BEE NEWS & VIEWS

The Mississippi Beekeepers Association Newsletter

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July-August 2016

MBA Annual Convention

By Austin Smith

The annual convention of the Mississippi Beekeepers Association (MBA) will be held on November 4-5, 2016. It will be held at Ramada Airport Convention Center, 9415 Highway 49, Gulfport, MS 39503 (ph. 228-868-8200). The room rate is $67.19 per, which includes taxes.

We are still working on the program, but speakers will include scientists from the USDA, ARS Honey Bee Lab in Baton Rouge, Jennifer Berry for the University of Georgia, Carl Webb from Georgia, Dan Conlon, a member of the Russian Honey Bee Breeders Association. Local speakers will include Milton Henderson, the MSU Apiculture program staff and other MBA members. Registration forms for MBA membership and for the annual conference have been attached to this email. They should be completed and returned by October 21, 2016. For beginners and hobby beekeepers, please note that special workshop sessions will be ongoing on Friday afternoon and all day on Saturday.

If you would like to bring a door prize, feel free to do so and note it on your pre-registration form. Just report it at the registration desk as you arrive on Friday. Giving away door prizes is a way to spice up a meeting. We also seek items that could be used in a silent auction. We encourage you to bring items for the silent auction related to beekeeping (even ones you no longer use but are still in good condition), crafts (paintings, stitch work, etc.), tools (every beekeeper needs tools in the shop), or other interesting/ unique items. Silent auction items should be brought in no later than Saturday, Nov. 5 @ 8AM.

Please contact Joe Scott [phone: 228.669.8336 or email: elevenoaks58@cableone.net] if you wish to mail your donated items for either the silent auction or for door prizes. His mailing address (where to send door prize donations) is: 23416 Meaut Road, Pass Christian, MS 39571. Thanks for your time and support of beekeeping in Mississippi, and I look forward to seeing you in November.

The schedule for the convention will be similar to last year. We will hold a Board of Directors meeting on Friday morning (TBA). Afterwards, the convention will begin Friday at noon and continue until 5:30 PM. The banquet dinner will begin at 6:30 PM, and there will be some entertainment from a local performer during the meal. We will resume the convention on Saturday morning at 8:00 AM, and it will end at 5:00 PM on Saturday. The MBA business meeting will immediately follow the convention. Jeff Harris is still developing the program for the convention, and when it is completed, he will post it on his website and via email.

Please note that the conference pre-registration fee is $25, and registration at the door will be $35.00. ***Also, we ask everyone to renew their normal MBA memberships in the months of September-October every year. We do not want renewals streaming through the entire year. So, please, just get into the habit of renewing your MBA membership during September through October of each year.***

Additionally, there will be the Honey and Wax Contest. If you would like to participate, please see the rules for entering and judging standards at the MSUCares website:

(https://blogs.msucares.com/honeybees/files/2014/08/JUDGING-STANDARDS.pdf).

We are looking forward to a very fine meeting, and I hope you can join the fun and festivities.

Thermoregulation of the Hive

By Audrey Sheridan & Clarence H. Collison

The internal temperature of a honey bee hive ranges from 31°C in the periphery to 36°C in the brood nest, regardless of ambient environmental conditions. The process by which worker bees maintain a near-constant hive temperature is called 'thermoregulation', and it is crucial to the proper development of larvae to adults.

Capped pupae are especially sensitive to drastic changes in temperature. If the brood area remains below 32°C for too long, there is a high incidence of deformed wings, legs and abdomens, and emerged adults may exhibit neurological and behavioral abnormalities; eggs and larvae in open cells are less sensitive to prolonged drops in temperature. Brood nest temperatures above 36°C for any prolonged period are equally detrimental to brood (Yang et al. 2010). Thus, thermoregulation is a high priority in colonies rearing brood, but more variable in the absence of brood (Stabentheiner et al. 2010).

