.
    - Note: BT was sold as a product with the trade name of Xentari.  That product is no longer manufactured (at this time)

# Q&A

- **Questions**

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# BABA Beekeepers School

## Queen, Workers, Drones

Lesson | Meet the Colony Inhabitants

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# What is Covered in this Module

- Honeybee Colonies
- Superorganism
- Queens
- Workers
- Drones
- Bee Development
- A ‘Taste’ of Colony Operations

# Honeybee Colonies

- **Critical Insect to the earth** *and humans*
  - *Environment Pollination*
  - *Honey*
  - *Beeswax and other products of the hive*
- **Social Dependency**
  - *Eusocial Insect Organization*
    - The colony is made up of individuals, but they cannot survive by themselves
    - No individuals directing the rest what to do

*Definition*

**Eusocial**: showing an advanced level of social organization, in which a single female or caste produces the offspring and nonreproductive individuals cooperate in caring for the young

# Colony Superorganism

- **Honeybees are social insects that work together as a superorganism**
  - *Together they support complex tasks like communication, nest construction, environmental control, defense, and distribution of labor*
  - *Three types of adult bees: workers, drones, and a queen.*
  - *Individual bees cannot survive without the support of the colony.*
    - The goal of the colony is to expand and reproduce when possible, and sustain colony life during the non-growth windows

# Makeup and Structure

## A colony supports:

- *A single queen*
- *Several hundred drones during late spring and summer*
  - Some may be present throughout the year
- *Tens-of-thousands of workers (roughly from 20,000 to 60,000)*

## Social Structure

- *Colony activities are a balance between queen and workers through compendium of chemical pheromones and communicative dances*

# Labor and Reproduction

## Bees distribute work amongst the individual

- *There are some 20+ key jobs*
  - Wax Builder, Undertaker, Forager, Water Collector, Nurse Bee, Hive Defense, Etc.
- *The superorganism will do what is required, and adapt as needed, based on the needs of the colony through a division of labor*

## Reproduction & Survival

- *Reproduction and colony strength depend on the queen, food stores, and the size of the worker force. A better equipped colony does best.*

# Meet the Queen

- **One Queen**
  - *Except during swarming preparations or supersedure*
- **Primary Roles**
  - *Egg Production*
  - *The queen also produces pheromones which govern colony operation*

