

Selection of Traits

For Honey Bees



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Many Levels of Selective Breeding

Natural
Selection

Queen
Purchase

Queen
Selection

Drone
Saturation

Isolated
Mating

Instrumental
Insemination

What to Select For?

- Bee Population
- Brood Area
- Brood Viability
- Gentleness
- Honey Production
- Hygienic Behavior
- Varroa Mites
- VSH (Varroa Sensitive Hygiene)

Measuring Bee Populations



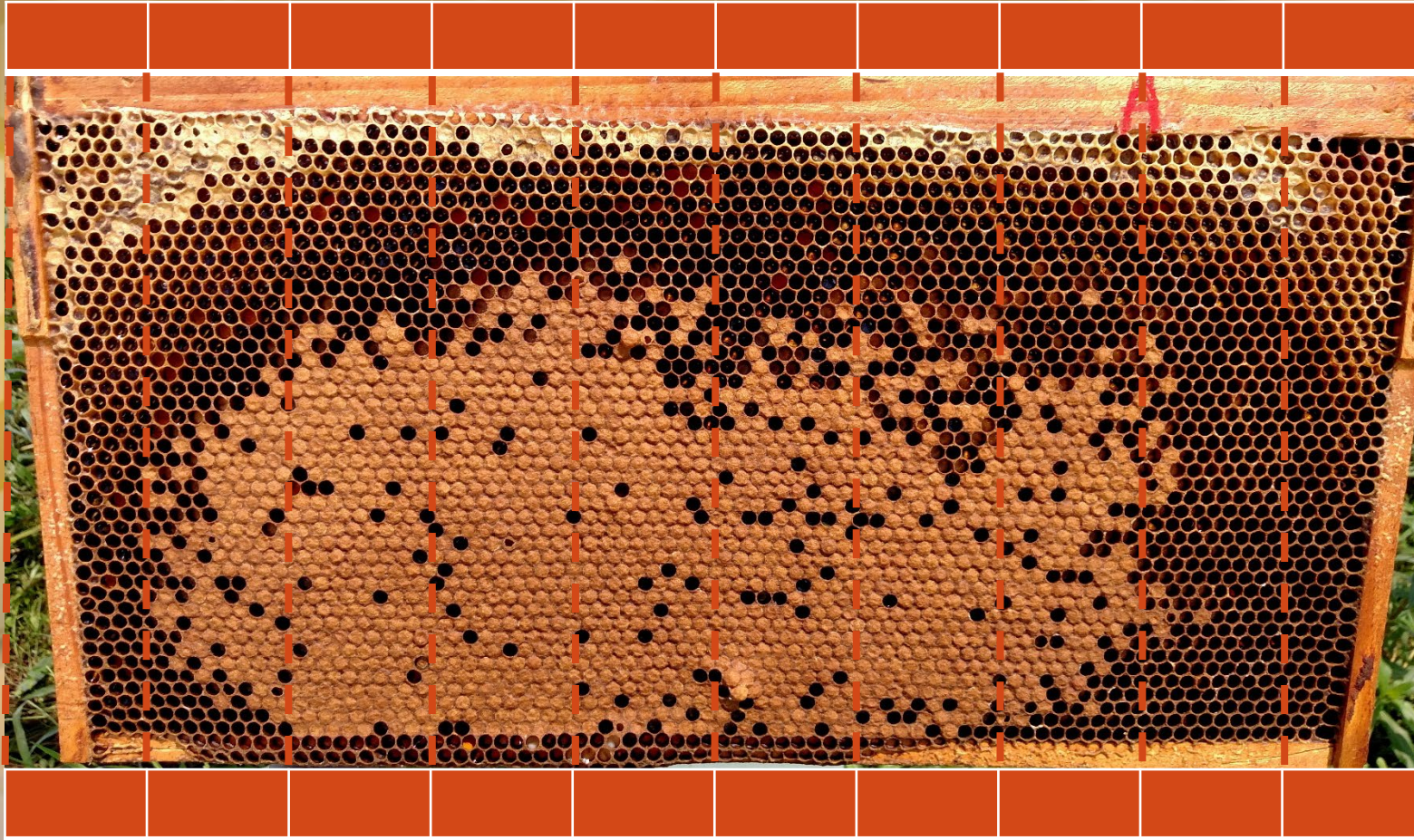
- Divide the frame into 10 vertical sections.
- “Push” the bees to fill full sections of the frame
- Count sections
- Max score of ‘100’ per side, ‘200’ per frame
- Score for this pic is 80

