MONTGOMERY COUNTY BEEKEEPERS' ASSOCIATION of Pennsylvania

July 2022

House (Bee)keeping

Hopefully everyone had a great 4th of July weekend and had plenty of time to get in those hives! We are now officially a few weeks into summer signaling a shift in some of our beekeeping activities. As we exit the peak of swarm management season, our attention can begin to shift to honey extraction (sweet!) and varroa management (not so sweet). A few housekeeping notes to pass along:

- Many of you have likely already begun to extract/bottle that spring gold, while others may be waiting for a mega-harvest. As a reminder, the MCBA has two extractors available to rent. For more information, visit our website HERE.

- There is no General Meeting scheduled for July. Instead, we are excited to host our 2022 Annual Picnic! The picnic will be held July 30th from 12PM – 4PM at the Carousel at Pottstown. See below for more information or visit the website for full details and registration HERE.

- If you treat/manage against varroa mite, the Honey Bee Health Coalition offers a very useful decision management tool: https://honeybeehealthcoalition.org/varroatool/

- Varroa in the news: After years of evading the introduction of *Varroa destructor*, our beekeeping friends in Australia are now faced with what was likely an inevitability. The varroa mite has been found in New South Wales, and a Movement Control Order has been issued in Queensland. Colonies in impacted areas are also being destroyed to help limit the spread of this parasite: https://www.bbc.com/news/world-australia-61976446

What's ahead:

Fri 08	86°/68°	AM Clouds/PM Sun
Sat 09	77°/60°	AM Rain
Sun 10	83°/62°	Mostly Sunny
Mon 11	85°/68°	Mostly Sunny
Tue 12	92°/72°	Mostly Sunny
Wed 13	90°/67°	Isolated Thunderstorms
Thu 14	85°/65°	Partly Cloudy
Fri 15	83°/64°	PM Showers
Sat 16	85°/65°	Partly Cloudy
Sun 17	87°/68°	Partly Cloudy

www.weather.com

What it means:

Summer is officially here, and the temperatures in the extended forecast reflect as much.

While it may make the job a little more uncomfortable, high temperatures are great for honey extractions! But keep an eye on the humidity. Because honey is hygroscopic, extracting in very humid conditions can have an impact on your honey's water content and therefore its shelf life.

If you are above your treatment threshold for mites, be sure to read label recommendations carefully, as temperatures can play a role in both product efficacy and safety.

General Meetings

There is no General Meeting scheduled for July. Instead, please join us at the annual MCBA picnic at the Carousel at Pottstown!

MCBA Picnic Details

- The picnic will be held July 30th from 12PM – 4PM
- Carousel at Pottstown: 30 W King Street; Pottstown, PA
- Registration is OPEN – click HERE to register and review event details
- Cost to register is $10 per person
    - Children 5 and under are free
    - Beginners Class participants: your 1 ticket (single) or 2 tickets (family) are covered in your class registration costs – **but please register** for catering/planning purposes

Calling all Presenters!