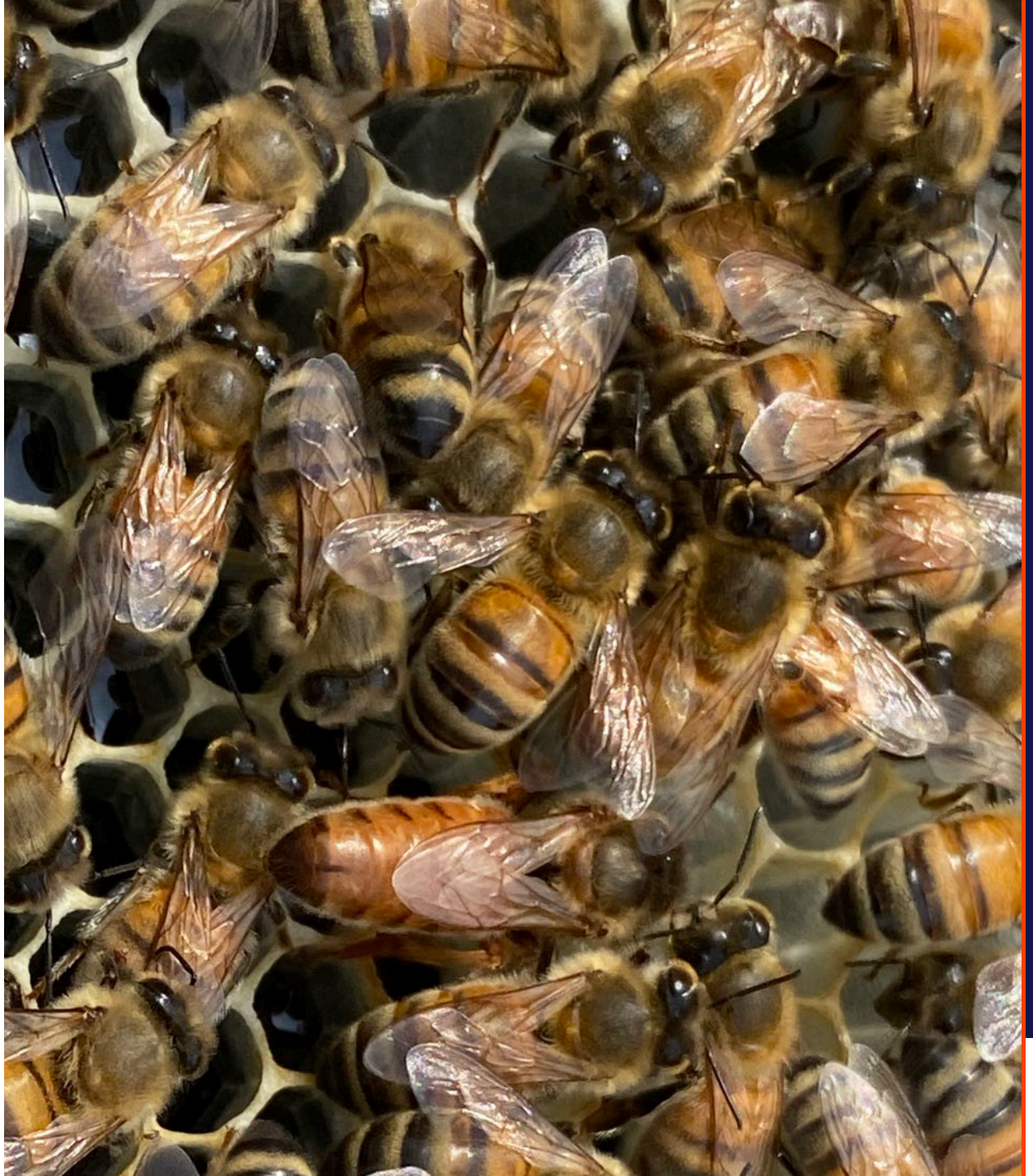
# Meet the Queen

## Egg Laying

- *Lays up to 1,500 eggs per day*
  - A queen can produce up to 250,000 eggs per year and live for several years
  - Average productivity: 2 to 3 years.