Measuring Bee Populations



- Commercial Measurement
- $2/3^{\text{rd}}$ covered with bees = 1 full frame
- Check through top and bottom
- This pic is 7 frames of bees

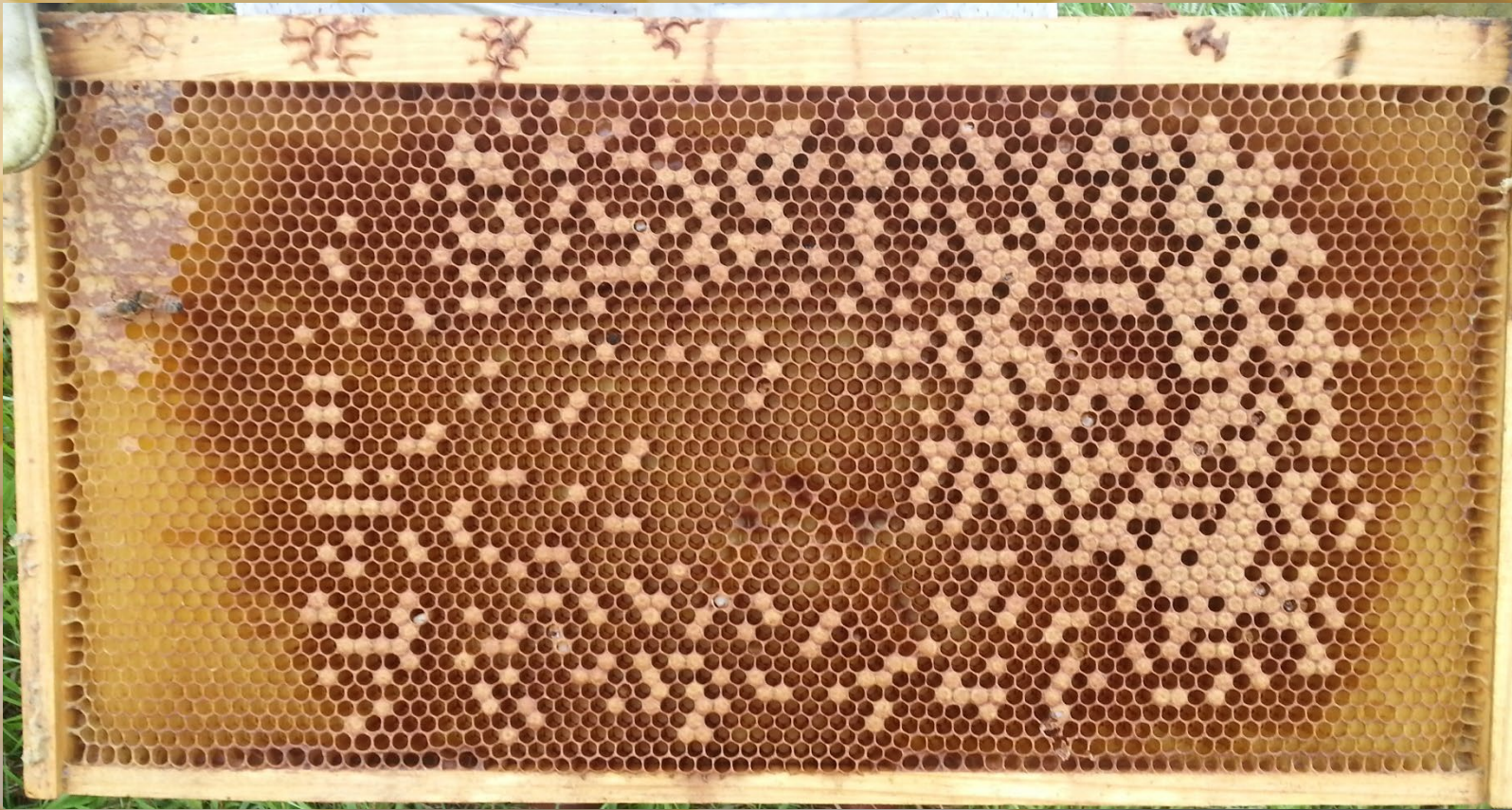
Measuring Brood Area



- Divide the frame into 10 vertical section.
- Use only sealed brood
- Mentally make full sections accounting for brood pattern
- Count sections
- Max score of '100' per side, '200' per frame
- The score for this pic is 50