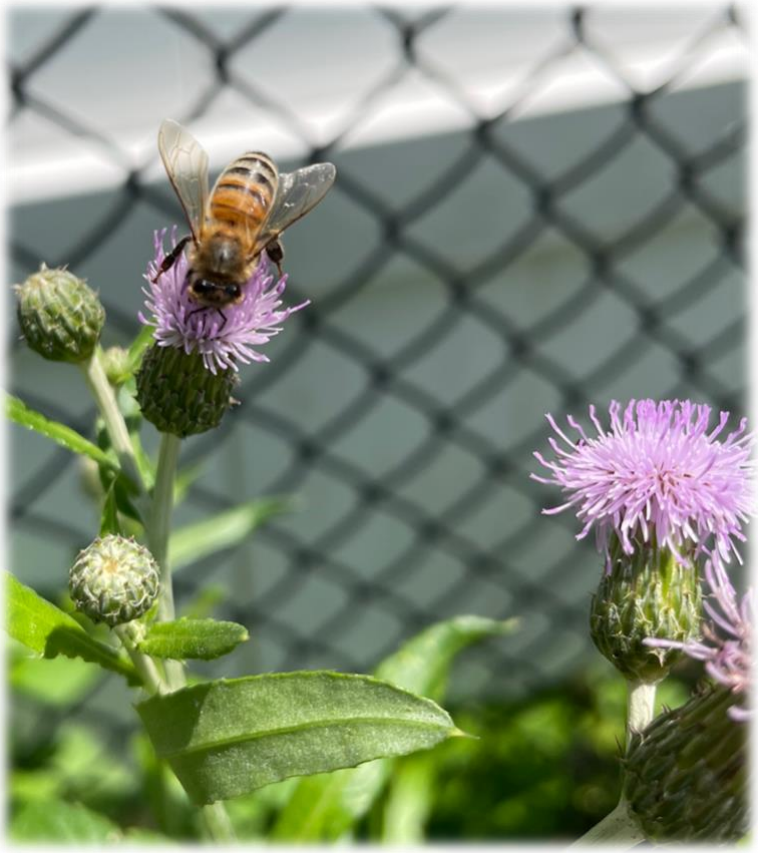
It may be hard to believe, but the main program for our 2023 general meetings is filling up fast! However, we are looking for "Mini-Presenters". Hopefully you are familiar with the format of our general meetings, but we really enjoy kicking off each session with a 15-30 minute "mini". This could include anything beekeeping or pollinator related! If you are interested in leading a discussion or sharing some cool material, please let us know!

Some Takeaways:

- In January, Dr. Juliana Rangel of Texas A & M University passed along a terrific resource for additional beekeeping education: the At Home Beekeeping Series through the Alabama Extension beekeeping team. This is a webinar series offered the last Tuesday of every month. For more details: https://www.aces.edu/blog/topics/bees-pollinators/at-home-beekeeping-series/
- In May, Dr. David Tarpy of NC State University gave a talk featuring fascinating 'queen' content for all levels of beekeeper, but there was some especially pertinent information for current or prospective queen producers. For those interested, you can even have queen lots tested for health and quality through the NC State Honey Bee Queen and Disease Clinic. For more information, visit https://www.ncsuapiculture.net/queen-and-disease-clinic
- Our June meeting featured timely presentations from Paul Niemczura (new organic miticide progress) and Dr. Katie Lee from the University of Minnesota (Varroa and Risk Factors). Check your email for the Zoom recording!
    - Product registration through the EPA is no easy task, but we are getting closer to having another organic miticide in our varroa toolbox (as early as 2023) – great work, Paul!
    - Dr. Lee's presentation covered a lot of ground on the varroa mite and colony viability demonstrated through years of regionally dispersed research. One observation that really stood out to me is the potential importance of a spring varroa treatment. Here in Pennsylvania, we tend to focus on varroa populations in the early part of summer – when populations explode. However, Dr. Lee contends that an already-high population of mites is *very* challenging to control. Therefore, a spring mite treatment could prove to be a valuable addition to a mite management program.

Thistle: Foe?

Let's take a minute to talk about thistle! First, is thistle a friend or a foe? The answer: YES! But in order to clear up some of that ambiguity, we need to take a closer look at the group of plants characterized as "thistles".



Thistles are a common name given to a large group of prickly plants in the Asteraceae family, and they are generally of great benefit to pollinators. However, thistles get a lot of bad press. That is mostly due to the non-native, highly invasive nature of Canada thistle, bull thistle, and sow thistle. In particular, Canada thistle is an economically devastating agricultural weed with huge negative impacts on the environment as a whole. While Canada thistle may have some pollinator benefits, it can rapidly take over large areas of land producing a monoculture through vigorous spread via both rhizomes and seed. Just to confuse the matter on North American invasive species, Canada thistle doesn't even originate from Canada.

But did you know that the Mid-Atlantic is home to approximately nine species of *native* thistles? Perhaps unsurprisingly, many of these thistles are in severe decline due to habitat loss and confusion around what is a prickly nuisance weed and what is not. To learn all you'll ever need to know about native thistles and restoration opportunities, check out Native Thistles – a Practitioner's Guide (Xerces Society for Invertebrate Conservation). To learn a bit more about Canada thistle, refer to this PA Noxious Weed Alert (PA Dept. of Agriculture).