## Pheromones

- *Produces pheromones that act as a social "glue" for the colony*



# Queen Fertilization

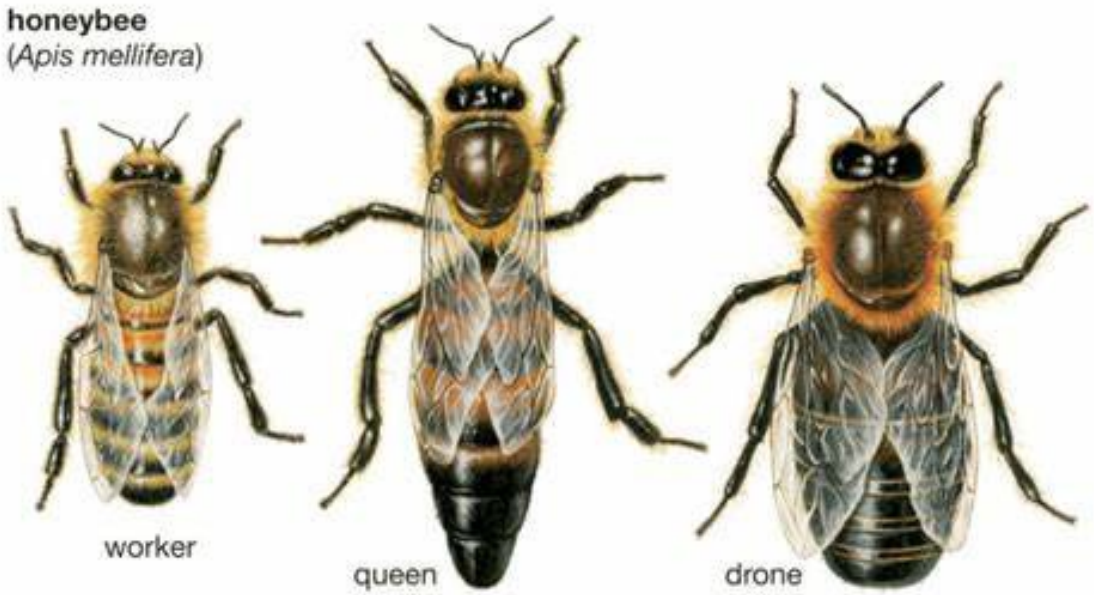
## ❑ Virgin Queens

- *Virgins leave the hive and fly to a drone congregation area*
- *They mate with drones, taking on sperm in their spermatheca*
- *They return to the hive and begin laying eggs with 48-hours*

## ❑ Fertilized Eggs

- *The combination of queen pheromone (like perfume for the workers) and the **presence of eggs** establish a working colony*
  - If these things are not present in the right ratio, the workers will detect the lack of 'proper' odors and seek to replace the queen
  - This is how they know a queen is failing

# Queen Appearance




## Queen Characteristics

- *The queen's body is longer*
- *Her wings cover only about two thirds of the abdomen*
  - Worker and drone wings nearly reach the tip of the abdomen when folded
- *The thorax is slightly larger than that of a worker*
  - This is an important consideration as sometimes you can pick out the queen by the appearance of the dark (less hairy) thorax which stands out in the crowd of bees on the comb
  - It is also conducive to paint her – *that makes it far easier*

Image credit: Britannica.com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# Workers

## Anatomically

- *Smaller than queen and drones*
- *Barbed Sting*
- *Feature pollen baskets on their back legs*
  - Not present on queen or drones
- *Do not produce pheromones like the queen*

# Workers

## Anatomically

- *Female workers do not have a developed reproductive system*
  - They can lay eggs, but they do not have a spermatheca
  - This means they cannot fertilize an egg and could not perform the role of replacing the queen
- *Wax Glands*
  - Workers have wax glands on the bottom of their abdomen for creating wax sheets

# Drones (male bees)

## Anatomically

- *The largest bees in the colony.*
- *Feature a large stout body, large head, with eyes that cover the top surface of their head*
  - A drone's compound eyes meet at the top of its head and the size serves their ability to see a queen in flight during mating
- *Drones have no stinger, pollen baskets, or wax glands*
- *They are fed by workers, and perform no known hive functions*

# Drones

- **Anatomically**
  - *They are fed by workers, and perform no known hive functions*
- **Presence Limited**
  - *Generally, mix into the colony from late spring to late summer*
- **Function**
  - *There is debate about any other roles they perform in colony operations; this is being studied*

# Drones

## Function

- *Their main function is to fertilize the virgin queens*

## Drones in Mating

- *Drones become sexually mature about a week after emerging*
- *Drones die as a result of the mating process with a queen*
  - Their endophallus pulls out and they suffer a mortal wound as a part of the mating process

# Drones

## Presence Limited

- *Generally, mix into the colony from late spring to late summer*

## Function

- *Their main function is to fertilize the virgin queens*
- *There is debated about other roles; this is being studied*

## Drones in Mating

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# Bee Development

## Development

- *Bees being reared in the cells are commonly referred to as 'brood'*
- *They progress from:*
  - **Egg** to **Larvae** to **Pupae**
- *Open and Capped Brood*
  - Eggs and Larva are open
  - Pupa develops under wax capping

**Developmental stages of the three types**

| Developmental Stage | Duration of Stages | | |
|---|---|---|---|
| | Queen | Worker | Drone |
| | ----------Days---------- | | |
| Egg | 3 | 3 | 3 |
| Larval Stage | 5 1/2 | 6 | 6 ½ |
| Pupal Stage | 7 1/2 | 12 | 14 ½ |
| **Total Time:** | **16** | **21** | **24** |

*Typical colony population*

- Colony size in winter 15,000 to 30,000+/-
- Colony size at the height ~50,000+

**Drones** are reared in cells that are larger than worker cells

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**Queens** are reared in cells that resemble a peanut shell

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**Workers** are reared in the typical honeycomb within the colony

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# Lifespans

## Queens

- *2 to 5 years; this is typical*
- *Can go to 6 or 7; this is rare*

## Drones

- *Typical lifespan is 2 months*
  - Like workers, some drones can stay in the hive for months
  - Fall drones, could be found in the colony in February or March

## Workers

- *Varies upon workload/colony role*
- *Workers live about 6 weeks during summer.*
- *Workers reared in fall can live up to 6 months*
  - This allows the colony to survive winter and assist in rearing new generations in spring.

