NC STATE UNIVERSITY

July 2016

# Wolfpack's Waggle

## July 2016 Newsletter

## NC State Apiculture Program

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

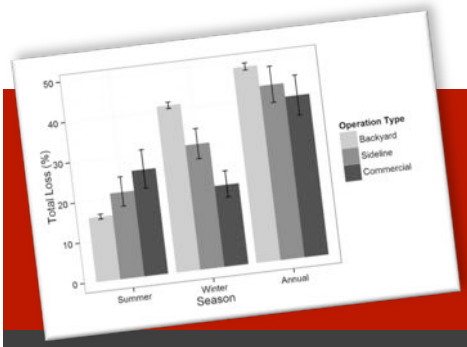
Issue 3, July 2016

## More inside



## What have we been up to?

There has been a huge turnover in our program these last few months, which is always a good thing! Most excitingly, Margarita has accepted her job offer from Penn State and will be starting her tenure-track faculty position there later on this year, congratulations Margarita! We've also had many of our undergraduate researchers either graduate or move on, so thanks also to Sam Freeze, Jennifer Fulp, Cameron Johnson, Omar Halawani, Jackie Fitzgerald, Joli Stavish, Allison Fowler, and Andrea Fitzgerald. Fortunately, we've been joined by a new grad student Joe Milone, an NCSU undergrad research Christopher Juberg, and a visiting undergrad from the University of Exeter (UK) Viki Blanchard, so welcome aboard! We've been keeping busy during this active field season collecting data on several projects, including the in vivo and in vitro rearing of queens. Deniz has been particularly busy in the Queen & Disease Clinic this year with samples from all over the country, so we hope that bodes well for increased traffic of samples going forward.

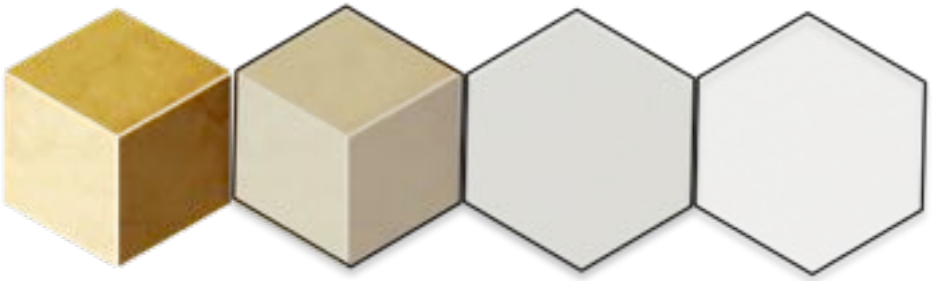



## Analysis of the latest annual loss survey

The Bee Informed Partnership has published its latest survey results on colony losses. It seems the more things change, the more they stay the same…

More on Page 3

Beekeeper Education & Engagement System



# New developments in the BEES network

## Course enrollment predictably lower with increased overhead costs

The BEES network has officially moved has moved to DELTA as of January 1, 2016, and is now including a 43% overhead on each person for each course. Perhaps predictably, this has resulted in a significant decrease in enrollment for the first half of the year: we're down 41.2% from the same period last year. We hope this trend does not continue and that enrollment will rebound later this year.

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)

**Sign up today @:**

http://go.ncsu.edu/BEES

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

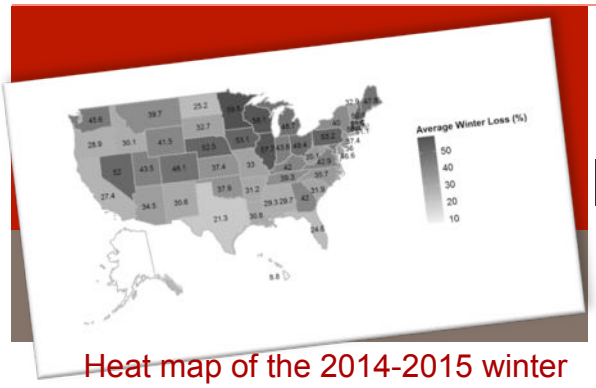
BEES 2.03.07: History of beekeeping

## Lab spotlight: Parry Kietzman

Last fall we were joined by **Dr. Parry MacDonald Kietzman**, a postdoctoral researcher who recently received her Ph.D. from the University of California at Riverside.

