

# Wolfpack's Waggle



July 2014 Newsletter

NC State Apiculture Program

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

Issue 3, July 2014



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## What have we been up to?

This summer has been quite intense so far, but much more relaxed than last year at this time! We were quite over-extended last year, as we were short on colonies for research which only compounded the stress. This year, we got a late start because of weather and the design of the various studies, so our bees were able to build up nice and strong during the main nectar flow in April. We should do that every year! The result has been our overwintered colonies making strong queen-rearing colonies, and our newly established colonies being healthy and productive. This has made research on *in vitro* queen rearing, mite video tracking, urban pollination ecology, and queen competition a lot easier than in years past. We're also getting the Queen & Disease Clinic up and running on campus, and we already have several beekeepers who have taken advantage of the high-throughput techniques of measuring sperm viability and viruses. The fall semester will be here before you know it, though, so we want to make sure we capitalize on our momentum!

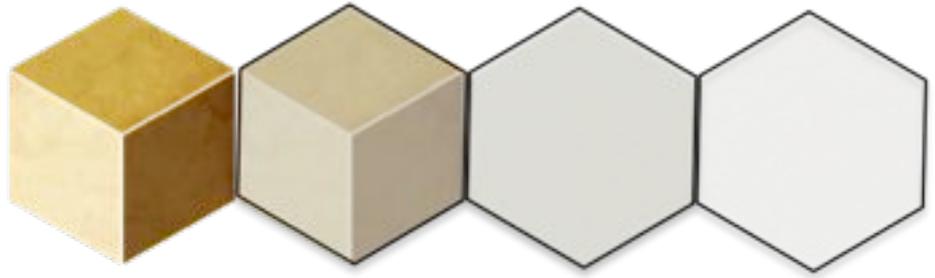


## New funding for effects of urbanization on bees

This was an internal grant from the highly competitive Dean's Enhancement fund, and helps to build on a terrific collaboration with Steve Frank and Rob Dunn's labs on how urban environments might affect bee health.

More on Page 3

# Beekeeper Education & Engagement System



## New developments in the BEES network

Streamlined enrollment! Now you can automatically sign up and gain immediate access to any of our online beekeeping courses.

The **BEES** network is a new online resource for beekeepers at all levels. The system is entirely internet based and aims to foster an online learning community among beekeepers. The structure of the **BEES** network is broken into three ascending levels of difficulty (Beginner, Advanced, and Ambassador) and three general areas of content (honey bee biology, honey bee management, and the honey bee industry).

### 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: Mark Jandricic

We're happy to now have Mark Jandricic, the Queen & Disease Clinic technician, on board full-time. Mark only recently joined the program this past winter, and he has quickly launched the clinic and streamlined the working logistics so that we can really crank through samples at a rapid pace.

Mark is a native of Canada and has come to us most recently from Cornell University where he was a technician in several productive labs. Mark's unrivaled ability for databases and code has been a huge asset for both the clinic and the BIP viral database as well.

Mark also helps out several other research projects and serves as the essential IT go-to person in the lab. Needless to say, he has quickly established himself as the mortar that helps keep the lab up and running!



# New grant on urbanization and bees

We recently secured a new grant from the NCSU Dean's Enhancement Grant titled "Impacts of global climate change on bees: how urbanization and management practices affect pollinator immunology and disease ecology," which will capitalize on some of our previous work on urbanization and honey bee physiology.



Foraging bees in the urban environment

Urbanization is one of the greatest forces of environmental change affecting the world today and is seen as a driving force of climate change. By 2050, 67% of the world's population will live in urban settings. The ecological impact of urbanization on urban fauna, the world environment, and the surrounding regions used to provision urban centers, demand investigation. The impact of urbanization on ecosystem services such as pollination requires particular attention in order to sustain world populations.

Bees are the most important pollinators of agricultural and native plant species, and they contribute ~\$20 billion to the United States economy alone. All bees—both social and solitary species—are affected by many parasites and diseases that reduce their survival and pollination efficiency. Urbanization may worsen these diseases by increasing bee stress, exposure to pollutants, and reducing resource concentration or quality. Surprisingly, we know little about how biotic and abiotic urban stressors affect bee health. With the

fear of Colony Collapse Disorder reaching the general public and the potential devastating environmental and economic impacts it is causing, factors affecting bee health must be identified.