# Age Based Polyethism

## ❑ Work is often guided by individual age

- *Worker bees perform differing tasks as they age*
  - Often tasks are tied to physical development (abilities) – things like gland development and physiology

## ❑ Example progression

- 1-2 days — Clean Cells, Keep Brood Warm
- 3-5 days — Feed Older Larvae (Nurse Bees)
- 6-11 days — Feed Younger Larvae
- 12-18 days — Produce Wax, Build Comb, Undertakers
- 18-21 days — Protect Hive Entrance, Guard Duty
- 21-45* days — Nectar, Water, Propolis Collection

*Definition*

**Polyethism**: refers to an ordered, predictable sequence of task specializations through which an adult worker passes as it ages.

This is just a representative sample

It is said that there are around 20 to 40 tasks undertaken by the bees

# Honeybee Glands

## Honeybee Glands Play a Vital Role

- *Glands in honeybees serve several functions in colony operation*
  - Worker glands are used in food production, chemical communication and signals
    - The role of Worker glands in food production have much to do with bee development. What food is presented, as interspersed with gland secretions, determine the makeup of the bee being reared
    - Queens, Workers, and Drones are fed different formulations and that results in their specific physiology – the most prevalent example being Royal Jelly for queens
  - Queen glands produce pheromones which control colony behavior and sequester worker sexual production (among other things)

# A 'Taste' of Colony Operations

## ❑ Open vs. Clustering

- *Honeybees operate in an open manner in normal weather*
  - They move about the comb, performing whatever duties are required
- *Clustered in winter (<45°F)*
  - Winter over as unit, working together to generate heat by **clustering** together to stay warm

## ❑ Hive Defense

- *Workers will serve as guards, monitoring every bee that attempts to enter*
  - They can distinguish their nest mates by smell
  - Each hive has its own individual odor
  - Exception: Often drones are allowed in from other hives

# Colony Operations (cont.)

## Nest Organization

- *Typically, the queen operates in the brood area*
- *Brood area is synonymous with the 'nest'*
- *The brood area is flanked with food storage made up of pollen, nectar and ripened honey*

## Hoarding

- *A trait of European Bees*
- *They will store more than they require*
- *Honey is often stored in the periphery and above the brood nest if storage space is available*

# Colony Operations (cont.)

## ❑ Wax Building

- *Wax is created by bees of a certain age*
  - They have to be well nourished, and their wax glands need to be fully developed
- *Bees can recycle wax and propolis when wax builders are not in operation*

## ❑ Propolis Envelope

- *Honeybees have a limited immunity system*
- *They depend up on natural immunity from nature in the form of propolis*
- *They create a propolis envelope within the hive*
  - Anti-Microbial, Anti-Bacterial, etc.

# Colony Operations (cont.)

## Reproduction

- *Bees reproduce by casting off swarms*
- *The swarm establishes a new colony with the old queen (old queen leaves with the swarm)*
- *The original colony rears a new queen*

## Queen Replacements

- *If the queen is failing, the colony will rear new ones*
- *The new queens will emerge*
  - Sometimes more than one emerges, and the queens will fight until one emerges as the victor
  - When new queens are present, workers will sequester and kill the old queen

# Honeybee Anatomy

- **Head**
  - *Sight, sense, mouthparts*
- **Thorax**
  - *Locomotion*
- **Abdomen**
  - *Internals*

