

Wolfpack's Waggle

January 2019 Newsletter

NC State Apiculture Program

Dedicated to the dissemination of information and understanding of honey bee biology and management

Issue 1, January 2019



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What have we been up to?

The beginning of a new year always brings reflection about the previous. We've had another successful year, with 11 peer-reviewed publications (tying a record high for our program for a second year in a row) and 13 presentations at scientific meetings. We had 8 active grants totaling \$2.3M, and we have 24 people in the program. By last count, we have 46 different research projects, ranging from projects at an early conception all the way to those soon to be submitted for publication. On the extension side, collectively we delivered 16 presentations and workshops to various beekeeper groups for 4,532 individual contacts, and we were covered by nine media stories on our work. Our Queen & Disease Clinic is growing ever-more popular among beekeepers and queen producers, and it is really starting to gain traction in becoming a self-sustaining resource for beekeepers to ascertain the reproductive quality of queens (and drones) and the disease levels in their colonies. Overall, 2018 was a great year, and we hope the same for 2019!



ABF 2019: messages from plenary speakers

Several members of our program attended the recent annual conference of the American Beekeeper Federation in Myrtle Beach SC. Here is a quick summary of the three main plenary speakers who presented at the meeting.

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Honey Bee Queen & Disease Clinic

Better Data, Better Bees



Quality Assurance

Troubleshooting

Customized Experimentation

Morphometric Analysis: multiple measures of queen or drone, body and reproductive tract (rearing quality)

Semen Quality: total sperm count, and sperm viability in queens (mating success), or drones (mating potential)

Genotyping Analyses: full assessment of paternity for up to 48 workers and an estimate of queen mating frequency

Quality Report: a "grade" report of a queen or drone's reproductive quality for your quick interpretation

Pathogen Screening: identification of presence and relative levels of ABPV, BQCV, DWV(A&B), IAPV, LSV, Trypanosomes, and both *Nosema* species

Mitotyping for Africanization: genetic analyses of maternal ancestry as African or European using population genetic techniques and markers

Your Bees, Your Data: any results or interpretations from our work is held in the strictest confidentiality and anonymity

This highly-tailored collaboration involves custom experimental design, analyses, and interpretation. This unique partnership between science and industry has been utilized to:

- > Test the impact of various agrochemicals
- > Assess the effects of banking on queen quality measures
- > Evaluate novel management practices' improvements in queen mating quality
- > Observe the effects of shipping on queen health and sperm quality

Contact us for more information & pricing

Queen & Disease Clinic Pricing (five sample minimum, bulk pricing available)

Strong Research Foundations
Established as a natural extension service leveraging basic and field honey bee research at NCSU, the clinic has worked to improve colony health for over 10 years.

| Analysis | Pricing (per sample) | Samples Tested | | |
|-----------------------------|----------------------|----------------------------|--------|----------|
| | | Queens | Drones | Colonies |
| Reproductive Quality | \$24.00 | ✓ | ✓ | ✓ |
| Standard Pathogen Screen | \$55.00 | ✓ | ✓ | ✓ |
| Aplary Pathogen Screen | \$220.00* | *up to 10 colonies, pooled | | |
| Mitotyping (Africanization) | \$35.00 | ✓ | ✓ | ✓ |
| Genotyping (Mating Number) | \$320.00 | ✓ | ✓ | ✓ |

Custom Disease Screening
Additional and custom pathogen targets available upon request

Lab spotlight: Gaven Bell

For this last academic year (starting in August), we have had the pleasure of hosting **Gaven Bell**, a high school intern from the NC School of Science and Math in Durham NC. Their curriculum includes and encourages seniors to participate in research

opportunities at UNC, Duke, and NC State.

Gaven reached out to our lab given her interests in bees and genetics. Several of our projects were of interest, but she quickly focused on Lauren's project on the mating frequency of queens in the Hawaiian archipelago.



She has been impressive in her work at the bench and analysis.

Gaven hopes to attend NC State next year, and we hope fervently that she does so that she may continue to be a valued member of our team!

American Beekeeping Federation (ABF) comes to Myrtle Beach, SC



Marla Spivak is a leading authority in apiculture who spoke about Restoring Bee Health: Molecules to Landscapes

There were many excellent presentations at the recent ABF conference. Here are some quick summaries on the three main plenary sessions, as their lessons should resonate.

Like most beekeeper conferences, the American Beekeeper Federation (ABF) changes the venue for its annual convention every year. This year, they met quite close to North Carolina in Myrtle Beach SC. In doing so, they had three high profile or 'keynote' speakers in their plenary sessions. Here is a quick synopsis of what they said.

Marla Spivak needs little introduction, since her program at the University of Minnesota serves as a model for all academic apiculture programs in the country. Her keynote address summarized many of the projects that her lab has been doing, ranging from molecules to landscapes. The overall message of her presentation was that honey bees are part of a much larger community of pollinators, and that we have to think mechanistically about bee health by promoting factors that not only help honey bees but all bees. In particular, landscape-level approaches that help honey bee nutrition also help native bee populations, and in doing so we should not be pitting one bee against other bees but instead be thinking holistically about pollinators in general.