This multidisciplinary project involves a fantastic collaboration among three different labs: our Apiculture program, Dr. Steve Frank's applied ecology and ornamental IPM program, and Dr. Rob Dunn's broad-sweeping program ranging from quantifying the insects in our backyard to conservation biology. This research integrates Research and Academic objectives conducted by faculty from Entomology (Tarpy and-PI Frank) and Biology (Dunn) who have multidisciplinary expertise in arthropod pests, urbanization, and climate change (Frank and Dunn) bee health, management, and physiology (Tarpy), teaching (Tarpy, Dunn), and outreach to professionals and the general public (Tarpy, Frank, Dunn).

The objective of this research will be to determine how urbanization affects pollinator (bee) health. In

order to create a comprehensive view of this system, we will investigate the immunocompetency of bees from the sub-organismal to the population level. To accomplish this, three separate lines of inquiry will be followed.

*Objective 1: Identify how urbanization and management practices affect individual honey bee immune response;*

*Objective 2: Describe the effects of urbanization on disease incidence*



Photo by Hannah Burrack

**How might urbanization affect bee health? This study will start unraveling this important question by investigating the mechanisms of immunity and disease.**

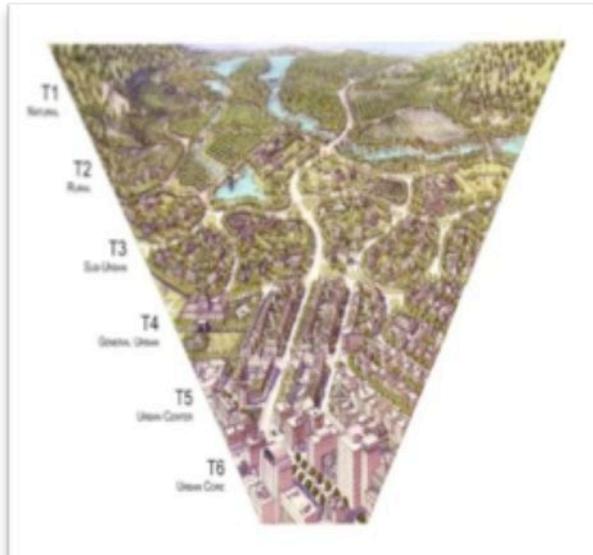
## NCSU Swarm Collective (Continued)

and prevalence in honey bee individuals and colonies;

*Objective 3: Determine how sociality (colonial vs. solitary) alters the effects of urbanization on individual bee health.*

**Holden Appler** is just finishing his MS degree studying some of these very aspects of feral and managed honey bees. We are extremely fortunate to now also be joined by **Dr. Margarita Lopez-Uribe**, a postdoctoral researcher who recently completed her Ph.D. at Cornell University in Bryan Danforth's lab. Margarita brings with her a tremendous background in native bee ecology and population genetics

that she will apply to this system. She is already getting up to speed on collecting bees in and around the Raleigh area, so we expect great things to come!



**Transect of urbanization.** We will sample both native and honey bee colonies across urban (T5), suburban (T3), rural or agro-ecosystems (T2), and natural areas (T1) to determine any effects of urban sprawl and human encroachment on bee disease and physiological stress. We will also compare solitary and social species to see if 'social immunity' plays a significant role in buffering the negative impacts of urbanization. ([source](#))

### NC State Apiculture Program

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Holden Appler, MS Student (co-advisor, [Steve Frank](#))  
James Withrow, MS Student

Undergraduate Researchers  
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## 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.

## Random notes

### New publications

Rogers, S., D. R. Tarpy, and H. J. Burrack. (2014). Bee diversity and pollinator dynamics affect agroecosystem services. *PLoS ONE*, **9**(5): e97307. doi:10.1371/journal.pone.0097307

Tarpy, D. R., M. Simone-Finstrom, M. Huang, M. Strand, and O. Rueppell. (2014). Effects of migratory beekeeping on longevity and oxidative stress. *American Bee Journal*, **154**: 453.