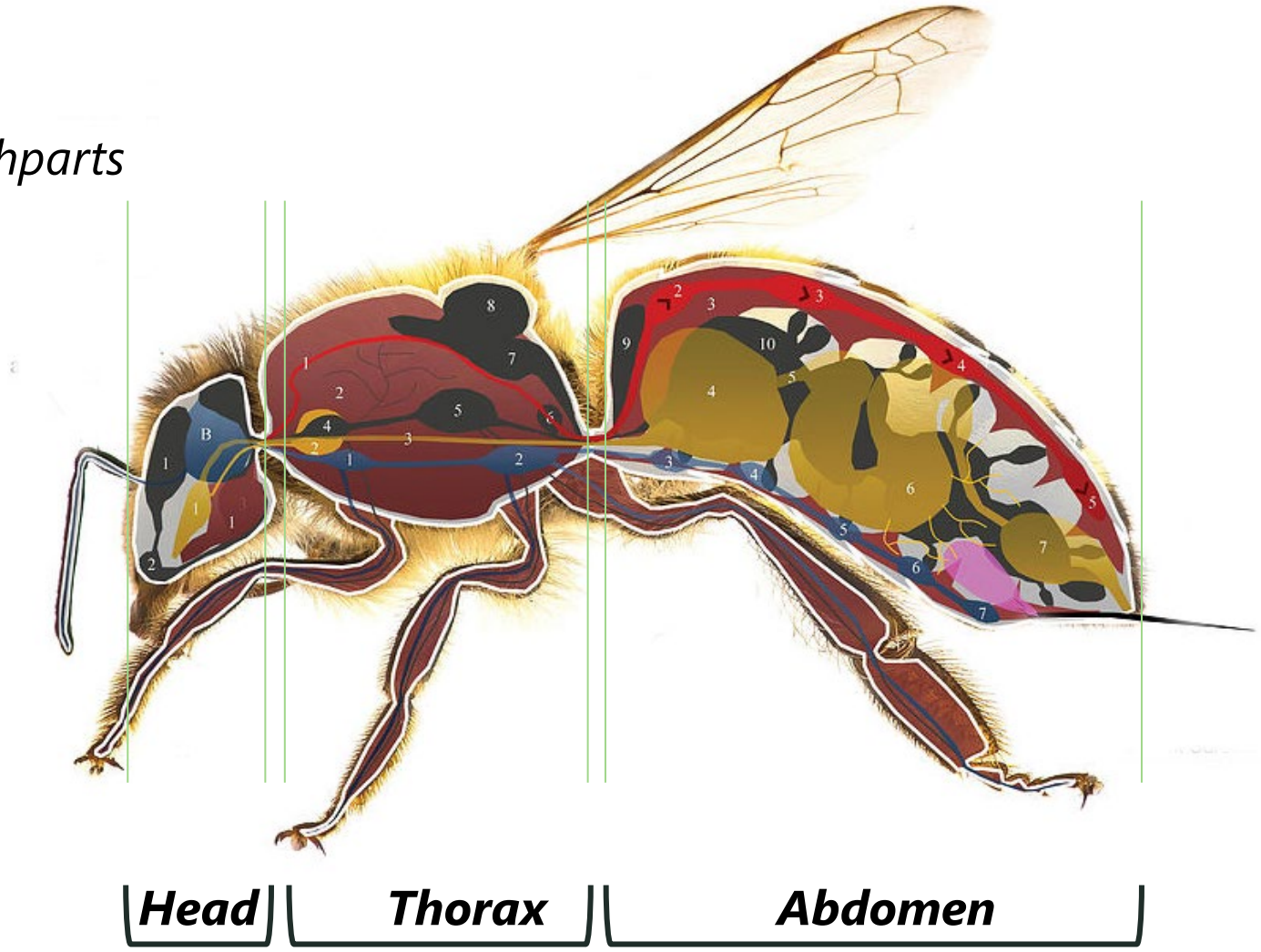



Image credit: Digital Museum of Natural History

# Honeybee Anatomy

## ❑ Anatomical Systems

- *Honeybees have several core anatomical **systems***
  - Circulatory
  - Glandular
  - Muscular
  - Nervous
  - Skeletal
  - Respiratory
  - Reproductive
  - Digestive/Excretory

