

Wolfpack's Waggle

April 2017 Newsletter

NC State Apiculture Program

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

Issue 2, April 2017



More inside

- Page 2 Queen & Disease Clinic
Lab spotlight: James Withrow
- Page 3 Four abstracts from the ABRC published in *Bee World*
- Page 4 Donate to the NC State Apiculture Program
- Page 5 Random notes
- Page 6 Teacher's Corner
Tarp's back page

What have we been up to?

The slow start to the spring means a delayed research season, which has everyone on edge. Typically we are up and fully running at this point, but we are just only now gearing up to do our experiments for this summer. At last count, we have 20 different projects for which we are actively collecting data this year, which is an astounding level of productivity. Two of our off-campus postdoctoral researchers, Dan Charbonneau (UPenn) and Daiana De Souza (Galveston), are temporarily here at NC State to conduct their field research. Samples have been flying into the Queen & Disease Clinic this year, so our services seem to be gaining traction in the industry. All four of the graduate students in the program (James, Joe, Hannah, and Lauren) are heavily involved in their respective projects, but they each also have one or more side projects that they're actively participating in. It is clear that when we look back on things, this will be a very busy summer!



Four published abstracts in *Bee World*

Based on the presentations earlier this year at the ABRC, we have several publishable and citable abstracts in a beekeeper-friendly venue, which helps bring the research and beekeeping communities together.

More on Page 3



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)

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

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

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

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

Contact us for more information & pricing

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

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

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	✓	✓	✓
Apiary 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

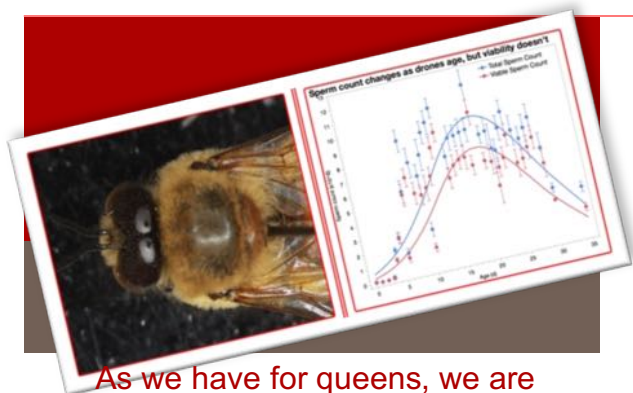
Lab spotlight: James Withrow

As one of the more senior members of the lab, **James Withrow** joined our group in the summer of 2014 for a Masters degree. He accomplished that feat—working on both 'royal' subfamilies in colonies as well as the effects of shipping temperature on queen quality—in early

2016, and we were lucky enough to keep him on board as a PhD student. He is now half way finished in that degree, where he is studying the evolution of polygyny and specifically how beekeepers may be able to establish multiple queen colonies.



James plans to remain in academia, and he has been very involved in the EGSA, NC State student government, and teaching. He has also been very helpful in welcoming new people into the lab, given his experience and tenure.



As we have for queens, we are developing a “standard measuring stick” to objectively and empirically quantify drone reproductive quality. This study enables us to do just that so that we can develop such a service in our Queen & Disease Clinic.

Four abstracts from the American Bee Research Consortium (ABRC) highlights recent studies

Published as an entire symposium in *Bee World*, the ABRC helps to bring cutting-edge science to the beekeeping community

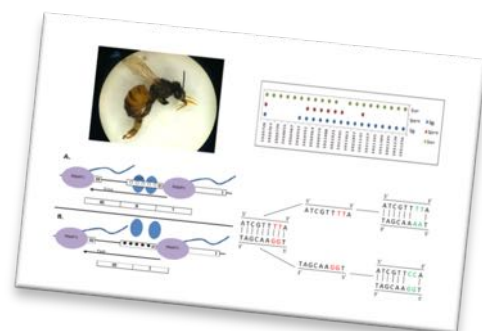
One of the strengths of extension—indeed, it’s main mission—is to serve as a conduit for new scientific information (apiculture research) to the end user community (beekeepers). Every year, the American Association of Professional Apiculturists (AAPA) puts on a research symposium (the ABRC) that is nested within one of the two main national beekeeping conferences (either the ABF or the AHPA). That way, beekeepers and scientists alike are able to mingle, share ideas, and catch up on the latest research.