Reed Johnson's plenary address was an excellent exploration about the complex environment in which bees live, particularly in agricultural settings such as almond orchards. With the majority of beehives in the US migrating to northern CA every year for that singular crop, it is critical to understand the different pesticide exposures that they experience. The research out of Reed's lab tested combinations of pesticides, particularly how fungicides interact with insecticides and even the adjuvants (the delivery compounds in the commercial products). What they have found is concerning—that certain (but not all) combinations of pesticides can have non-additive effects that synergize to create higher toxicity than they do in isolation, and that adjuvants themselves can be surprisingly toxic to bees but are usually not considered during normal safety screening. These findings, however, will hopefully prompt additional measures among regulatory authorities to include adjuvants and pesticide combinations in their registration considerations of commercial



Reed Johnson, from the Ohio State University, is a national authority on honey bee toxicology and health.

products rather than simply looking at individual active ingredients.

Dennis vanEngelsdorp rose to fame for initially elucidating Colony Collapse Disorder and more recently spearheading the Bee Informed Partnership (BIP) out of the University of Maryland. His plenary topic covered an important issue, titled "Mites matter!" Based on the BIP surveys and other data, he correctly surmises that varroa mites are the primary parasite that threaten honey bee health today, as they have for the last 3 decades or so. Nonetheless, management practices still struggle to cope with

ABF conference (Continued)

these parasites and the pathogens that they vector (mostly RNA viruses). His presentation demonstrated why it has been so difficult, how the mites fight back against beekeepers' attempts to control them, and the perils of simply letting one's bees succumb to varroa (at the population level, "varroa bombs" from your neighbor's collapsing colonies can pose significant problems for your colonies even if you've done well to keep the mites in check).



Dennis vanEngelsdorp at the University of Maryland stated his plenary talk very simply: mites matter!

What I particularly enjoyed about these three plenary sessions is how they greatly complimented each other. Honey bee health and the threats that bees face are myriad and interacting; there is no singular issue that trumps all others, and thus there is no single solution to all of the problems. Instead, only by taking a comprehensive approach can we start to move the needle on the significant losses of honey bee colonies and maintain a sustainable, healthy population. Marla's focus on nutrition at the landscape level, Reed's focus on environmental contaminants and how they interact, and Dennis' focus on the primary parasite are all connected to the biology of honey bees where you can't address one without considering the others. Only by taking such a multifaceted approach to bee health will the apiculture industry and the beekeeping community reach a sustainable solution to bee management.

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Undergraduate Researchers

Olivia Loyack, Nissa Coit (UNC), Ashley Rua, Will Fowler, Tess Wiegmann (artist-in-residence), Zachary Everson, Gaven Bell (high school intern), Austin Acree, Emily Johnson (media intern), Danyelle Reiskind, Austin Rose

Support the NC State Apiculture Program!

The Apiculture Science fund-raising efforts operate under the auspices of the North Carolina Agricultural Foundation, Inc. a 501(c)3 organization. You will receive an official receipt for your donation.

Make a gift toward emerging needs

– Consider supporting the program with a gift that would go toward the current area of greatest importance. Flexible funding enables the Apiculture Program to address critical needs as they emerge, often enhancing the program beyond what would be possible through restricted grant funding. Funding of any amount, from \$10 to \$10,000, will be extremely helpful.

Make a gift-in-kind

– The Apiculture program is always seeking creative solutions to its material needs. If you have surplus equipment or other non-monetary assets to give (e.g., gently used honey extractors, microscopes, even vehicles), please consider donating them to the program. You will receive credit for the monetary value of the gift and the gratitude of our faculty and students.

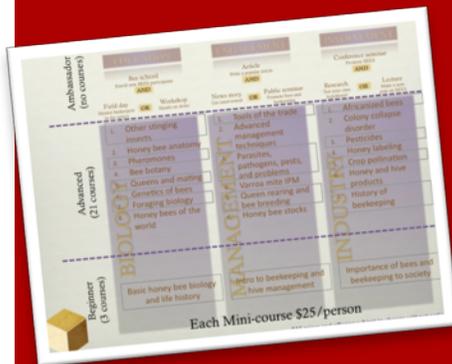
MAKE A DONATION

Make an estate gift – If you are interested in planning an estate gift to benefit Apiculture, please let us know! We can provide you with the tools you and your attorney will need to ensure that your wishes are fulfilled. Please click the link above for more information.



Check out our new website!

For the third time in 3 years, we have completely revamped our website, which is still located at <https://ncsuapiculture.net>. With a cleaner look and streamlined content, we hope this new look will be easier to navigate and enable us to include regular blog posts.