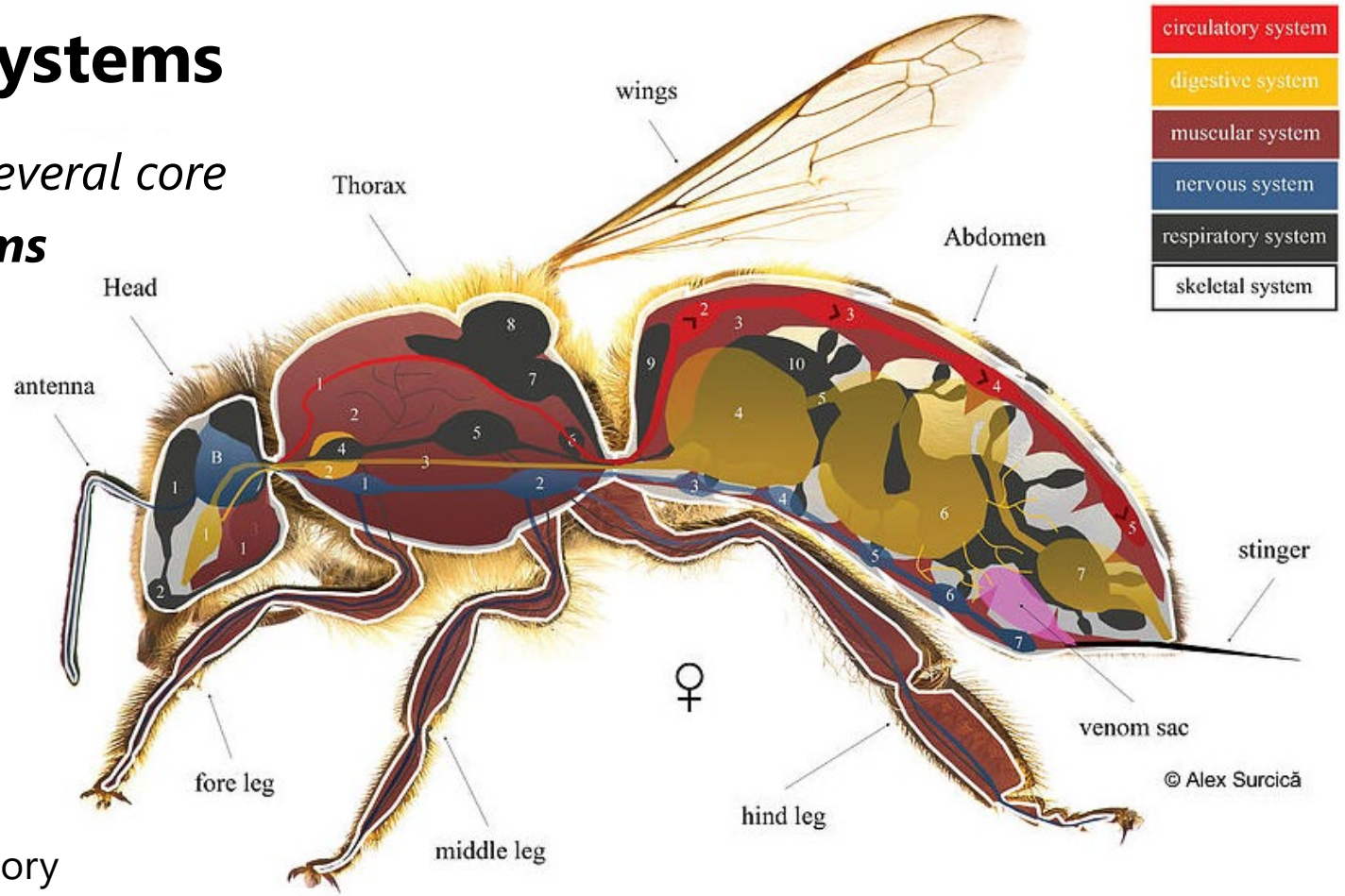



Image credit: Digital Museum of Natural History

# Honeybee Anatomy

## ❑ Anatomical Systems

