

Wolfpack's Waggle

October 2015 Newsletter

NC State Apiculture Program

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



Issue 4, October 2015

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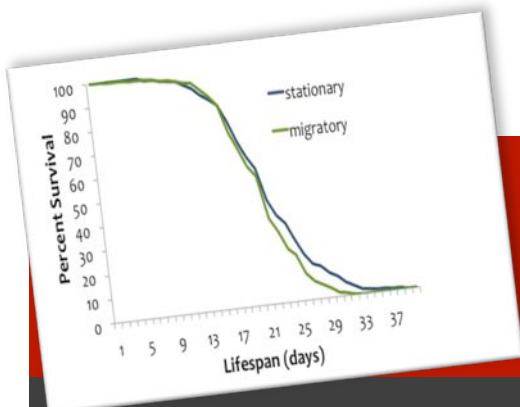
What have we been up to?

After a relatively busy yet quiet summer with little travel, we're starting to gear up for numerous scientific conferences and other presentations. Carl is in his last year of his PhD research, so he is focusing on analyzing and writing up his three chapters (one on worker grooming behavior, one on varroa movement behavior, and one on pollen analysis). James, after a busy summer in the field, is now cranking non-stop on genotyping his samples to see how colonies might preferentially raise certain genotypes as queens. Hongmei has been focusing on writing and analyzing her large bioinformatics datasets, and Margarita is wrapping up numerous projects in the lab in preparation for a temporary hiatus—she is joyously expecting twin girls next February! Igor, our visiting PhD student from Brazil, has also made the very most of his time here, finishing three project (one of which is already written up) and finalizing a third! We're also entering grant-writing season, which of course always keeps us busy.

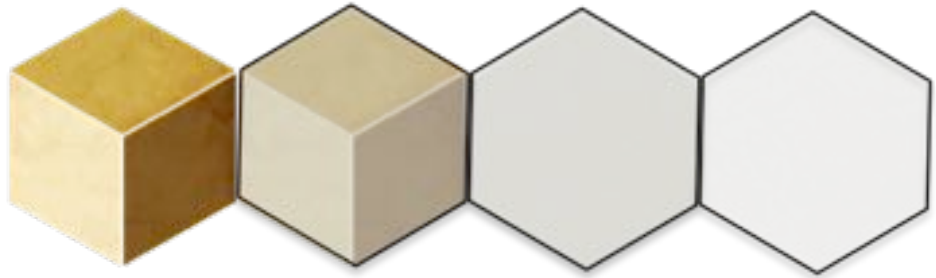
Research collaboration on oxidative stress

Our continuing collaboration with UNCG and the US Army Research Lab is finally starting to pay dividends on understanding the link between oxidative stress, stress resistance, and honey bee survival.

More on Page 3



Beekeeper Education & Engagement System



New developments in the BEES network

DELTA to add 43% overhead for online classes starting Jan. 1 2016

Now that the **BEES** network has moved to DELTA (the distance education division in the University), they will understandably need to recover some of the costs for hosting the Moodle server and the IT support behind it. As such, they will be charging \$10.72 per person per course starting the next calendar year. We will continue to work with them on new price structures and offerings.

Beginner level

- BEES 1.01: Basic honey bee biology and life history (1.66 hours)
- BEES 1.02: Introduction to beekeeping and hive management (1.95 hours)
- BEES 1.03: Importance of bees and beekeeping to society (1.71 hours)

Advanced level

- BEES 2.01.02: Honey bee anatomy
- BEES 2.01.05: Queens and mating
- BEES 2.01.07: Foraging biology
- BEES 2.02.03: Pathogens, parasites, pests, and problems
- BEES 2.02.04: Varroa mite IPM
- BEES 2.02.05: Queen rearing and bee breeding
- BEES 2.03.01: Africanized bees
- BEES 2.03.07: History of beekeeping

Sign up today @:

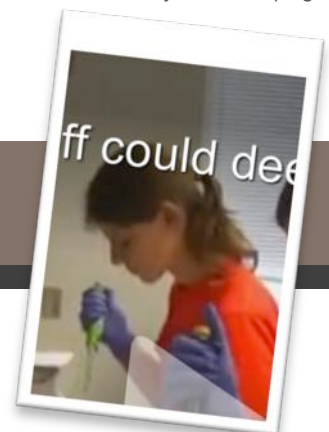
<http://go.ncsu.edu/BEES>

Lab spotlight: Jennifer Fulp

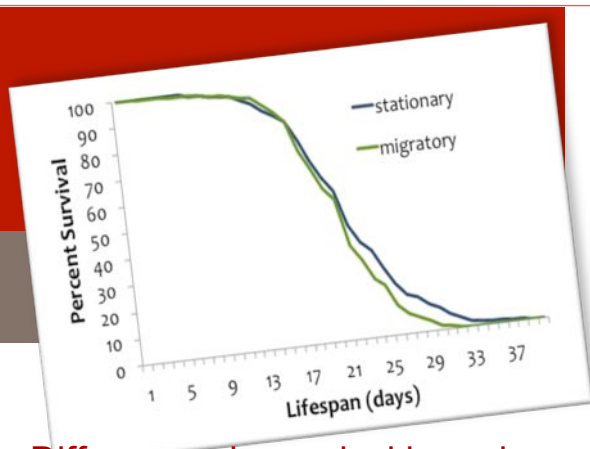
Jennifer Fulp has been an undergraduate researcher in the lab for several years now, and she has become an invaluable contributor to several projects. With plans to go to vet school when she graduates, she started out helping with our Bee Informed Partnership virus screenings, but she has

since moved onto other projects.

