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The Dance Language of Bees

Ryan Cutts, a 17-year-old 4-H'er from Chipley, Florida, wrote Florida's 1st place essay in the 4-H Beekeeping Essay Contest sponsored by the Foundation for the Preservation of Honey Bees, Inc. Ryan's essay has been entered into the national running and is published here in full:

LITTLE DID anyone know that in 1886 in Vienna, Austria, a boy would be born who would make immense contributions to the beekeeping community. Karl Von Frisch was a child that was fascinated by science, especially science having anything to do with animals. He would patiently observe an animal until he had learned everything about it. This trait helped him to accomplish things that people with less patience could not, such as discovering that fish have the ability to hear noises and see color. Frisch also discovered that honey bees can see color, but his most astonishing discovery was that of the dancing bee.

The first person in our history to call attention to communication in honey bees was Ernst Spitzner in 1788. He described the dances as being a way bees communicate the volume of honey flow and location of nectar sources. Spitzner's observations were mostly forgotten until Frisch published *Über die "Sprache" der Bienen* in 1920. Frisch went above and

beyond after he observed the dances. He grew an interest in observing the bees and went on to conduct experiments that revealed several unknown things to the public.

Frisch began his studies in 1919 with the simple idea of marking bees with paint as they fed at a flower that he had made more desirable with a drop of sugar syrup. He then observed their behavior when they entered a glass-walled observation hive. Frisch watched his marked bees enter the hive and begin doing a "round dance." The surrounding bees were attentive to the dancer. He then noticed that the other bees, probably the ones who attended the dances, would investigate the same type of flower that the marked bee had fed at! Frisch also described a "waggle" type dance. Unfortunately, he falsely concluded that the waggle dances indicated pollen, and the round dances indicated nectar because the waggle dancers often had pollen on their legs, while the round dancers did not. As a

result of World War II, Frisch was forced to move from his devastated town to a rural town called Brunnwinkel, Austria. After 25 years of living with his unknown error, he discovered for himself the full story in 1944 and 1945. Out of his small garden at his old residence, Frisch was working under more normal conditions for the foraging bees. He found that when bees fed from long-distance plants, they did the waggle dance but also performed the same type dance for nectar as well. During the study, Frisch also observed that not only do the dances tell what type of flower, but also distance, direction, and odor of its food source.

As mentioned earlier, there are two basic dances, the round dance and the waggle dance. The round dance is a speedy, almost violent dance. It is used when a bee wants to tell his fellow hive mates that food can be found within about one hundred yards of the hive. While performing the dance, the dancer stays confined to a small space on the comb, usually less

Continued on back



fly one mile north, hang a left at the third blossom

FROM THE DESK OF JERRY HAYES



Jerry Hayes, FDACS/DPI
Asst. Chief Apiary Inspection

THE 2ND ANNUAL Master Beekeeper Program and Bee College recently were held at the Whitney Lab in Marineland. For those of you familiar with hosting large meetings, I'm sure you can appreciate the effort it requires to put them together and to have them run

seamlessly. This is not something that can be done alone, and because Dr. Jamie Ellis has such a great team, the 2nd Annual Bee College

was a huge success! I would like to take a moment to offer special recognition to everyone who helped make this event possible, but I would especially like to thank Mike and Hannah O'Malley for all their hard work and dedication.

Through the years I have been fortunate enough to participate in lots of beekeeper meetings on both a national and an international level. Last year the first University of Florida (UF) Bee College and Master Beekeeper Program

was held. It was not only well-organized, but it also had a great turnout. This year's event was an even greater success. The 2009 UF Bee College and Master Beekeeper Program were more solid, informative and enjoyable than most other meetings I have attended.

For those of you who are involved in the Master Beekeeper Program, I encourage you to continue moving forward. This is the premier Master Beekeeper Program in the nation. It's tough and it will become even harder, but if you are going to become one of the Future Florida Beekeeping Leaders, you wouldn't want it any other way. Our goal is to let everyone know that you are a professional; that's why we provide a proper challenge for you to achieve your Apprentice and Advanced Beekeeper status.

If you are a novice beekeeper or someone who is simply interested in honey bees, then the Bee College is a great place to do that. Keep coming and be sure to tell your friends. Learn all you can because a knowledgeable beekeeper is a successful beekeeper.

In the Apiary Section, I want to recognize some of our Inspectors who did double (sometimes triple duty) at the Bee College.

Mr. Richard Dunaway, Apiary Inspector/Supervisor of the Southern Apiary District and Mr. Fred Howard based

out of LaBelle, Florida, and Mr. Doug Corbin based in Milton, Florida, each easily moved through the Advanced second level of the Master Beekeeper Program and were great volunteers at other segments of the meeting.