Summertime thermoregulation is achieved through evaporative cooling. Workers collect water and deposit it in empty cells within the brood chamber, then fan the water vigorously. Water collection is a specialized task, like pollen or nectar foraging, and bees assigned to this task appear to perform only duties related to hive cooling. Kühnholz and Seeley (1997) studied the behavior of water-collectors in honey bee colonies, and reported an increase in the number of water collectors during a heat-stress event. Heat lamps were used to bring brood nest temperatures up to approximately 42.5°C, and the number of water collectors rose slowly but steadily until well after the peak temperature was reached. However, when heat lamps were turned off, water collection dropped abruptly. Water-collecting bees passed their loads off to water-receiving bees at the hive entrance, rather than bringing it inside themselves. Water receivers tended to deposit their water loads in empty cells in the brood nest, smearing it on the sides and ceilings. They also occasionally ventilated the hive.

To the observer, the act of hive cooling is demonstrated by a line of bees stretched across the hive entrance fanning their wings furiously. Within the brood nest, fanning workers form chains facing the same direction to move air over their developing young. The direction in which worker bees circulate air from the hive entrance differs among species of honey bees: *Apis cerana* orients itself head-in-tail-out at the hive entrance and fans cool ambient air into the hive; *Apis mellifera* faces the opposite direction and fans hot air out of the hive.

Yan et al. (2010) attempted to elucidate this difference in interspecific hive cooling by studying the effects of combining the two species into a single colony and comparing their behavior with two pure colonies. Their research looked at the following behaviors in hybrid colonies: 1) whether workers of both species ventilated at the hive entrance; 2) if they fanned with their natural body posture, or adopted the posture of the other species; and 3) whether their ventilation efficiency improved or worsened compared to a single-species colony.

Experimental colonies were established with either an *A. cerana* queen or an *A. mellifera* queen, and both *A. mellifera* and *A. cerana* workers. Pure colonies of each species served as controls. Test hives were fitted with small heaters and brought to an internal temperature of 38°C. At this point the heaters were removed and cooling behavior of the bees was recorded until temperatures returned to normal. In all mixed colonies, each species retained their natural cooling posture at the hive entrance: *A. mellifera*, head out; *A. cerana*, head in. Interestingly, there were significantly more *A. cerana* than *A. mellifera* fanning at the entrance in both types of mixed colonies, regardless of the queen species.

A comparison of control colonies showed that pure *A. cerana* colonies solicited a significantly greater number of entrance fanners and were more sensitive than *A. mellifera* to temperature changes in the hive, which was exhibited in the early-onset of fanning when the hive was heated. However, *A. mellifera* were able to cool their hives faster on average (55 minutes, versus 67 minutes for *A. cerana*) and with fewer workers fanning, indicating that drawing hot air out of the hive is more efficient than forcing cool air in. Results of the study showed a decrease in cooling economy in mixed-species compared to pure *A. mellifera* colonies, but similar cooling efficacy in mixed and pure *A. cerana* colonies.

Thermoregulation behaviors can also vary within a single species of honey bee. Genetic variation among patrilines was shown to have a significant effect on the ability of workers to keep brood temperatures stable. Jones et al. (2004) compared the thermoregulation efficiencies of colonies with a single patriline to those having multiple patrilines. Colonies were assessed for their ability to achieve and maintain a proper temperature in the brood nest (*ca*. 35°C) when the ambient temperature was raised to 40°C. Uniform patriline colonies had a significantly higher variance than non-uniform colonies with respect to the mean temperature. In addition, two colonies of five-patrilines each were observed for differences in fanning-onset thresholds as temperatures increased. In both colonies tested, fanning workers were collected from the hive entrance as hive temperatures were increased, and their paternity was determined using genetic markers. Some patrilines produced more fanning workers than other patrilines for many or all of the experimental temperatures (25°C to 40°C, in 1°C steps), suggesting that these patrilines had a lower than average threshold for fanning. The responses of different patrilines to changes in ambient temperature illustrate two important phenomena. First, patrilines undoubtedly vary in their responses to changing temperature; and second, the proportion of fanning workers from different patrilines changes with temperature.

Fanning is not the only technique honey bees employ to regulate brood nest temperatures during the summer months. Starks and Gilley (1999) showed that worker bees shield brood against external heat by creating a physical barrier with their bodies, and absorbing the excess heat. Workers can withstand temperatures up to 50°C, while brood have a threshold of approximately 36°C. By placing heating pads on the outside of small observation hives, they were able to simulate heat stress to the brood chamber of a hive, while observing worker behavior through the glass pane. Worker bees were attracted to the heated glass and clustered more densely over the brood comb than the honey comb. There was no apparent buzzing of wings, and drones and queens were excluded from the “shields”. Starks and Gilley proposed that in a natural environment, heat shielding may act as mobile insulation for nest cavity walls that are particularly thin and exposed to sunlight.