BeeWorks, LLC

Ready to start bottling some honey? Visit our friends at BeeWorks in Bucks County, stocked with plenty of glassware and PET containers (and much more). Take a look at their product catalogue HERE

BeeWorks, LLC is open on Wednesdays from 2-6:30PM, or you can schedule an appointment for your convenience. Click HERE to visit the BeeWorks, LLC website.
Beeworksllc01@gmail.com

The Beginners' Corner

Derek Pruyne

Fellow beginners: welcome back to this month's edition of the Beginners' Corner. As we near the summer "dearth", it's time to start thinking about winter preparation… Wait, WHAT?!

Okay, that may be getting ahead of ourselves a little bit, but the important thing to know is that we are approaching the time of year typically associated with rapidly increasing varroa mite populations. So, while it seems premature to even think about winter, the management choices we make over the next month or two could make a huge difference in colony health as we march towards fall and winter.

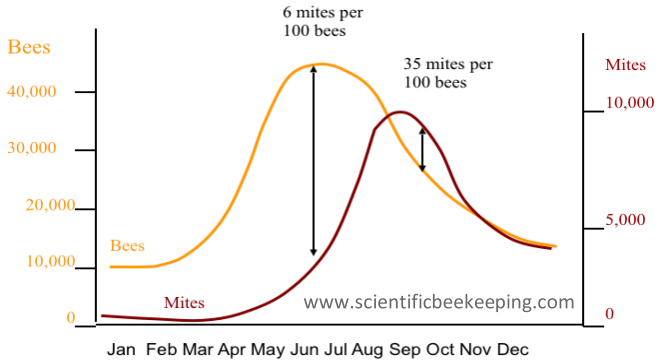


Figure 1. Simplified bee and mite population growth curves for a temperate climate. The mite growth curve lags behind the bee curve. Note how the number of mites per hundred bees greatly increases in fall. A colony is unlikely to survive a fall infestation rate this high.

First – a quick philosophical comment. We at the MCBA welcome beekeepers of all styles and approaches. Whether you exercise conventional, organic, or treatment-free management, you are a welcome member of our community and should always feel comfortable sharing ideas and discussion. That said, **I encourage you to find a mentor(s) with similar philosophies and styles**. As you have surely learned by now, keeping bees has a tremendously steep learning curve. A lot will go wrong, even when everything is going right! You are unlikely to find two beekeepers who approach every issue the same way, so finding a more experienced beekeeper with a similar approach will give you a resource to lean on that aligns with your goals.

Regardless of your mite-management strategy, **testing for mites is important for any operation.** Even in treatment-free colonies, mite numbers remain a very important data point. Are your bees simply rock stars that excel at varroa mite suppression? Is there something unique about your bees that allows them to tolerate high rates of infestation? If you experience colony loss, do you know if mites or disease could have been a factor? Having answers to these questions will allow you and the greater beekeeping community to learn. One great example would be through collective improvements in regional/local genetic stock. Another example is how we answer annual surveys and how that information is used to advance our broader understanding.

With that out of the way, a quick story on why testing for mites before **and after** treatment is important. In my first season with bees, the summer seemed to go smoothly. My mite counts stayed pretty low for a while, but when late summer rolled around, I reached my "treatment threshold" and decided it was time to do something. I chose formic acid (MAQs) – easy to apply, lower risk of queen loss (under the right conditions) – boom, done. Given this was my first season, I was admittedly a little nervous about making a mistake and killing a queen so late in the season resulting in a hopelessly queenless colony. I also convinced myself that I would probably not have time for another mite treatment anyway so late in the season (wrong). All that said, I did not perform a mite count following my final treatment of the year.

Fast forward to late winter (March timeframe) the following year. I began to notice *a lot* of mite corpses on the front porch of my colonies. Not good. So, when the weather allowed, over the next few weeks I initiated a series of oxalic acid vapor treatments. As a result, I dropped *thousands* of dead mites. In this scenario, I believe I got pretty lucky. Both my colonies did in fact survive and quickly rebounded in early spring. But I learned a few valuable lessons here: 1) not every mite treatment will be effective, 2) testing after treatment is critically important, and 3) mites are persistent, skilled parasites!