Parry did her graduate work with Kirk Visscher on the regulation of foraging by honey bee colonies. Specifically, she is one of the world's experts on the 'stop signal', in essence the negative feedback counterpart to the waggle dance for recruitment. Her work has helped to understanding the regulation of foraging at the colony level.

Parry's work here at NC State has been to take the lead on the BIP analysis of ~2,500 virus samples that we've been processing for the last 5 years. We hope to mine this huge database for insights into how viruses affect bee health. Welcome!




Heat map of the 2014-2015 winter losses across the US. Darker states showed higher colony mortality than lighter states, with NC being 35.7%.

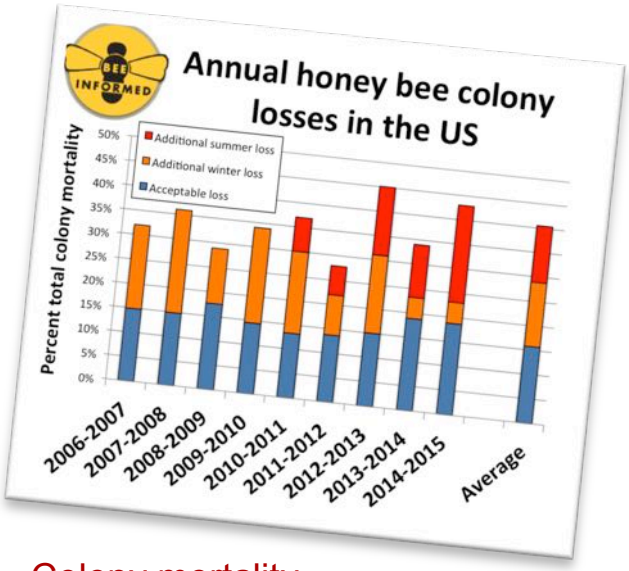
# BIP winter-loss survey shows last winter to have high losses (which is now normal)

Our latest paper with the Bee Informed Partnership demonstrates that the high summer- and winter losses of honey bee colonies throughout the US continues, with little evidence of major patterns or predictors.

In *Groundhog Day*, Bill Murray's character (Phil Connors) is a misanthropic TV weatherman who relives the same day *ad infinitum* while covering whether or not Punxsutawney Phil (the infamous groundhog in Western PA) sees his own shadow. Sometimes I feel like the reports about our managed honey bee population is stuck in a similar loop…

The Bee Informed Partnership recently published its latest survey results, and in many ways they aren't too different from past years. Average losses were 14.7% over the summer, 43.7% over the winter, and 49.0% over the entire year. This isn't all too different from the running average totals since 2006 (see Figure), with some years being higher than others but none being within the range that beekeepers deem acceptable.

As usual, there are a lot of data in these reports, so some things that really stood out this year were that summer losses were much higher in commercial beekeeping operations and winter losses were much higher in backyard or hobbyist operations.




Colony mortality has remained fairly consistent since 2006 at ~30% and always above what beekeepers report as "acceptable losses." Recent surveys have included summer as well as winter losses, which is more reflective of the population dynamics.

While there is power and utility in looking deeply into the results for any given year, there is also tremendous value to look across time to see if there are any trends among years. While there does not seem to be any evidence that things are getting better or worse in terms of colony losses, there are some interesting trends that have emerged since 2006 as to what beekeepers are attributing to the causes of their losses (see Figure page 4).

In particular, the top-ranked issues that beekeepers have been facing over the last decade have consistently been related to environmental factors and management practices; starvation is a function of local forage availability, 'weak in fall' can be addressed by colony manipulation, and weather is just that. Interestingly, 'queen

## Annual losses (Continued)

failure' ranks above all disease-related issues—significantly higher than parasitic *Varroa* mites, Colony Collapse Disorder (CCD), nosema, and even pesticides. For this reason, our research has been focusing on improving queen reproductive quality in an effort to mitigate queen problems and therefore improving colony productivity and fitness.