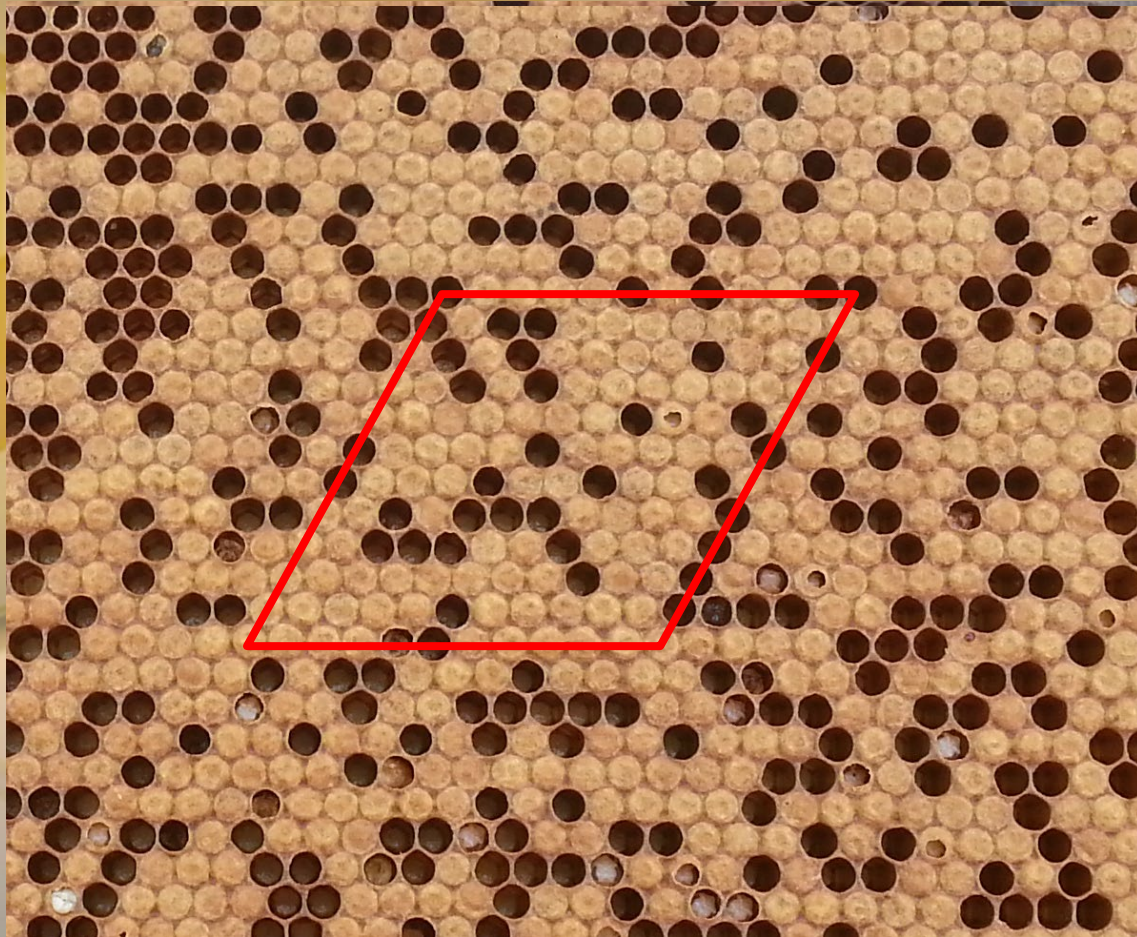
Same for honey and pollen

Measuring Brood Area



- Commercial Measurement
- Size of the palm of the hand = 1 full frame

Brood Viability



- Rhombus to hold 100 worker cells
- Place it over the best patch of brood
- Count the number of uncapped cells
- More than 15 uncapped cells means poor brood viability
- First pic has 4 uncapped cells (96%)
- Second pic has 23 uncapped cells (77%)