- *Overview of honeybee anatomical structures*

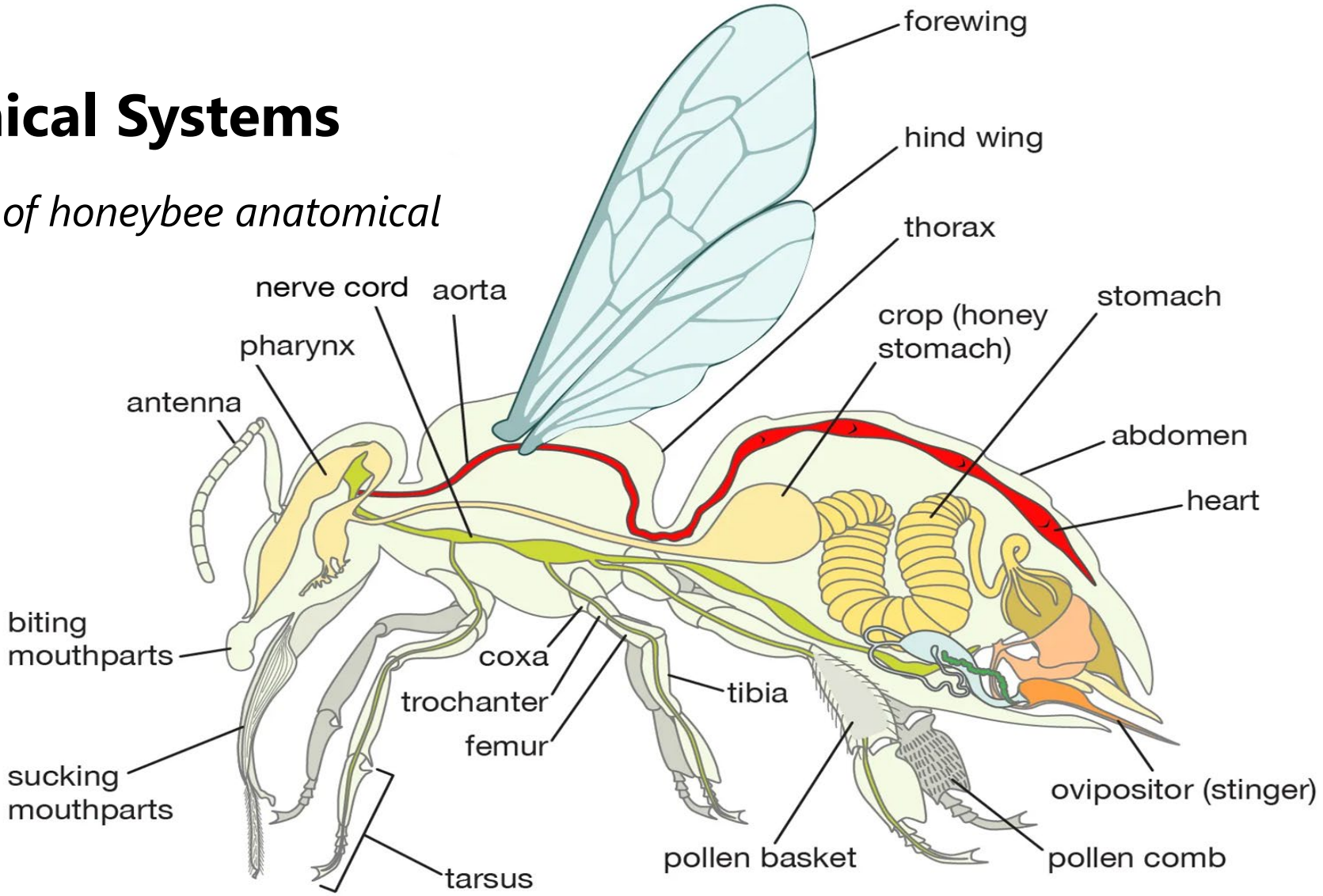



Image credit: Encyclopedia Britannica, Inc.