BEES network

Our online courses in the Beekeeper Education & Engagement System (BEES) are still up and running, although we have been continually delayed in creating new content. Enroll today at: go.ncsu.edu/BEES

Random notes

New publications

- Lee, K., M. Goblrich, E. McDermott, D. R. Tarpy, and M. Spivak. (2019). Is the brood pattern within a honey bee colony a reliable indicator of queen quality? *Insects* 10: 12; doi:10.3390
- Metz, B. N. and D. R. Tarpy. (2019). Reproductive senescence in aged drones of the honey bee (*Apis mellifera*). *Insects* 10: 11; doi:10.3390
- Amiri, E., G. Seddon, W. Z. Smith, M. K. Strand, D. R. Tarpy, and O. Rueppell. (2019). Israeli Acute Bee Paralysis Virus: queen-worker interaction and potential virus transmission pathways. *Insects* 10: 9; doi:10.3390
- de Souza, D., M. H. Huang, and D. R. Tarpy. (2019). Experimental improvement of honey bee (*Apis mellifera*) queen quality through nutritional and hormonal supplementation. *Apidologie*. <https://doi.org/10.1007/s13592-018-0614-y>



Presentations

Cabarrus County very generously made a donation to the NC State Apiculture Science Fund of \$1,000. The donation derived from Kim Flottum and Kathy Summers of *Bee Culture*, who spoke at their first annual “Cabarrus Beekeepers Present” symposium. When presented with their honorarium, Mr. Flottum kindly redirected it to the Apiculture Science Fund. We can’t thank everyone enough, particularly Kim and Kathy, Todd Eury, and Mark Smith for their generosity and support.

Welcome aboard!

We are pleased to have **Danyelle Reiskind** and **Austin Rose** join our lab in recent weeks. Danyelle is an Animal

Science major aiming to attend vet school after she graduates, and she took ENT 203 last semester that included an additional honors project on the interface between apiculture and veterinary medicine. She joins the lab with those continued goals in mind, where she is helping Daiana on her project on the physiology of honey bee queen quality and ovary development. Austin was recruited by Joe to work on his projects involving toxicology. He has a general interest in Entomology and is minoring in that curriculum. Welcome to you both!

Moreover, we’re very fortunate to be joined by Dr. **Alison McAfee** as a postdoctoral researcher. Ali received her PhD from the University of British Columbia in Canada in Leonard Foster’s lab studying the proteomics of hygienic behavior in bees. While a member of our collaborative team, she will continue her work there because of the logistical advantage of Leonard’s facilities and expertise. Come see her speak at the NCSBA Spring Conference!

...and sadly missed

Carson Noel was an undergraduate researcher who had been working in our lab for the last year, including receiving an Undergraduate Research Award to conduct her own project on how pesticides affect adult workers from different genetic stocks. Her priorities have shifted, however, and she can no longer fit bee research in her schedule. Thanks for all that you’ve done, and best wishes!

Congratulations!

Joe Milone was awarded a coveted scholarship from the Foundation for the Preservation of Honey Bees at the recent ABF conference earlier this month. Well over 20 graduate students nationwide were considered for this prestigious award, and Joe was one of only four who received it this year. The committee commended him on his research on how the exposome of honey bees affects their health and productivity, an issue as important as it is timely. Congratulations, Joe, we’re all very proud of you on your latest accomplishment!

Teacher's corner: Courses at NC State

Contrary to our original plans, we are offering ENT 601/801E this semester, which is a graduate seminar titled "Social Behavior of Insects." It is co-instructed by Bonnie Blaimer and Aram Mikaelyan, two relatively new faculty members in our department. Bonnie's main research is on the systematics and ecology of ants, and Aram's focus is on the gut microbes of termites. We have ~12 participants in this year's seminar, so we look forward to our discussions!

<http://go.ncsu.edu/honeybees>



Tarpy's back page

For about 4-5 years now, I have systematically declined all speaking engagements at the NCSBA county chapters. This was in stark contrast to when I first arrived at NC State 15 years ago, when I was doing ~50 meetings per year. The reasons for this decision—which was difficult to arrive at—were numerous. First, the sheer number of chapters has grown from around 40 when I first arrived to a whopping 78 at last count. That means that there are nearly 1,000 local meetings per year not including all of the bee schools across the state! Needless to say, even the excellent crew of 6 full-time NCDA&CS Apiary Inspectors have a hard time to accommodate the number of meetings, making it unrealistic for just one person. Second, my appointment has changed significantly over time; when I first started, my job was defined as 70% extension and 30% research. When I started teaching, the extension appointment dropped to 50%, and today it is defined as only 15%, which means I have much less bandwidth for extension travel for local presentations. Finally, the issue of parity is significant, where I wouldn't wish to only accept the invitations from chapters closest to Raleigh (disenfranchising more remote chapters) or those with the largest membership (disenfranchising the smaller clubs). It therefore seems that the only fair thing to do would be to have an all-or-nothing policy, where we focus our efforts at the state level rather than at the county level.

Opinions vary, however, and recently we had a formal complaint from an extension agent lodged against the program for having such a policy. This and other discussions have actually prompted a comprehensive discussion among all extension specialists and the upper extension administration about the expectations, scope, and scale of specialist positions. It is my fervent hope that these discussions will prove fruitful and in particular embrace the modern reality of extension demands in the state. For example, I hope there will be a concerted effort to promote real-time and recorded webinars in lieu of physical visits, as these are clearly more efficient for time. In an age where we are compelled to do more with less, there needs to be a systemic culture change in the expectations of what specialists should be doing in general and how best to disseminate information about apiculture in particular.

Sincerely, David