Ms. Stephanie Tarwater, based in Gainesville, Florida, also moved through the second or Advanced level of the Master Beekeeper Program with no problem and after a year of preparation she also was awarded her Welsh Honey Judge certificate and uniform. She is now considered one of the most qualified Honey Competition Judges in the nation.

Mr. David Westervelt and Mr. David Barnes each were having a friendly competition as to who would have the highest score on the Master Beekeeper exam. I won't tell you who it was. They easily passed the Advanced Master Beekeeper level. Because of their level of general and specific Apiculture knowledge and teaching ability they served as Instructors during the Bee College and volunteered their time helping out where needed.

I have said it before, but having a strong UF Honey Bee Lab under Dr. Jamie Ellis and a strong FDACS Apiary Section to partner with enthusiastic, knowledgeable and committed Florida Beekeepers is a win-win situation. I am proud to be counted with you.



The Cape Honey Bee

By Anthony Vaudo

UF Entomology Graduate Student

THE CAPE honey bee (*Apis mellifera capensis*) is a subspecies of western honey bee. Its natural distribution is at the very southern tip of South Africa and it is found nowhere else in the world. Interestingly, its habitat is restricted to an area called the Cape Floristic Kingdom (CFK), again found only at the southern tip of Africa. This ecosystem is one of only six floral kingdoms in the world. It is the smallest floral kingdom, only about 46,000 km² (≈17,760 square miles) which is just over a quarter the size of Florida. However, it boasts the highest plant diversity per unit area in the world with over 8,800 species (67% cannot be found anywhere else). At the edge of the Cape bee's distribution, it hybridizes with *Apis mellifera scutellata* (the bee Americans know as the "Africanized bee").

The Cape honey bee has been considered a problem for beekeepers north of the CFK. In the past, Cape bees were transported out of their natural range for use by apiculturists because they were more "docile" than *A.m. scutellata*. However, when put in the same apiary, Cape bees parasitize and kill *A.m. scutellata* colonies.

How does this occur? Cape bee workers actually lay eggs that develop into other workers. In all other honey bee races, workers can lay eggs that develop into drones, but not Cape bees. Furthermore, Cape bee laying workers pro-

duce pheromones similar to those produced by queens. As such, they can receive food from subordinate workers as if they were a queen. The laying workers and their clones do not contribute significantly to hive maintenance and foraging. Cape bee workers can drift into an *A.m. scutellata* colony and quickly reproduce without responding to the natural queen's presence. The colony's queen mysteriously disappears and the colony eventually starves to death. Regulations are being passed in South Africa to prevent the spread of the Cape bee.

The Honey Bee Research and Extension Laboratory at the University of Florida is interested in this unique honey bee. Dr. Jamie Ellis studied the small hive beetle's interactions with the Cape bee for three years. I will be going to South Africa this summer and staying for a year to study wild Cape honey bees in their natural state. Very little research has been conducted to understand Cape bee's natural history. I hypothesize that the Cape bee is essential to the CFK because it is the only honey bee found there. Consequently, they may be responsible for maintaining the great biodiversity of plants in the CFK due to the pollination services they provide.

Recently, some have considered importing the Cape honey bee to the United States

Cape bees are interesting and their biology is unique among all other honey bees.

to control *A.m. scutellata*. This is not a good idea. Cape bees can take over European bee colonies the same way they invade African bee colonies. Our European bees likely would not survive this invasion. Regardless, Cape bees are very interesting and their biology is unique among all other honey bees. For this and many other reasons, they deserve our attention.



ABOVE, Anthony Vaudo: Anyone can catch the big ones. It takes skill to catch the little ones.



Florida Beekeeper Management Calendar – Spring 2009

	Month	Management Calendar	Blooming Plants
North Florida	April	<ol style="list-style-type: none"> 1) Disease and queen problems should be remedied 2) Make splits/nucs – new queens available 3) Control Swarming 4) Add supers, the primary nectar flow begins this month! 	Sweet clover, Wild Blueberry, Haw, Fetterbush ^M , Orange, Spanish Needle ^{MU} , Galberry ^M , Dog Hobble ^{MU} , Palmetto ^{MU} , Mexican Clover ^{MU} , Blackberry ^M , Butter Mint ^{MU}
	May	<ol style="list-style-type: none"> 1) Continue to inspect for colony maladies, but don't treat for diseases while producing honey 2) Continue swarm control 3) Super as necessary 	Palm ¹ , Gopher Apple ¹ , Joint Weed ¹ , Sandhill Prairie Clover ¹ , Spiderwort/day Flower ¹ , Partridge Pea ¹
	June	<ol style="list-style-type: none"> 1) Remove and process honey - main flow stops 2) Varroa populations begin to grow – monitor colonies closely. The economic threshold is 60+ mites/day on a sticky screen or 17+ mites in an ether roll. Treat if you exceed these numbers. 	Mangrove, Red Bay
Central Florida: similar to N. FL but 2-3 weeks ahead	April	<ol style="list-style-type: none"> 1) Disease and queen problems should be remedied 2) Make splits/nucs – new queens available 3) Control Swarming 4) Add supers, the nectar flow began in late March 	Orange, Sweet clover, Wild Blueberry, Haw, Fetterbush ^M , Spanish Needle ^{MU} , Galberry ^M , Dog Hobble ^{MU} , Palmetto ^{MU} , Mexican Clover ^{MU} , Butter Mint ^{MU}
	May	<ol style="list-style-type: none"> 1) Continue to inspect for colony maladies but don't treat for diseases while producing honey 2) Continue swarm control 	Palm ¹ , Gopher Apple ¹ , Joint Weed ¹ , Sandhill Prairie Clover ¹ , Spiderwort/day Flower ¹