Last spring, she secured her own funding through the Undergraduate Research Office to study the effects of genetic diversity on bee immune responses. These data are currently being written up for publication.



Jennifer has really flourished in the lab these past two years, which belies her quiet and humble personality, but we are all really proud of her and her accomplishments!



Differences in survival based on worker rearing- and hive environments give insights into stress tolerance.

For the past 5 years, we have been funded by a \$410,631 grant through the Army Research Office, the basic-science arm of the DOD. While this grant at NCSU is now over, we are incredibly fortunate to have the project renewed at UNC Greensboro for \$400,000 for another 4 years. Along with Drs. **Olav Rueppell** (UNCG) and **Mimi Strand** (USARO), we have developed a strong research team, the fruits of which are just now starting to pay off.

The importance of this research paradigm cannot really be understated. Like all animals, bees are subject to environmental stress, and some are better at withstanding those stressors while others are worse. If we can understand why certain bees are tolerant of stress, we may be able to improve their longevity and therefore capacity to withstand such stresses.

When the project first started, we hired Dr. **Mike Simone-Finstrom** (see below) as a Postdoctoral Researcher to spearhead the research. During the first year, he conducted a large project looking at variation within colonies of oxidative stress resistance. In doing so, he monitored individual workers throughout their entire lifetimes in

observation hives, measuring them for different behaviors (e.g., age at first foraging) and physiological factors (e.g., oxidative damage). He then genotyped the bees to see if there were any differences among the genetic patriline within the colonies in an effort to see if there were any specific genetic groups that are more tolerant of stress.

The following year, Mike and Jennifer conducted a huge field project investigating how migratory stress affected their physiological stress and oxidative damage. They compared commercial hives, migrating hives (those that we moved to different agricultural fields every 3 weeks), and stationary hives (those that remained on our Lake Wheeler apiaries). In doing so, we have been able to make inferences about the effects of rearing environment, adult environment, chronological age, and migration treatment that will undoubtedly provide important insights into how hive movement affects bee health.

In the third year, Mike secured his own USDA Fellowship and thus transitioned to different research,

The genetic architecture of oxidative stress and aging in honey bees

With an average lifespan of ~6 weeks for a typical worker, understanding how bees can mitigate aging and thus increase their lifespan by only a few days could have significant ramifications for colony productivity and survival.

although has remained a valued collaborator ever since. In his place, we brought on Dr. **Ming Huang** to spearhead the research effort, and he quickly took the project in another direction. His main project tested drones, not workers, as a proxy to understanding induced stress



Dr. Olav Rueppell (UNCG) and **Dr. Mimi Strand** (US Army Research Lab, not pictured by request) have been fantastic collaborators on this project for the past 5 years. Funded for another 4 years through UNCG, we hope to continue our positive momentum and productivity.

Oxidative stress and aging (continued)

(injection with paraquat) on longevity. Testing drones that died quickly (stress susceptible) to those that survived a long time (stress tolerant) is giving insights to the genetic basis of resistance.

Ming wasn't in the lab very long, however, as he quickly secured a job at Eurofins Scientific, so we brought on board Dr. **Hongmei Li-Byarlay** to continue the work. She is a widely recognized expert in molecular biology, and she and her undergraduate assistants have been analyzing these and other samples. One of the other main stressors that she has been working on is IAPV, an important bee virus, and how this stress can change the bee physiology and genetic machinery. Hongmei is on her own NRC Fellowship and thus will continue on these projects going forward.

The new iteration of the project will be taking place at Greensboro, where we will be joined this upcoming January by Dr. **Esmail Amiri**. He will add to our collaborative team by testing the important stressors identified in the

previous work and drilling down so that we can further understand the mechanisms behind them.

As with many scientific endeavors, the time between conducting the research and the publication of results can be many years. As such, we are just now analyzing, writing, and submitting the first manuscripts from this research paradigm. We anticipate that our patience will be rewarded with some important insights into how bees can reduce stress and oxidative damage.



Mike inspecting migratory colonies to measure oxidative stress.