Measuring Honey Production



- Remove supers
- Record the colony
- Weigh the full super

Formula:

Weight of full super – Tare weight
= Weight of Honey

Sample tare weights:

Deep super with 9 frames = 22 pounds

Medium super with 9 frames = 17 pounds

Measuring Honey Production



Count

- Frames of Honey
- Supers of Honey

For this pic:

10 frames of honey
or 1 super

Hygienic Testing



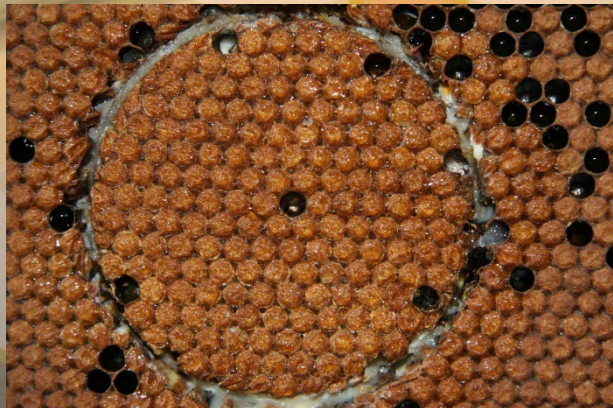
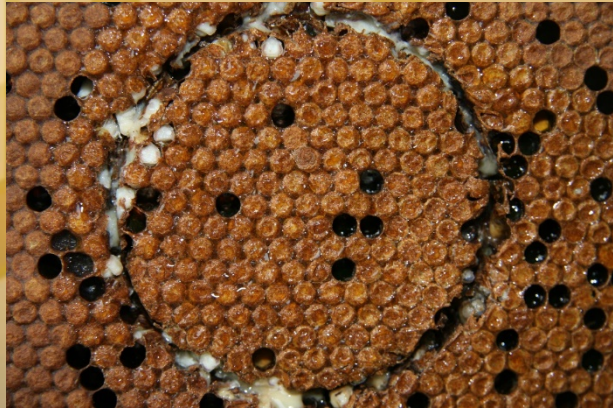
- Select a frame of solid sealed brood/white body pupae
- 5" tall, 3" diameter PVC pipe
- 10 oz. of liquid Nitrogen
- Count the number of sealed cells
- Place in colony for 24 hours
- Count the number of sealed or partially removed cells
- Above 95% removal Hygienic

Formula:

$$((\text{Sealed Initial} - \text{Sealed Final}) / \text{Sealed Initial}) \times 100 = \% \text{ Removed}$$