Hive warming is achieved in a much more visually subtle way than hive cooling. In the winter, when hive temperatures drop from 28°C (day) to 17°C (night), the metabolic rate of a honey bee colony rises tremendously from 7 to 19 watts/kg of body mass (Wineman et al. 2003). The honey bee’s hair also helps to insulate the cluster: it has a plumose structure, much like goose down, and when bees are tightly packed together it traps warm air within the mass of bodies (Mangum 2001). But heat must be generated continually to maintain a constant cluster temperature, especially during cold nights.

The center of honey bee heat production is the thorax. This is also where the flight muscles are located. Honey bees produce heat by contracting their flight muscles very rapidly, a behavior referred to as “shivering”. This activity is not detectable to the human eye, and heat-producing bees may appear to be at rest. The most intense heating is concentrated in the brood area; as mentioned earlier, the pupae are the most susceptible to fluctuations in temperature. Brood-heating bees are positioned one of two ways in the brood nest to transfer heat directly to their young sisters: 1) headfirst in adjacent empty cells to warm brood from the side or, 2) pressing heated thoraces onto capped cells (Basile et al 2008). Cell heating can occur in intervals of 30 continuous minutes, which leaves heater bees quite depleted of energy stores. The brood nest is usually surrounded by pollen cells and the stored honey is located beyond these. This would present a refueling problem for heater bees if they were expected to feed themselves. Fortunately, heater bees are regularly attended by food donors, who supply them with high-powered honey fuel. Basile et al (2008) observed the trophallactic dynamic of donor and recipient bees in the brood nest and found that donor bees are a separate task specialization from nurse bees, as the donors attend only brood warming bees, and not larvae.

Heater bees continue to render their services even after the brood have completed their development. From a physiological standpoint, bees are not adults as soon as they emerge from the brood nest. They are not capable of proper activation of their flight muscles for either flight or endothermic heat production until they are several days old. It is not until 8-9 days of age that bees are morphologically and physiologically fully- developed. Therefore, for the first week post-emergence, bees are poikilothermic and stay close to the brood nest and, where the temperature is high and stable, until they are able to generate their own heat (Stabentheiner et al. 2010).

Hive thermoregulation plays an important role in queen rearing as well as brood production. De Grandi-Hoffman et al. (1993) studied the effects of temperature and position in the brood box on the development rate of queen bees. Three studies of colony thermoregulation were conducted to determine if: 1) temperatures around queen cells differ depending on their location in the brood nest, and if queen cell location influences queen survival rates and emergence time; 2) the location of queen cells differs throughout the year, and whether queen development times are affected by ambient temperatures; and 3) temperatures in the central brood nest differ from those around queen cells. Results of the first study showed that queen cells located in or adjacent to the brood nest were held at higher temperatures and had a greater chance of emergence. In the second study, the position of queen cells migrated from the central brood nest to the periphery of frames from winter to summer. However, queens took significantly more time to complete development in winter, spring and early summer. Results of the third study showed significantly higher temperatures in the central brood nest than the environment immediately surrounding queen cells; the temperature gradient was also much smaller in the brood area. Due to the variability in emergence from queens of different patrilines, de Grandi-Hoffman et al. (1993) also proposed that queens from different patrilines could have different degree-day requirements for development. This would genetically predispose certain lineages to emerge first and become reigning matriarchs.

Although managed honey bees are capable of handling most temperature extremes that affect their hives, beekeepers may want to enhance the bee’s natural thermoregulation with hive modifications, especially during cold winters. Applying an exterior treatment to a hive during cold months can have a notable effect on colony thermoregulation. Wineman et al. (2003) showed that wrapping hives in infra-red polyethylene sheets during a subtropical winter increased hive temperature, colony population and spring honey production.

Furthermore, when compared with non-covered hives, polyethylene-covered hives showed an increase in brood area of 59%; non-covered hives actually had an 8.4% reduction in brood area. Adult bee populations were increased by 37.5% in covered hives and 11.8% in non-covered hives, and spring honey production was doubled in hives wrapped in polyethylene. This research supports the use of artificial hive insulation to increase colony viability during the winter and following spring.