Queen Cell Program

There are several reasons to requeen a colony – whether it's out of necessity, expanding your apiary, or **simply improving the genetics of your bees!** If you aren't familiar with the MCBA queen cell program, this is the perfect time of year to take advantage and introduce some elite queen genetics into your operation.
MCBA members should be noticing periodic emails offering available queen cells from the cell distribution coordinator Susan Alfano. These cells, selected and grafted from local, high-performance queens (or special queens from elsewhere) are available on a first come first serve basis at $5 per cell. Before reserving these cells, there are a few things to consider:

- When introducing a queen cell, you should be certain the colony is queenless. A queenright colony will tear down the cell and waste an otherwise high-quality queen.
- If the cell is introduced a short period of time after queen removal (post-split, swarm, or cull), consider the likelihood the bees are raising a sister-queen and the potential need to tear down 'emergency' queen cells. The goal should be to maximize emergence and acceptance of only the introduced cell.
- Upon receipt of a queen cell, time is of the essence. You will receive a "ripe" cell with queen emergence occurring within a few days. Be prepared to install the cell as quickly as you can manage.
- For more information, visit montcopabees.org/queen-cell-program and carefully review the information in the emails.

Education with Montgomery County Beekeepers' Association

Beginners Class with Mark Antunes

- Class #6 – July 19 – 6PM at the Montgomery County 4H Center
    - https://montcopabees.org/New-Beekeepers
    - Registration closed

Intermediate Class with Dr. Vincent Aloyo

- Class #6 – July 27 – 6PM at the Montgomery County 4H Center
    - https://montcopabees.org/IntermediateCourse
    - Registration closed

Proventriculus: Before the 'Belly'

By Graham Kingham, Exeter BKA

Have you wondered how foragers manage to transport nectar to the hive without digesting it? The reason is because the proventricular valve keeps nectar from entering the digestive area of the gut, as Graham Kingham explains.

All honey bees have a one-way filtering valve in their abdomens, called a *proventriculus*, meaning before the ventriculus, the latter perhaps being thought of as the stomach or 'belly' as it is where much of the food digestion occurs. The proventriculus is situated between the honey stomach, also known as the crop, and the ventriculus (figure 1). The crop acts as a storage organ for nectar and water while it is being transported to the hive and is capable of great distension. The proventriculus valve can be open or closed and thus can allow or prevent the passage of crop contents into the ventriculus. This control is achieved by its specialised structure, resembling a 'mouth' with four triangular-shaped 'lips', inserted into the base of the crop (figures 2, 3a and 3b). The lips are fringed with fine hairs (figures 2c and 3c) which, as will be described below, enable the extraction of pollen grains from the nectar and their deposition into small pouches found just behind the lips. This pollen can be transferred into the ventriculus and used by the bees.

Anatomy and function of the proventriculus

Much of our understanding of how the proventriculus works comes from elegant research published by Leslie Bailey at Rothamsted and others in the 1940s and 1950s. Both the crop and the proventriculus have an outer layer of circular musculature running around them and an inner layer of longitudinal musculature running down their length. The longitudinal muscles of the proventriculus are powerful and by contraction cause the lumen (cavity) of the organ to enlarge. The 'lips' are extensions of the folds beyond the encircling band of circular muscles and they open as the longitudinal muscles contract. The combs of filiform (thread like) hair on the edge of the folds appear to be capable of

