

Sampling Protocol for Varroa Sensitive Hygiene (VSH)

Modified from BeeStrong

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Additional Resources and
Areawide IPM project info:



Basic Protocol

- Pull brood frame(s) from colony consisting of mostly old pupae (7 to 12 days post capping).
- Open capped cells of pupae aged at least 7 days (purple eyes) and look for mite activity (e.g. live mites, mite offspring, feces).
 - If there are no mites, move to the next one.
 - If mites are present, note the number of each type of mite (sex and developmental stage).
- Continue until 250-500 cells have been checked or until 30 infested cells have been found – whichever comes first.

Choosing Colonies and Brood Frames

- Colonies should have undisturbed brood development for at least 30 days for accurate sampling.
- A good brood frame will have mostly old pupae (at least purple-eyed – 7 to 12 days post-capping).
 - Peel back 3-4 cells to expose capped pupae to determine age.

Examining Cells

- Cell dissections should continue until 500 brood cells have been checked **OR** 30 infested cells have been found (whichever comes first).
 - Do not count cells that have brood younger than 7 days (purple eyes).
- Carefully open the brood cell with fine forceps.
- Check the inside face of the cap:
 - If it is “**shiny**”, the cell has **not** been **recapped**.
 - If it is partially or **not entirely “shiny”**, the cocoon of the developing pupa has been partially disrupted and the cell has been **partially recapped** (image to right).

Reproductive Status

- Based on pupal stage and composition of the mite family – for a cell to be reproductive it should meet one of the following conditions:
 - **P5** pupa with at least **1 deutonymph male** and **1 deutonymph female**
 - **P6** pupa with at least **1 adult male** and **1 deutonymph female**
 - **P7-P9** pupa with at least **1 adult male** and **1 female daughter**
- If a cell does not meet these criteria it is **non-reproductive (NR)**
 - If both sexes are present but too young, it is “**delayed**” (**DR**)
 - If no offspring are present, it is **infertile (O)**
 - If no male is present it is **No Male (M)**

Things to Note

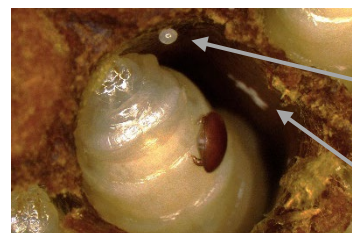
- Mites and exuviae (i.e. shed “skin” after mites molt) may be stuck to pupa – check the cell and pupa carefully.
- Non-reproductive and dead mites are easy to miss – ensure you fully check the bottom of the cell.
- Feces are a great indicator of a mite infested cell, though non-reproductive females will often defecate on the pupa.



Undisturbed vs recapped cells:

Left cell is shiny and has not been recapped.

The right cell is not shiny – this one has been opened and recapped.

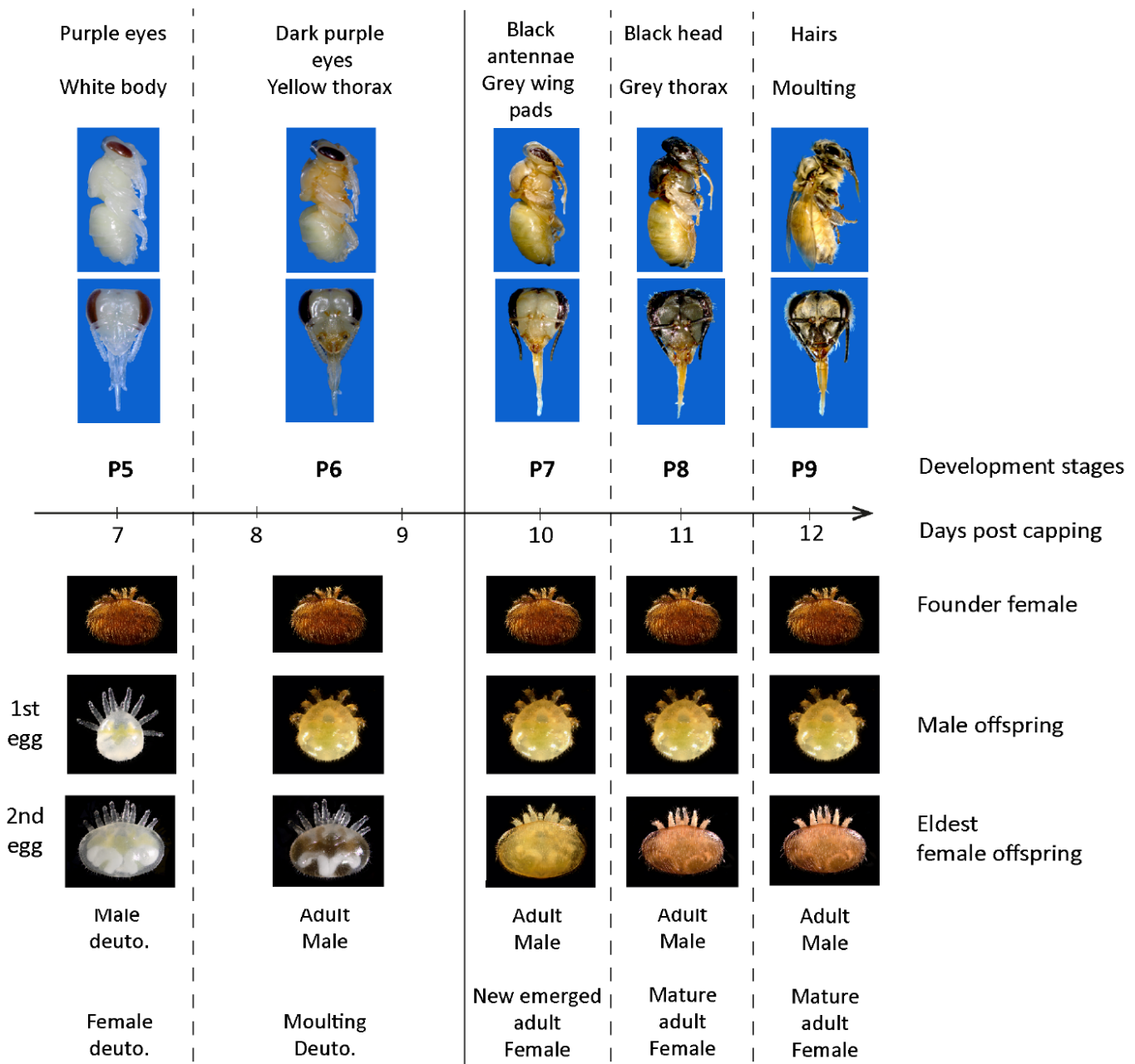


Mite egg and feces:

Note the mite egg at the top of the cell wall (these can be on the pupae too) and the patch of white feces deposited on the cell wall about halfway down.

Example Data Sheet

Inf. Cell	Cell Count	Brood Stage	# Fndress Adult	Eggs	Males	Prot.	Deut.	Mature Deut.	Dtr	R, NR, DR	Recap?	Comments
1	14	P7	2	1	1	0	1	1	0	R	Y	
2	22	P9	1	0	1	2	2	0	0	NR-M	N	Male Dead
3	40	P7	1	0	0	1	2	2	1	NR-M	N	
4	46	P8	2	0	0	0	0	0	0	NR-O	N	
5	53	P9	1	0	1	2	1	0	0	DR	Y	



Timeline of pupal stages and the associated mite stages.