References

Basile R., C. W. W. Pirk and J. Tautz. 2008. Trophallactic activities in the honeybee brood nest—heaters get supplied with high performance fuel. Zoology 111: 433-441.

Coelho J. R. 1991. Heat transfer and body temperature in honey bee (Hymenoptera: Apidae) drones and workers. Environ. Entomol. 20(6): 1627-1635.

DeGrandi-Hoffman G., M. Spivak and J. H. Martin. Role of thermoregulation by nestmates on the development time of honey bee (Hymenoptera: Apidae) queens. Ann. Entomol. Soc. Amer. 86(2): 165-172.

Jones J. C., M. R. Myerscough, S. Graham and B. P. Oldroyd. Honey bee nest thermoregulation: diversity promotes stability. http://www.sciencexpress.org/24June2004/Page1/10.1126/science.1096340.

Kühnholz S. and T. Seeley. 1997. The control of water collection in honey bee colonies. Behav. Ecol. Sociobiol. 41: 407-422.

Mangum W. A. 2001. Honey bee biology: the winter cluster up close. Amer. Bee J. 141(2): 101-103.

Stabentheiner A., H. Kovac and R. Brodschneider. 2010. Honeybee colony thermoregulation—regulatory mechanisms and contribution of individuals in dependence on age, location and thermal stress. PLoS ONE 5(1): e8967. doi: 10.1371/journal.pone.008967.

Starks P. T. and D. C. Gilley. 1999. Heat shielding: a novel method of colonial thermoregulation in honey bees. Naturwiss. 86: 438-440.

Wineman E., Y. Lensky and Y. Mahrer. 2003. Solar heating of honey bee colonies (*Apis mellifera* L.) during the subtropical winter and its impact on hive temperature, worker population and honey production. Amer. Bee J. 143(7): 565-570.

Yang M.-X., Z.-W. Wang, H. Li, Z.-Y. Zhang, K. Tan, S. E. Radloff and H. R. Hepburn. 2010. Thermoregulation in mixed-species colonies of honeybees (*Apis cerana* and *Apis mellifera*). J. Insect Physiol. 56: 706-709.

Urban Bees Make More Honey

By The New York Times

If you are a honeybee in France, the best place to live (and work) might be smack in the middle of Paris.

Audric de Campeau, who set up his first hives in the French capital in 2009, said he was surprised to discover that his Parisian bees produced more than twice as much honey as the ones he kept back in the northeastern Champagne region.

Mr. de Campeau said that green spaces in Paris and other large cities like New York or London actually had a better mix of trees, flowers and other plants than farming areas dominated by vast single-crop fields. Plus: no crop-dusted pesticides.

Honey produced in Paris tastes of red berries and lychee, Mr. de Campeau said. He said that traces of the city's high air pollution had been found in beeswax and the bees themselves, but that the bees still lived longer than their country cousins.

Bees were cultivated in Paris as far back as 1856, in the Luxembourg Garden, where there is still a beekeeping school. Now, the local authorities count 700 hives in parks, private residences and office buildings.

They have been set up on the rooftops of the National Assembly, France's lower house of Parliament, and on top of the Palais Garnier opera house, which sells small jars of its own honey online for 15 euros, or about $17.

At the Tour d'Argent, a Left Bank restaurant, diners could recently enjoy "roast duckling with spices and honey from our roof" as they took in the sweeping view of the Cathedral of Notre-Dame — where several hives sit atop the sacristy.

Even the French Communist Party recently set up a handful of hives on the roof of its imposing 1970s-era headquarters. One Twitter user wryly noted that the party was now in the capitalist business of exploiting workers.

A version of this article appeared in print on May 25, 2016, on page A7 of the New York edition with the headline: Bees Find Joie de Vivre in Paris.

Scientists Identify Gene Causing Worker Reproduction in Honey Bees

By The New York Times

The female Cape bee is a renegade. She breaks all kinds of rules and disregards orders. In this isolated subspecies of honey bees from South Africa, female worker bees can escape their queen's control, take over other colonies and reproduce asexually — with no need for males. Scientists identified the genes most likely to have instigated this unusually powerful worker bee behavior, according to a study published Thursday in PLOS Genetics.