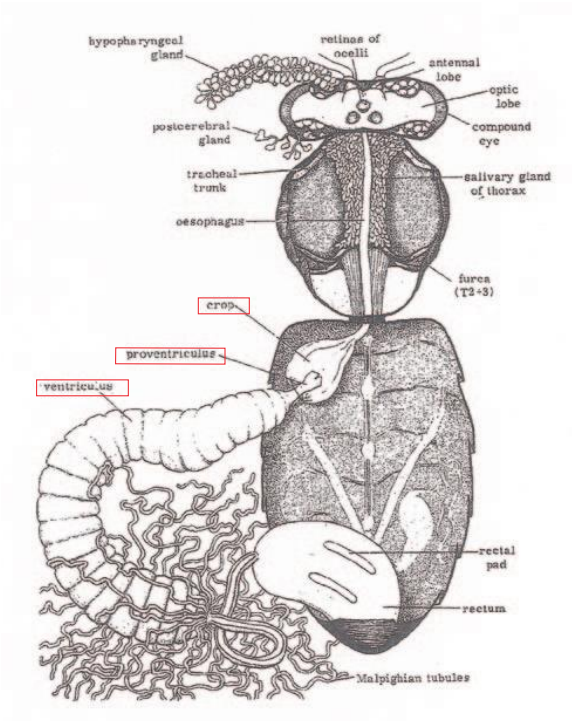


Figure 1. Dissection of a worker alimentary canal. The glands of the head have been lifted out, indirect flight muscles removed from the thorax and the underlying organs exposed revealing the alimentary canal, taken from Dade (2017)[1] with permission from IBRA.

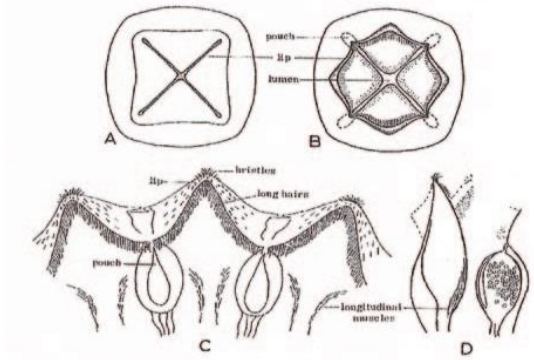


Figure 2. A sketch of the proventriculus as it would be seen when looking down at it from within the crop, showing its four muscular 'lips' in the closed (A) and open (B) states. Short spines (bristles) and long hairs of the lips as well as the pouches are illustrated in C. Here, the proventriculus has been slit down one side giving a view of the interior or lumen. Longitudinal sections through a lip (left) and pouch (right) are shown in D. Taken from Dade (2017)[1] with permission from IBRA.

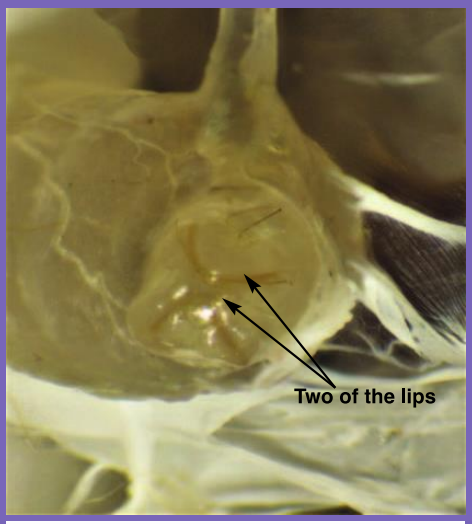


Figure 3a. A view of the proventriculus as would be seen looking down at it from within the crop, showing its four 'lips' that would be inserted into the base of the crop, which has been removed. Magnification X40, viewed with a dissecting microscope. All photos by Graham Kingham.

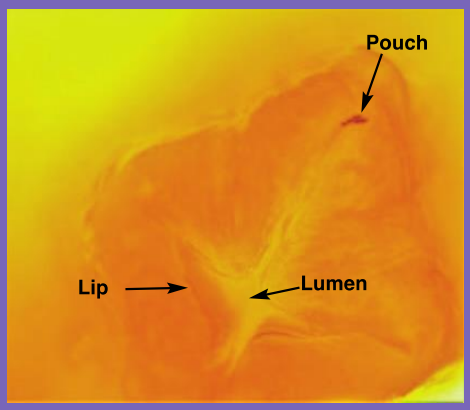


Figure 3b. The proventriculus in an open state at a higher magnification, x 100, showing lips, pouches and central lumen (arrowed).