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Avg. |
|---|---|---|---|---|---|---|---|
| Starvation | 37% | 59% | 39% | 31% | 30% | 36% | 37% |
| Weak in fall | 11% | 24% | 34% | 34% | 32% | 33% | 28% |
| Weather | 16% | 52% | 31% | 10% | 18% | 46% | 26% |
| Queen failure | 20% | 17% | 24% | 32% | 26% | 19% | 24% |
| Varroa | 15% | 21% | 20% | 17% | 23% | 17% | 20% |
| CCD | 6% | 8% | 7% | 9% | 11% | 7% | 8% |
| Nosema | 7% | 7% | 12% | 6% | 6% | 5% | 7% |
| Pesticides | 4% | 5% | 5% | 7% | 8% | 7% | 6% |
| SHB | - | - | 4% | 4% | 6% | 5% | 5% |
| No. beekeepers | 571 | 1587 | 2682 | 2887 | 4681 | 4903 | |
| Reference | vanEngelsdorp (2010). *JAR* | vanEngelsdorp (2011). *JAR* | vanEngelsdorp (2012). *JAR* | Spleen et al. (2012). *JAR* | Steinhauer et al. (2014). *JAR* | Lee et al. (2015). *Apidologie* | |

Results from the Bee Informed Partnership surveys, ranking the most common causes of honey bee colony mortality. 'Queen failure' ranks higher than any specific disease or parasite, making means to mitigate queen loss a top priority for the apiculture industry.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Carl Giuffre, PhD Student (Biomathematics)
James Withrow, MS Student (Entomology)
Joe Milone, MS Student

Research technicians
Erin McDermott
Hannah Levenson

Undergraduate Researchers
Claire Collins (media intern), Brooke Ganser, Christopher Juberg, Victoria Blanchard (UK exchange student)


## Support the NC State Apiculture Program!

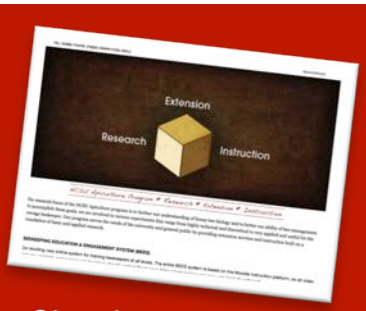
*The Apiculture Science fund-raising efforts operate under the auspices of the North Carolina Agricultural Foundation, Inc. a 501(c)3 organization. You will receive an official receipt for your donation.*

MAKE A 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 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!

In conjunction with our department merger, we decided to update and move our program's website, which is now located at http://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. Be sure to update your bookmarks!

## Hongmei's new sequencer

Dr. Li-Byarlay came in second in a national competition hosted by Illumina, the biotechnology company that makes (among other things) high-throughput and high capacity DNA sequencers. Hongmei received her very own miniseq machine, which is a huge coup! This will be a great help to her research on honey bee diseases and new approaches to mitigate them.

# Random notes

### Recent publications

Rangel, J., K. Böröczky, C. Schal, and D. R. Tarpy. (2016). Honey bee (*Apis mellifera*) queen reproductive potential affects queen mandibular gland pheromone composition and worker retinue response. *PLoS ONE*, **11**: e0156027.

Rangel, J. and D. R. Tarpy. (2016). In-hive miticides and their effect on queen supersedure and colony growth in the honey bee (*Apis mellifera*). *Journal of Environmental & Analytical Toxicology*, **6**: 377. doi:10.4172/2161-0525.1000377.

Seitz et al. (2016). A national survey of managed honey bee 2014 - 2015 annual colony losses in the USA. *Journal of Apicultural Research*, **54**: 292–304.