### Welcome aboard...

In addition to Dr. **Margarita Lopez-Uribe** (see page 3), we have been joined by a new postdoctoral fellow in our lab, Dr. **Hongmei Li-Byarlay**, who will be spearheading the joint project with Olav Rueppell and Mimi Strand on the genetic architecture oxidative stress. She comes to us most recently from Gene Robinson's lab at the University of Illinois, and her excellent reputation in the field precedes her.

We are also joined this summer by **James Withrow**, a new MS student who hopes to continue on for his Ph.D. James received his undergraduate degree from Gardner-Webb University and is interested in studying social behavior of bees.

### ...and sadly missed

We bid adieu to **Megan Walz**, who was an undergraduate

researcher who worked with us for almost 3 years. In doing so, she secured a grant to do her own research, which will likely result in a very impactful publication on in vitro reared larvae and AFB inoculation. She landed an excellent job at Syngenta now that she graduated. Congratulations, Megan, and we'll miss you in the lab!

### Summer visitors

We are privileged to be working with several collaborators this summer on a variety of projects. First, we were joined on July 15 by Dr. **Daiana De Souza**, a postdoctoral researcher from Brazil in Klaus Hartfelder's lab. We were able to secure some travel monies for her to come here for the summer and work on her area of expertise, the reproductive quality of queens.

Second, we have been working with five undergraduate fellows in the BioMath program (**Jason Brannock, Paulina Spencer, Ben Hamm, Jamal Moss, and Brinkley Raynor**). They have each earned a coveted research position in the Research Experience for Undergraduates (REU) program, funded by the NSF through the BioMath program. They are working in two teams, one spearheaded by **Carl Giuffre** on the movement models of varroa mites, and one headed by **Mike Simone-Finstrom** on automatically quantifying queen quality from digital images after rearing them in vitro.



Photo by Alex Wild

### Queen & Disease Clinic now open!

We're extremely excited to offer a new fee-based service to the beekeeping community. Send us your queens—good or bad—and we will be able to accurately quantify their sperm viability and sperm counts within a matter of days. We can also analyze entire colonies for virus levels, Nosema, and Africanization using genetic techniques.

[LINK](#)



Photo by Hannah Burrack

### Tarpy lab in the news

Lab alumna Shelley Rogers, along with collaborator and applied insect ecologist extraordinaire Dr. Hannah Burrack, recently published the third of four papers from her thesis in *PLoS ONE*, the findings of which have been making quite a splash. "Species complementarity" seems to be quite critical for optimizing pollination and crop yields, demonstrating that community diversity is key.

[LINK](#)

## Teacher's corner: Courses at NC State

We did not offer any courses during the Spring 2014 semester, but enrollment is now open for ENT 203 "An Introduction to the Honey Bee and Beekeeping" for the Fall 2014 semester. Aimed at non-science majors, we not only cover the interesting aspects of honey bee biology and beekeeping, we also delve into honey bees in art and literature, mythology and religion, even politics and warfare! Enrollment is capped at 180 student with a wait-list of 20, and both are already full.

*Next semester: ENT 203*

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



## Tarpy's back page

I'm not entirely sure how it happened, but we now have over 20 people in the lab! We have always been a fairly small operation, but recently we've been blessed with funding and attracting some real top-notch scientists at all levels.

As I am just returning from the NC State Beekeepers summer meeting, I am struck by how much has changed over the last 11 years that I have been here. At first, our focus was on getting to know the beekeepers in the state, continue our ongoing work on intracolony genetic diversity, and equip the lab with all of the tools and equipment we'd need to continue going forward. I would not have imagined at that time that we'd be engaged in several projects on pollination or rearing queens in the incubator to maturity! These changing directions, however, are a culmination of systemic changes in the Entomology Department and the College of Agriculture & Life Science, and we have therefore capitalized on this ever-evolving environment. This new normal has made breadth a premium so that we can be opportunistic and capitalize on new opportunities.

We have a large group, yes, but more importantly we have a wide assortment of different people working on wildly different projects. But like a honey bee colony, there is strength in numbers and there is value in diversity, thus I sense we are poised to continue the positive momentum we have generated.

Sincerely, David