# Important Anatomical Call Outs

- **Antenna**
  - *Critical to world interaction and smell*
- **Honey Crop**
  - *Holds nectar in transit*
- **Wings**
  - *Forewing and hindwing work in conjunction to provide flight*
- **Stomach / Intestines**
  - *For digestion of foods – can hold a massive amount of food waste*
- **Wings**
  - *Forewing and hindwing work in conjunction to provide flight*
- **Sting**
  - *Barbed sting for defense*

# Important Anatomical Call Outs

- **Pollen Basket**
  - *Specialized feature on the legs of workers that holds pollen in transport*
- **Wax Glands**
  - *Wax mirrors for producing wax for comb building*
- **Compound Eyes/Ocelli**
  - *Provide vision, and sense of speed and direction*
- **Proboscis**
  - *Sucking up Nectar and food*
- **Mandibles/Mouthparts**
  - *Chewing and food processing*

# Important Anatomical Call Outs

- **Spiracles**
  - *Respiratory openings that provide for oxygen exchange*
- **Hemolymph**
  - *Interior fluid responsible for circulatory functions (like blood)*
- **Glands**
  - *Used for food production, chemical communication and more*
- **Surface Hairs**
  - *Cover the surface of the bees and perform several key functions*

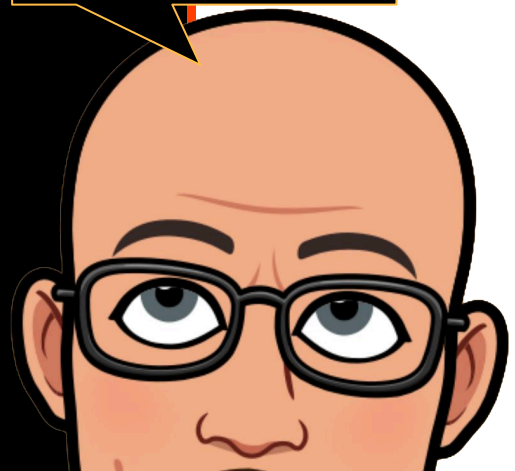
# Important Anatomical Call Outs - Queens

- **Ovaries**
  - *Fully developed ovaries for egg production*
- **Spermatheca**
  - *Specialized receptacle for holding sperm provided by drones*
- **Extended Abdomen**
  - *A larger abdomen allows the space for anatomy for egg production*
- **Stinger**
  - *Smooth barb, used for defense and against other queens*

# Scratching the Surface

- **This information is very superficial** *(on purpose)*
  - *A whole course could focus on colony operations and anatomy*
    - You have a lot of topics to learn when starting out
    - To add depth of content would be lost for three reasons
      - It takes some experience to understand the material
      - Your brain would be on overload with the information to process
      - There's not enough time to go into depth and cover the other things you need to know

*Kevin Moment*



# This is not to say this is unimportant…

Truly Critical *in becoming an educated beekeeper*

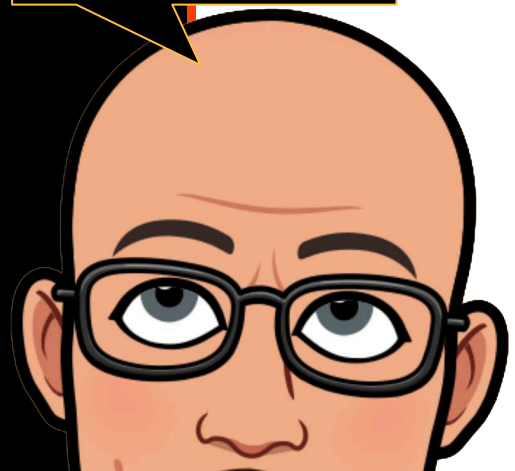
## ❑ Learning colony operation & anatomy

- *This is one of the most critical things you can invest in as a beekeeper*
  - When you know what they are doing, why they are doing it, and how they are equipped to do it – the puzzle comes together

## ❑ Recommendation & and Pledge from you

- *Please take the time after this course to learn the lower-level details*
  - Dig in on how wax is formed – Dig in on the detail of how bees overwinter – Dig in on swarming and reproduction – Supercedures – Drone Layers/Laying Workers – Dig in on biology….. *Become a long-term learner…*

*Kevin Moment*



# Q&A

- **Questions**