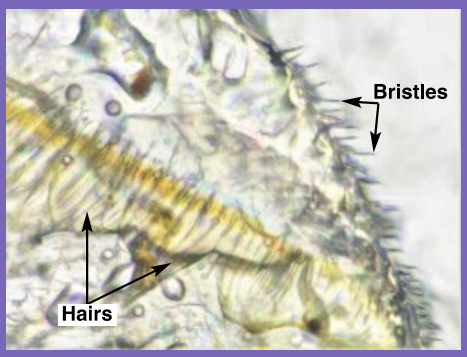


Figure 3c. Inside view of a lip. Magnification X400. This image shows the long filiform hairs, which are about 70 microns long, and shorter bristles.

either being folded in upon the surface of the fold, when the longitudinal muscles contract, or being opened away from the surface when the longitudinal muscles relax.[2]

These 'combs' of hairs allow unrestricted entry to pollen grains, which rush into the expanding proventriculus lumen (cavity) as the longitudinal muscles contract; they are capable of filtering particles as small as one micron. Relaxation of the longitudinal muscles and contraction of the circular muscles will cause expulsion of the fluid contents within the proventriculus back into the crop; a thicker 'sphincter' layer at the base preventing fluid entry into the ventriculus.[2] In closing, pollen grains will be held back by the hairs lining the lips while the nectar returns into the crop. Pollen is thus 'sieved out' of nectar by the hairs and forced into the pouches as the folds of the lips collapse upon each other. Repeated intake and expulsion of crop contents in this manner will gradually cause a mass of pollen grains to accumulate in each pouch.[2] Finally, a large ball-shaped mass of pollen grains (a 'bolus') is collected in each pouch, and then contraction of the circular muscles forces this large bulk against the hairs of the combs and into the neck of the proventriculus.[2] From here each pollen bolus passes into the ventriculus, leaving just a few grains of pollen behind in the collapsed pouches.[2]

Whitcomb and Wilson, in 1929, showed that the outer walls of the pollen grains are not digested at any stage, yet their contents are completely digested in the ventriculus. This is because digestive enzymes can enter through pores in pollen grains and the products of digestion can leave. The boluses can pass quite quickly towards the posterior end of the ventriculus, within 5–20 min, depending on the amount of pollen in suspension of the feed.[2]

An Australian study in 2004 found that between 0.15% and 0.433% of pollen has been left in honey, showing how effective a filtering mechanism it is. As Bailey comments, '*this [filtration] alone probably facilitates the digestion of pollen, since the proteolytic enzymes* [these are also called proteases, proteinases, or peptidases, and are any of a group of enzymes that break the long chainlike molecules of proteins into shorter fragments, called peptides, and eventually into their components, amino acids] *are not diluted by an excess of fluid*'.[2]

The proventriculus, therefore, filters off pollen as compact masses and leaves the nectar behind in the crop, and thus serves the purpose of dividing the two principal items of food – nectar and pollen – for separate treatment. The volume of fluid within the crop, the size of pollen particles in suspension and their concentration all have significant effects on the rate and efficiency of filtration by the proventriculus.[2]

Within the ventriculus, the swallowed pollen is kept within a thin membrane, the peritrophic membrane. These membranes are secreted by cells lining the upper ventriculus (epithelial cells). Nearly all insects have membranes like these, and a considerable amount of study has gone into establishing the role that they play in digestion. In the honey bee, successive sheets of membrane peel away from the epithelial cell wall and coat each bolus of pollen as it arrives. The membranes were previously thought to provide protection for the lining of the ventriculus from sharp points of some pollen. However, it is more likely that they are important in concentrating a range of digestive chemicals (enzymes) where they are most needed.

References

1. Dade HA. *Anatomy and Dissection of the Honeybee*, IBRA and Northern Bee Books, 2017.
2. Bailey L. The action of the proventriculus of the honeybee, *Apis mellifera* L. *Journal of Experimental Biology* 1952; 29 (2): 310-327. Available at: https://repository.rothamsted.ac.uk/download/0c92d6acd7a2286cf5a9abca798c50639a14e7521d9434a9784d432a09f6db7f/6595540/310.full.pdf