We had four papers presented at the ABRC, which were recently published as abstracts in *Bee World*. They all focused on very different project in the lab. First, Esmaeil Amiri led a study quantifying the size of eggs laid by the queen, which vary

quite drastically in size (see picture on Page 1). Size difference seem to be a function of the queen’s stock as well as the size of her colony, and as such it may be possible to use egg size as a proxy for queen quality without the need for destructive sampling.

Second, a former postdoc in the lab, Hongmei Li-Byarlay, published her preliminary findings on how the Israeli Acute Paralysis Virus (IAPV) affects bees by looking at what genes are turned on or off during the course of infection. This will help us better understand what genes we may select to make bees resistant to viruses, as well as how bees may be able to physiologically prevent disease.

Third, Brad Metz published his work on the variation in



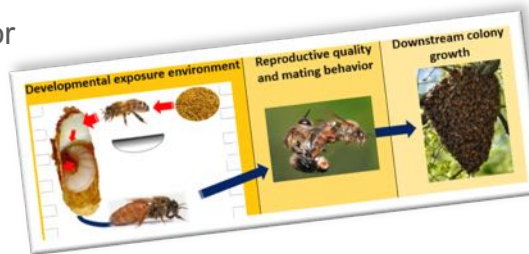
The methylation of the honey bee genome during IAPV infection can lead to uncovering how it makes bees sick.

drone reproductive quality and how different measures change over time. Specifically, there seems to be an optimal age for drone size and sperm count/viability, thus middle-aged drones have a happy medium between being sufficiently large (so that they can fly faster to mate with a queen) and fertile (so that they have enough sperm to inseminate the queen). This

Bee World abstracts (Continued)

study lays the groundwork for us to develop a new service in our Queen & Disease Clinic that quantifies drone reproductive quality as well as queens.

Finally, Joe Milone published his first abstract on his field study from last year. This project was highlighted in the last issue of the *Wolfpack Waggle* as well as the NCSBA *Bee Buzz*, and it has been met with great enthusiasm by both the scientific and beekeeping communities. In short, he tested multiple pesticides simultaneously (and thus was field realistic) to measure their effects on queens and their resultant colonies. It seems that exposure through pollen negatively affects



queen quality directly, whereas exposure through wax has downstream effects on the colony. He is following up on this work this year in several different directions, including taking an *in vitro* approach to rearing larvae.

In all, it is helpful to forge linkages between the research and beekeeping communities so that solutions can be found to current problems. These four abstracts help to bridge that very gap.

NC State Apiculture Program

David Tarp, Professor and Extension Apiculturist
919-515-1660
david_tarp@ncsu.edu

Jennifer Keller, Apiculture Technician
919-513-7703
jjkeller@ncsu.edu

Erin McDermott, Genetics Technician
919-513-3967
eemcderm@ncsu.edu

Sharon Munger, Project Manager
919-513-3967
swmunger@ncsu.edu

Esmail Amiri, NRC Postdoctoral fellow (UNCG)

Dan Charbonneau, Postdoctoral researcher (UPenn)

Brad Metz, Postdoctoral researcher
Daiana De Souza, Postdoctoral researcher

James Withrow, PhD Student (Entomology and Evolution & Ecology)
Joe Milone, PhD Student (Entomology)
Hannan Levenson, MS Student (Entomology and Evolution & Ecology)
Lauren Rusert, MS Student (Entomology)

Undergraduate Researchers

Claire Collins (media intern), Alexandria Fava, Elizabeth de Jongh, Carson Noel, Kimberly Rogers, Olivia Loyack, Nissa Coit (UNC), Jerry Oxendine

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.

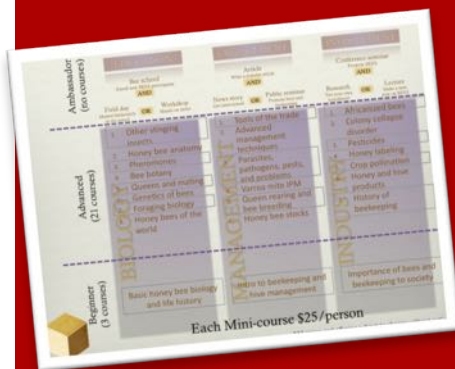


Check out our new website!