Freeze Killed Brood for Hygienic Testing

Initial



Final

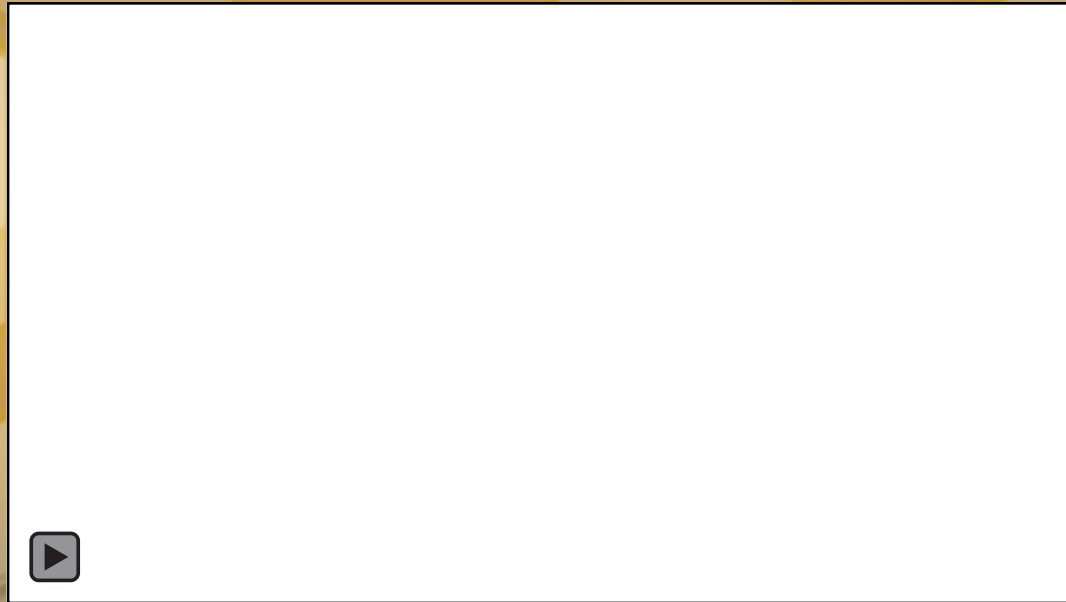


Non-Hygienic



Hygienic

Measuring Mite Populations – Mite Washes



- Collect a sample of 300 bees.
- approx. ½ a cup of bees.
- Shake the sample with alcohol or soapy water.
- Count the number of varroa.
- Repeat until you reach 2 zeros in a row.



Select a comb or two from broodnest



Protect the queen



Shake adult bees into a container



Scoop 300 bees (about ½ cup) from the mix



Place in shaking jar



Shake to remove *Varroa*

Sticky Board



- Cover paper with vegetable oil or spray
- Leave on colony for 24 to 72 hours
- Count the number of mites

VSH – Non-Reproduction

- Pull sealed brood.
- Purple eye with tan joints to black head.
- Open cells and look for mite infestation.
- Determine re-productiveness.
 - Offspring present?
 - Age of offspring?
 - Will the female mite make it to adulthood?

Col. 203 Trial _____ Comb No. _____ Date 21, 26 Nov '12 Initials RGD, DED W X D _____ Page _____

Side _____ Cells opened 500

Bee Stage		0 - larva / pre	1 - white eye	2 - pink eye	3 - purple, no tan								
4 - purple, tan joints	5 - tan, white wing	6 - tan, gray wing	7 - black head	8 - adult									
Inf. Cell	Cell No.	Re-cap	Bee Stage	Foundress	Progeny			Deuto		Adult		R or NR	
				No. Dd. Ent.	No.	Egg	Proto	Male	Fem.	Male	Fem.		
1	54	5	7	1	0							NR	Feces on abdomen
2	118	0	7	1	0							NR	
3	205	5	5	1	0							NR	
4	224	0	5	1	2	2						NR	Feces on thorax
5	249	0	5	1	✓	✓	0					NR	
6	279	0	5	1	0							NR	
7	320	3	6	1	0							NR	
8	350	4	6	1	4	4						NR	
9	380	2	7	1	4					1	3	R	
10	464	0	5	1	0							NR	Feces on abdomen
11	End @ 500												
12													
13	Infestation = 10/500, 2%												
14	Infertility = 7/500, 70%												
15	Recapping = 88/500, 18%												
16													
17													