Penick C. A., C. A. Crofton, R. H. Appler, S. D. Frank, R. R. Dunn, and D. R. Tarpy. (2016). The contribution of human foods to honey bee diets in a mid-sized metropolis. *Journal of Urban Ecology*, **2016**: 1-5. DOI: 10.1093/jue/juw001

### Welcome aboard!

We were joined by several new members in the past few months. First, **Christopher Juberg** joined our team to assist with the processing of BIP samples under the guidance of Parry and Erin, and we've been impressed at how quickly he's been able to get up to speed on the qPCR techniques. Second, we were lucky to recruit **Joe Milone** to our lab as an incoming MS student. Joe graduated from Elon University and worked, among other interesting places, Smithers Vincent in Snow Camp where he gained a lot of experience in honey bee field work. Joe is eager to get started and thus joined us a summer early, and while his project is not yet set in stone it will likely be centered around queen reproductive potential and external factors that influence it. Third, we are excited to host **Victoria Blanchard** for the next year. Viki is doing the equivalent of her junior year abroad from the University of Exeter in the UK, where she has been an undergrad researcher in James Cresswell's lab (one of the most prominent pollination ecologists in Europe). While she's here for the next year, she will be shadowing Hannah on her pollination genetics project and picking up new skills and techniques in the genetics lab to bring back with her to England. Welcome to the three of you!

### …and sadly missed.

Two of the longest serving members of the Tarpy lab, **Sam Freeze** and **Jennifer Fulp**, were undergraduate researchers who graduated this spring. Sam had been with us since he was a freshman, and Jennifer soon thereafter. Sam has worked almost exclusively out at the bee lab with Jen all these years, and Jennifer has worked on various genetics projects (including one of her own funded by an undergraduate research grant). As they go off to greener pastures (Sam to work as a bat biologist for a private consulting firm, and Jennifer to NCSU Vet school), please accept our heartfelt thanks from all of us!

Also former undergraduates who recently moved on included **Cameron Johnson, Omar Halawani, Jackie Fitzgerald, Joli Stavish, Allison Fowler, and Andrea Fitzgerald**. Thanks to you all for your hard work!

# Teacher's corner:
# Courses at NC State

This upcoming fall semester, our ENT 203 course, "An introduction to the honey bee and beekeeping", has regained traction and quickly hit the maximum enrollment of 180 students. It will be TA'd by Joe Milone for the first time, and James Withrow will assist for the third straight year. This summer we have updated much of the content to make it more timely and relevant, and we look forward to what will surely be another successful and fun semester!

http://go.ncsu.edu/honeybees

## Tarpy's back page

As you may or may not have heard, South Carolina recently had an incident with Africanized honey bees (AHB) earlier this year. While so much attention has been paid to CCD, varroa, pesticides, and many other threats to honey bees (and rightly so), we tend to have neglected the ever-looming threat of this long-time scourge, but I think we do so in NC at our own peril.

The incident in Charleston, SC still remains ambiguous. The first reports came out that they were AHB, but a follow-up press release said that they tested as negative. While this may sound conflicting, both may be right! Remember that it can be fairly fuzzy to define or distinguish EHB from AHB, but in general there are two ways to do so. First, officials can use morphometrics (careful measurement of body parts). There is a "quick" means to do so (called FABIS, which stands for the fast-Africanized bee identification system) that simply measures wing lengths (AHB are slightly smaller, on average), and there is a "comprehensive" means to do so (called USDA-ID, that measures dozens of body parts simultaneously). Second, officials can use genetic techniques to distinguish EHB from AHB, typically testing the mitochondrial DNA inherited through the maternal line. Thus it is quite plausible that a given sample may test both positive for AHB (e.g., smaller wing lengths) and negative for AHB (e.g., European mitochondria).

The incident in South Carolina should remind us about the potential consequences of AHB being found in North Carolina: all of the public good will and positive perception about bees engendered by their plight will likely be all for naught once any and all bees are deemed "killer bees." Thus we should remain vigilant, proactive, and ready for any change in the beekeeping landscape when it comes to the AHB so that we can minimize their impact when (not if) they arrive.

Sincerely, David

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