The typical story of reproduction is that males and females of an animal species do it sexually. Generally, that's what honeybees do, too. Sperm from a male drone fertilizes a queen's eggs, and she sends out a chemical signal, or pheromone, that renders worker bees, which are all female, sterile when they detect it.

But the Cape honeybee, a subspecies that lives in the Fynbos ecoregion, a unique area of incredible diversity along the southwestern tip of South Africa, evolved a workaround where, in some cases, female workers can become something like a queen and produce offspring of their own.

Like all honeybees, some Cape bee colonies also have male drones. But female workers can start laying their own eggs in their home colony when a queen dies. These females will also invade colonies of other honeybee subspecies and lay eggs in some cases, and they can enter undetected by bees that would normally kick them out.

"The Cape bees will take over the foreign colonies and start eating up all the honey," said Matthew Webster, a geneticist at Uppsala University in Sweden, who led the study. This behavior is called social parasitism.

To understand what was driving this behavior, researchers compared the whole genomes of 100 honeybee subspecies with those of 10 Cape honeybees. Unsurprisingly, the genomes were very similar: The bees look and act the same in every way except for the egg-laying quirk. But a few select areas of the genome were unique on the Cape honeybee genome.

"Normally that doesn't cause really big differences," said Dr. Webster. But in this particular bee, the workers lay eggs that self-fertilize and become female workers in their home colonies or the hives they invade.

Genetic differences likely made social parasitism possible by selecting for bees that could develop ovaries to a greater extent than other worker bees, lay eggs prepackaged with two sets of chromosomes, and possibly emit a chemical signal to mask their presence while laying eggs, said Dr. Webster.
This asexual tendency may sound weird, but it's not unheard-of in biology. A variety of species of ants, wasps and bees can switch between sexual and asexual reproduction. And scientists have documented virgin births in turkeys, chickens, sharks and reptiles.

During a process called thelytoky, two of the Cape bee's daughter cells fuse together to make a single cell with both sets of chromosomes — just like Thelma the snake, a reticulated python known for her virgin births. Normally, honeybee eggs split during meiosis into four daughter cells with just one set of chromosomes. Those turn into male drones without a father to contribute the other set to make them female.

What scientists haven't sorted out is why there might be an evolutionary advantage for a female being able to reproduce without a male. In extreme situations with no males, it could mean the survival of her species. But then again, self-fertilization, the epitome of inbreeding, could leave her offspring more vulnerable to disease and other threats.

Dr. Webster hopes to elucidate why this adaptation on the Cape honeybee genome survived.

"Why doesn't it take over the whole world, and why doesn't it die out?" wondered Dr. Webster. "There's no really good answer to that."

A version of this article appeared in print on June 10, 2016.

Young Farmers and Ranchers

By MSFB & Jeff Harris

The Young Farmers and Ranchers program is designed to develop young people into the leaders that will someday guide Mississippi Farm Bureau. Educating young farmers about the purpose and function of Farm Bureau and providing opportunities for them to participate in the program structure of Farm Bureau will prepare them to assume roles of leadership in the organization.

The YF&R program is designed for younger members, ages 18 – 35, who share an interest in improving themselves and agriculture. They are encouraged to use their own knowledge and the information gained about Farm Bureau to help formulate policies and programs that can lead to solutions to their problems.

Each year, the Young Farmer & Rancher Department sponsors the YF&R Achievement Award. County winners compete at the district level and district winners compete at the state level. The state winner represents Mississippi in the American Farm Bureau YF&R Contest.

The YF&R Department also sponsors the YF&R Excellence in Agriculture Award each year. This contest is designed to recognize the accomplishments of contestants that derive the majority of their income from efforts other than agriculture but are involved in farming and Farm Bureau.

One of the most interesting and rewarding programs sponsored by the YF&R department in the Discussion Meet where young people get together to discuss issues and problems affecting their way of life.

The Young Farmers and Ranchers program also sponsors scholarships for deserving students.

I participated in a forum with this group that was sponsored by MSFB and the Mississippi State University Extension Service held at the Bost Extension Center on the MSU campus in early July. My role was to explain to them the current status of honey bees in the U.S. and factors that have led to increased mortality of colonies during the last decade or so.