Selection Index

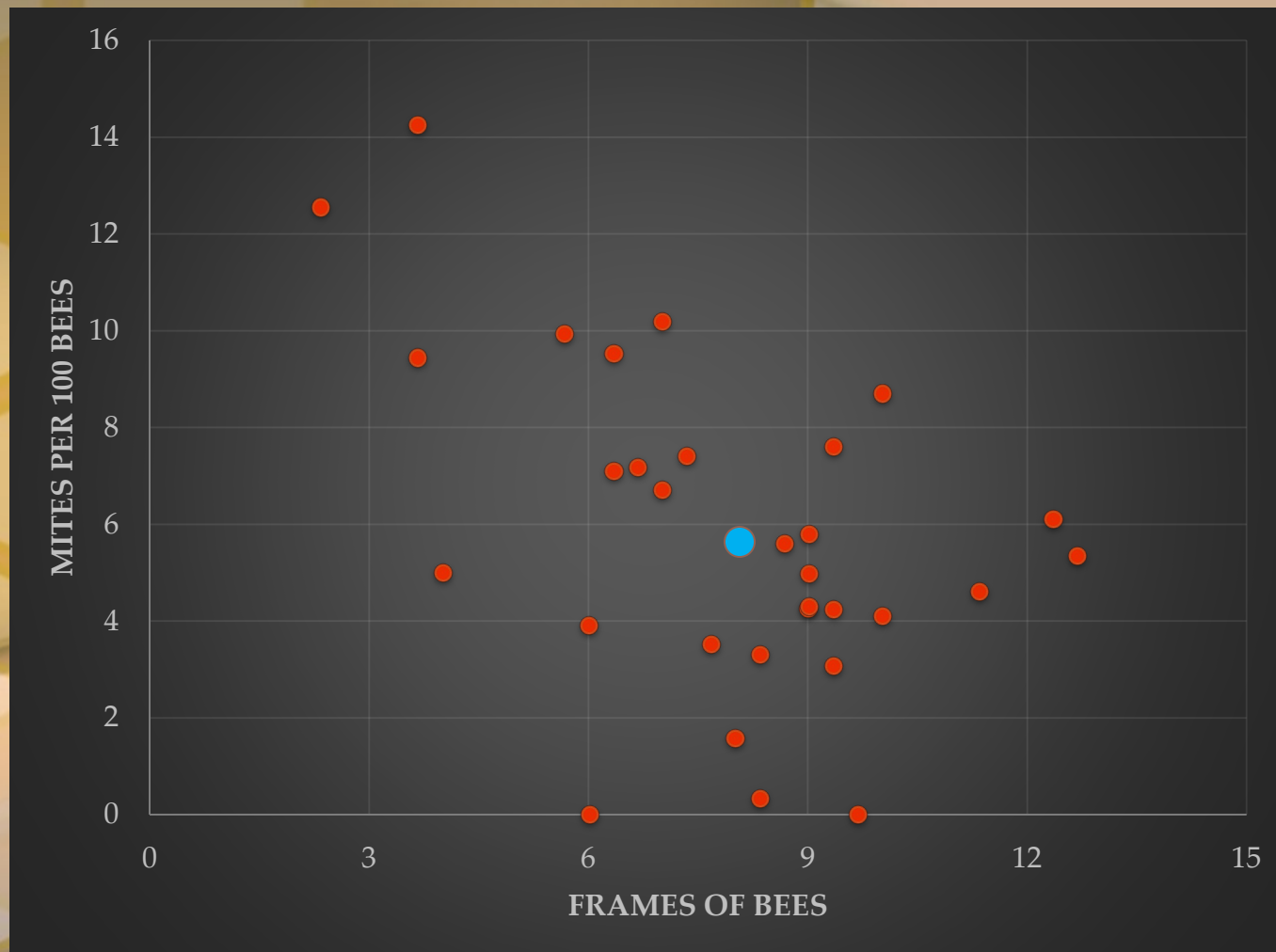
- Numbered scale to simplify scoring
 - 1 – 5 or 1 – 3 scale
 - Can be used for any trait
- Traits weighted differently
 - Honey production 2x the importance of gentleness
- Impartiality
 - Less likely to play favorites