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

Simone-Finstrom, M. and D. R. Tarpy. (2018). Honey bee queens do not count mates to assess their mating success. *Journal of Insect Behavior*, **31**: 200-209.

Amiri, E., P. Kryger, M. Miexner, M. K. Strand, D. R. Tarpy, and O. Rueppell. (2018). Quantitative patterns of vertical transmission of deformed wing virus in honey bees. *PLoS ONE*, **13**: e0195283.

de Mattos, I. M., A. E. E. Soares, and D. R. Tarpy. (2018). Mitigating effects of pollen during Paraquat exposure on oxidative stress and pathogen prevalence in *Apis mellifera* L. *Ecotoxicology*, **27**: 32–44.

Presentations

James Withrow presented at (and **Erin McDermott** attended) the Gaston County beekeepers association last month. They were very excited to hear about his work on queens, and we thank them for being such excellent hosts.

David also provided a virtual meeting (through Skype) to the Morris Summerset beekeepers in New Jersey, which was a lot of fun and went off without a hitch. He also provided a research update at the NCSBA Spring Conference, at which Erin and Lauren were also attending.

Welcome aboard!

We are excited to have our very first Artist-In-Residence, **Tess Wiegmann**, who is a freshman in the College of Design. She will not only be involved in our ongoing Virtual Reality beekeeping project, but she will also be using honey bees as an art subject in different ways. Stay tuned!

We also will be bringing on two new students this summer through the BeeMORE internship program. **Nicole Hanselman** (Elmira College) and **Marshae` Cappaninee** (Maryland) will both be studying bees and microbes but in different ways. Nicole will be helping Hannah's project on native bees and their pathogens, while Marshae` will be working alongside Joe on how virus infection interacts with pesticide exposure. Welcome aboard, we look forward to working with you!

Congratulations!

Hannah Levenson won a \$1,500 research award through her co-major Biology degree with a concentration in Evolution & Ecology. With the degree program being so new, this was the first ever awards to be given out, which will very helpful for her project on disease ecology.

James has also been busy getting travel awards to attend the International Union for the Study of Social Insects (IUSSI), which holds its conference in Brazil this year.

Teacher's corner: Courses at NC State

We are not teaching any courses this Spring 2017 semester at NC State, since our distance-education course on 'Honey bee biology and management' is currently on hiatus. We have already reached maximum capacity for our fall offering of ENT 203 course, "An introduction to the honey bee and beekeeping," which reached 180 students in record time during the open enrollment period. We hope this is a continuing sign of the course's popularity and future potential for increased enrollment or even multiple sections.

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



Tarpy's back page

Conducting honey bee research has ups and downs, busy times and super-busy times. When it's called for, as a lab group we often solicit help from others to help when many hands can make light work (e.g., making nucs, extracting honey, building frames, etc...). This year, Dan Charbonneau (a postdoc housed at the University of Pennsylvania but comes to NC State to conduct his field research) is doing an experiment involving observation hives and detailed behavioral observations on nurse bees (specifically, do certain nurse bees preferentially feed queen larvae over worker larvae?). In doing so, he is gluing small numbered colored tags onto the backs of thousands of workers so that he can individually identify them as the colony rears new queens. Hence, an ideal situation for all-hands-on-deck.

We tried something different this year, where instead of asking others in the lab we solicited help from the beekeeping community. At the NCSBA spring meeting, I announced Dan's plans to tag bees and ask for volunteers, hoping that there might be a handful of people willing to lend a hand. Instead, we've had over 50 people enthusiastically volunteer to help with the project, many of whom signed up for multiple sessions! We can't thank everyone enough for being both willing and able, and it has helped the project tremendously.

The positive response has been so exciting, in fact, that we're very much trying to think of future projects or activities where we can offer a similar experience for beekeepers to get engaged in apiculture research. We have also liaised with the MBP committee, and we have agreed that such service will count towards either MBP service credits or a Master-level sub-specialty (if greater than 10 hours). We will continue to provide such experiences as we are able, and we are incredibly thankful and appreciative for those who have helped this first year.

Sincerely, David