NC State Apiculture Program

David Tarpy, Professor and Extension Apiculturist
919-515-1660
david_tarpy@ncsu.edu

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

Deniz Chen, Clinic Technician
919-513-6732
deniz.m.chen@gmail.com

Hongmei Li-Byarlay, NRC Postdoctoral Fellow
[Margarita Lopez-Uribe](#), NSF Postdoctoral Fellow

Carl Giuffre, PhD Student (Biomathematics)
James Withrow, MS Student (Entomology)

Undergraduate Researchers
Sam Freeze, Jennifer Fulp, Jason Brannock, Cameron Johnson, Omar Halawani, Andrea Fitzgerald, Hannah Levenson

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

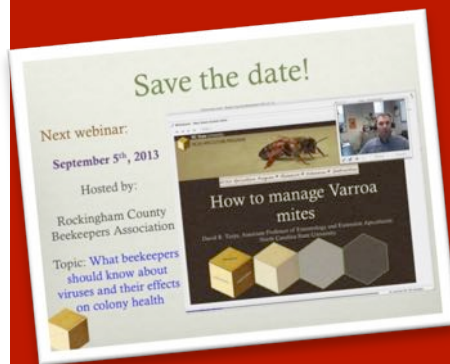
Make an estate gift – If you are interested in planning an estate gift to benefit Apiculture, please let us know! We can provide you with the tools you and your attorney will need to ensure that your wishes are fulfilled. Please click the link above for more information.



Pollinator Conference in WNC

We've just returned from an excellent conference about Pollinators in Ornamental Landscapes, co-organized by Michigan State and our NCSU collaborators Drs. Elsa Youngsteadt and Steve Frank. Fantastic speakers, great crowd, and lots of interesting information.

[LINK](#)



Latest webinar

Our last Apiculture Webinar was about some of our research on feral and managed bees in urban and rural landscapes. Kindly hosted by the Surry County Beekeepers Association, we discussed some of our recent publications and soon-to-be published data about bee health, management, immunology, and genetics.

Random notes

New publications

Seeley, T. D., D. R. Tapy, S. R. Griffin, A. Carcione, and D. A. Delaney. (2015). A survivor population of wild colonies of European honeybees in the northeastern United States: investigating its genetic structure. *Apidologie*, **46**: 654–666 .



Welcome aboard!

We have been joined by a new undergraduate researcher this fall semester, **Hannah Levenson**. Hannah worked for Smithers Vincent all summer doing tons of beekeeping field work, so she wanted to keep her hand in honey bee research. She has been working with Deniz on queen and sample processing for the Queen & Disease Clinic.

...and sadly missed

It is bittersweet to say that **Mike Simone-Finstrom** has recently departed our lab for far greener pastures. Mike is the longest tenured member of the Tapy lab (besides Jennifer and David, of course), having been a postdoc in our lab for over 4 years. However, Mike's hard work, talents, and patience has well-paid off, as he has started a new Senior Researcher position (equivalent of an Associate Professor) at the USDA Bee Breeding lab in Baton Rouge, LA. This lab has a storied history in honey bee genetics and breeding, bring us (among many

other things) the Russian and VSH stocks. We can't thank you enough, Mike, for being such a tremendous colleague and collaborator these past several years, and you will be greatly missed.

Bee Informed Partnership update

We're now in our last year of our 5-year, \$5M USDA grant to support the BIP. While the annual and management surveys, tech transfer teams, and emergency response kits (ERKs) are the core of the initiative, our relatively minor component is to subsample the commercial bees and screen them for 7 economically important viruses. Ever since Margie Gurganus departed us this past August, we have been searching for her replacement. It has been slow and difficult, however, because of the uncertainty of further support. We will endeavor to continue, however, even though processing has been significantly slower than usual.

Teacher's corner: Courses at NC State

Our current offering of ENT 203 "An Introduction to the Honey Bee and Beekeeping" is going well. Enrollment is once again at capacity (180 students), and the TAs (Sarah Parsons and our own James Withrow) have been terrific in working with the students, largely non-science majors. This is the first year in recent memory where we had to outright cancel the annual swarm demonstration because of weather! We're through the first unit on honey bee biology, so we're starting honey bee management then cover honey bees and society in the final two units.

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



Tarpy's back page

October in North Carolina is synonymous with the State Fair, which is currently underway. Every year, the NCDA&CS Apiary Inspectors do a fantastic job coordinating what is arguably the year's most important public-educational event about bees and beekeeping. Of course, the state beekeepers and their local clubs, NC State undergraduate students, and other volunteers are all critical in interfacing with fairgoers.

When I first started 12 years ago, the NCSBA displays were fairly few, antiquated, and recycled year after year, which I believe reflected poorly on beekeeping and the vigor of the state's beekeeping community. This year sets a new watermark, in my opinion, with 8 high-quality, newly constructed, and informative display booths by local NCSBA chapters. These displays do an excellent job of engaging and educating the public about how important and fascinating honey bees are, which reflects well on the association and our apiculture community.

State Apiarist Don Hopkins and the entire group of apiary inspectors have also stepped up their game, with ever-improving displays, the live bee demo in the "bee cage" with video feed, and local honey sales from all across the state coordinated by the NCSBA that has become an important fund-raising initiative for the association.

North Carolina has more beekeepers than any other state per capita, and this thriving community should and is reflected in the quality of our biggest celebration of agriculture in the state. The many people working so hard behind the scenes deserve our compliments and thanks!

Sincerely, David