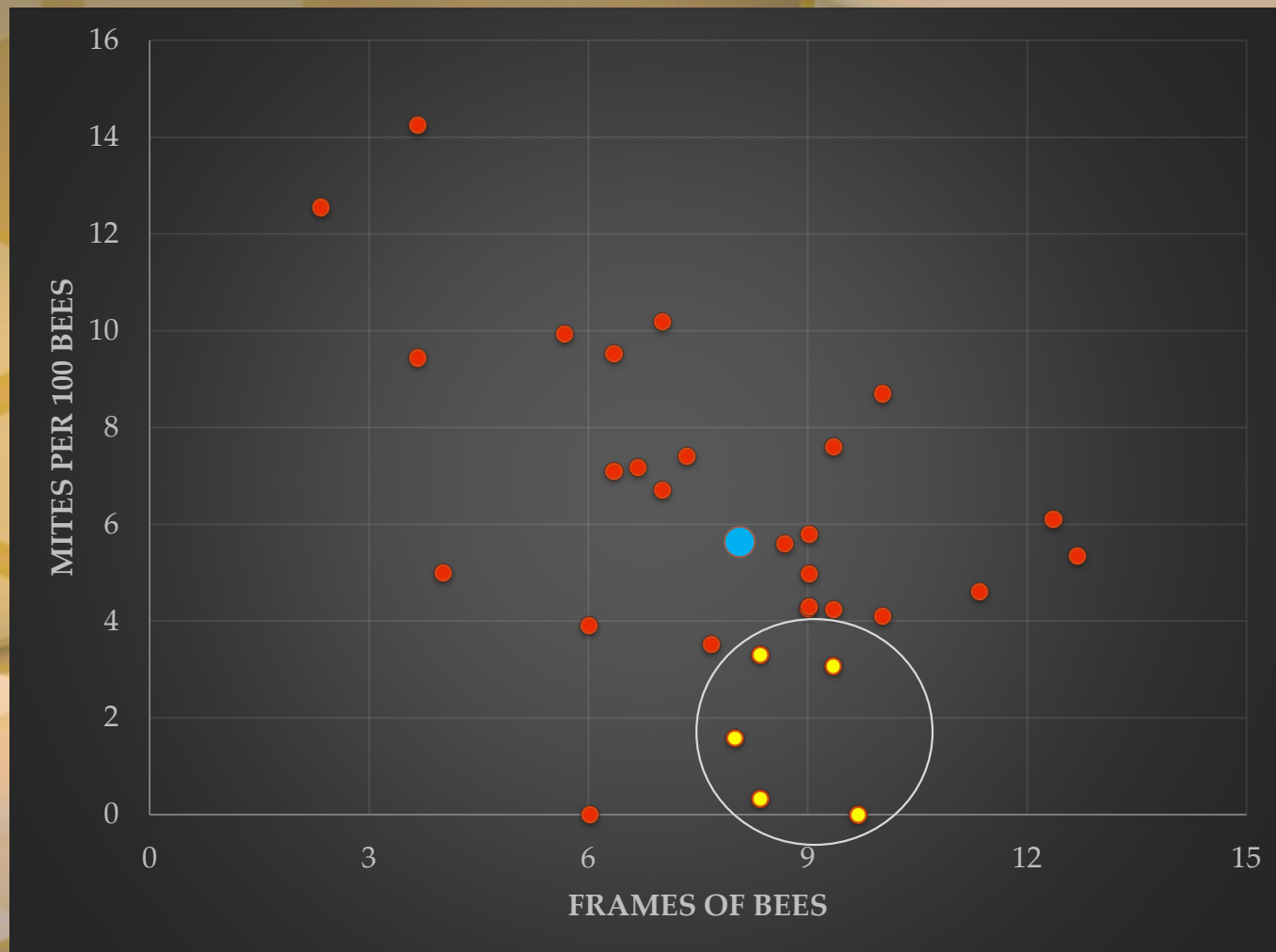
Selection Index

Colony	Population 3 = > 10 frames 2 = 5 to 9 frames 1 = < 5 frames	Brood Viability 3 = > 95% 2 = 85% - 94% 1 = < 85%	Gentleness 3 = Nice & Calm 2 = Runny 1 = Stingy	Total
Test Colony 1	2	3	3	8
Test Colony 2	3	3	3	9
Test Colony 3	1	3	3	7
Test Colony 4	2	2	3	7
Test Colony 5	2	1	3	6

Real World Data







Success tips

- Set your breeding goals
 - Make them reasonable
 - Do not expect immediate results
- Accurate measurements
 - Detailed measurements may not be necessary
- Stay consistent
 - The affects of selective breeding takes years
- Reevaluate
 - Reasonable reevaluation is important

Watch out!!

- Inbreeding
 - Large number of breeders are important
 - 20 breeders should last for 15 to 20 years with minimal inbreeding
- Prejudice/favoritism
 - Impartial measurements
 - Index system
- Untested latest/greatest (Fad)
 - Wastes resources
 - Maybe labor intensive

VSH Testing