I stayed throughout the program and was amazed as to how much information was provided from all of the university specialists that spoke to the group. The newest issues in row crop farming (corn, soybean, cotton, and rice), cattle industry, lumber industry, etc. were covered in great detail. Equally impressive was the eagerness to learn that I sensed from this group of young people. I left the event feeling like agriculture was in good hands with the next generation.

Antibiotic Use and the Veterinary Feed Directive

By Dr. Carla Huston, Extension Veterinarian, MSU

We enjoy one of the safest and most affordable food supplies in the world thanks to years of hard work by many—farmers, ranchers, veterinarians, processors, packers, distributors, government agencies, and others. To protect the gains made, it is the responsibility of livestock producers to understand and follow the laws and be prepared to meet the new and changing standards set in the years to come.

The U.S. Food and Drug Administration (FDA) is responsible for protecting public health by assuring the safety, efficacy, and security of human and animal drugs, biological products, and the food supply, among other things. The FDA Center for Veterinary Medicine (CVM) specifically regulates animal drugs, animal feeds, and animal devices. All medications (drugs) used in livestock, such as cattle, sheep, goats, pigs, and poultry, are regulated by the FDA because they are used in animals that will enter the human food supply. It's that simple.

Animal drugs are available as over-the-counter (OTC), prescription (Rx), or through a veterinary feed directive (VFD). For prescriptions and VFDs, veterinarians are responsible for authorizing the proper medications, in a legal manner, only to those animals that truly need them. In turn, producers are responsible for the proper use and administration, according to the drug label, and documentation of all prescription and VFD medications used in their animals.

Dispensing, prescribing, or authorizing a prescription or VFD product requires a valid veterinary-client-patient relationship (VCPR). *It is illegal for a veterinarian to dispense or write a prescription or VFD for an animal/herd he/she has not seen or is unfamiliar with.* A VCPR is important for both veterinarians and livestock producers because it communicates a type of "agreement" between parties on the responsibility and care for the animals. Under the guidelines of the FDA Animal Medicinal Drug Use Clarification Act (AMDUCA), a VCPR exists when all of the following conditions are met (Title 21, Code of Federal Regulations, Part 530 or 21 CFR 530):

• The veterinarian has assumed responsibility for making clinical judgments regarding the health of the animal/herd and the need for medical treatment, AND the client has agreed to follow his/her directions.

• There is sufficient knowledge of the animal(s) by the veterinarian to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s).

• The veterinarian is readily available for follow-up in case of adverse reactions or failure of the regimen of therapy. Such a relationship can exist only when the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of examination of the animal(s), and/or by medically appropriate and timely visits to the premises where the animal(s) are kept.

Drugs used in food animals must be used according to their labeled directions, unless the veterinarian feels that an extra-label drug use (ELDU) is indicated. The FDA allows ELDU only under the context of an established VCPR, and only with products that are not prohibited for ELDU. Extra-label drug use means the "actual use or intended use of a drug in an animal in a manner that is not in accordance with the approved labeling. This includes, but is not limited to, use in species not listed in the labeling; use for indications (disease or other conditions) not listed in the labeling; use at dosage levels, frequencies, or routes of administration other than those stated in the labeling; and deviation from the labeled withdrawal time based on these different uses" (21 CFR 530). A current list of drugs prohibited from ELDU can be found at ***www.fda.gov*** or ***www.farad.org***.

Rules regarding ELDU apply to both OTC and prescription products. This is an area that is often misunderstood: *both OTC and prescription products require veterinary oversight to be used in an extra-label manner*. In other words, just because you can purchase a product without a prescription doesn't mean you can use it any way you'd like. Withdrawal times for extra-label use of any product, as well as use according to the label, must be provided by the veterinarian. Medication delivered in feed can only be used according to the label. Extra-label use of medication in feed is strictly prohibited and has been for many years. Veterinarians cannot legally prescribe the use of any feed additive other than what is on the label.

This is an excerpt from new extension publication (MSUCares publication P2994) written by Dr. Carla Huston to explain changes in FDA laws regarding antibiotic use. These changes apply to honey bees. I am exploring ways in which the law will be administered relative to the beekeeping industry. I will report on the situation at our upcoming MBA convention on November 4-5, 2016.