		3) Super as necessary 1) Remove and process honey - main flow stops 2) Varroa populations begin to grow - monitor colonies closely. The economic threshold is 60+ mites/day on a sticky screen or 17+ mites in an ether roll. Treat if you exceed these numbers.	Mangrove, Rod Bay, Cabbage Palm
South Florida	April	1) Disease and queen problems should be remedied 2) Make splits/nucs - new queens available 3) Control Swarming 4) Flow began in March - continue to add supers as necessary 5) Orange blossom honey can be extracted (late Apr)	Orange ^M , Spanish Needle ^{MO} , Galberry ^{MO} , Mexican Clover ^{MO} , Primrose Willow ^{MI} , Smart Weed ^{MO} ,
	May	1) Continue to remedy colony maladies, especially queen problems 2) Continue swarm control 3) Super as necessary 4) Move bees from orange to other locations	Palmetto ^J , Mangrove ^J ,
	June	1) Super as necessary for late flows: 2) If flow is over, remove and process honey 3) Varroa populations begin to grow - monitor colonies closely. The economic threshold is 60+ mites/day on a sticky screen or 17+ mites in an ether roll. Treat if you exceed these numbers.	Palm, Melaleuca

^MContinues to bloom in May, ^JContinues to bloom in June, ^{MO}Continues to bloom in May and June

Small Hive Beetle: Designed for Destruction

By Eddie Atkinson

UF Entomology Graduate Student

SINCE THE MID-1990s, the small hive beetle has been killing colonies of honey bees in the United States. The beetle has a suite of adaptations that allows it to integrate into and potentially destroy its hosts' colonies. Such adaptations can be behavioral, morphological, or both. Let's consider an example of an adaptation that involves both.

When a small hive beetle encounters a defensive bee, the beetle often will retract its appendages completely under its protective shell, a behavior called "turtling." This prevents the bee from being able to grab and remove it. Also, the beetle must be able to hold onto the substrate to prevent the bee from simply flipping the beetle over and carrying it out/stinging it. If the beetle fails to turtle or grab the substrate, it may be removed from the colony thus losing resources that would be valuable for its potential young.

The small hive beetle has been killing honey bee colonies since the mid-1990s.

The legs of the beetle are modified to accommodate "turtling." The tibiae are flattened (A in Figure 1), and the femora are either grooved or notched (B in Figure 1). When the beetle "turtles," the tibia will fold into its corresponding grooved or notched femur, allowing the beetle to completely retract its legs, leaving no part exposed for grabbing by bees. There are hairs on the tarsi (C in Figure 1; Figure 2) that have an adhesive effect. The hairs allow the beetle to stick to the substrate and avoid being flipped over by bees.

Finally, small hive beetles have an interesting morphological adaptation that is useful for life in the colony, even though it was originally developed for a different purpose. The beetles have an antennal pocket on their head (Figure 3) which, in the small hive beetle, facilitates complete antennal retraction when "turtling." Other related beetles share this feature, but they probably use it for crawling through small areas, and not specifically for avoiding honey bees.

As small hive beetles are very well adapted to their host nest environments, one can assume that there are several other yet undiscovered adaptations that allow them to be so successful. Research is currently underway in an attempt to uncover the secrets of the small hive beetle and how they integrate so successfully into honey bee colonies.

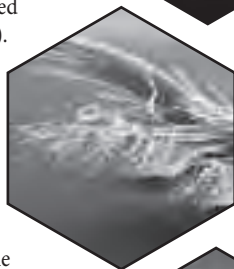


Figure 1. Small hive beetle left foreleg (front leg), showing flattened tibia (A), grooved femur (B), and tarsal hairs (C). The flattened tibia can be retracted into the grooved femur, making it possible for the beetle to hide its legs from attacking bees. The tarsal hairs are used for holding on to a substrate and are magnified in Figure 2.

Figure 2. Small hive beetle right protarsus (front "foot"), showing hairs used for grabbing substrate.

Figure 3. Small hive beetle antennal pocket with inserted antenna. Notice the sunken area (or pocket) of the head that neatly accommodates the antenna.

FROM THE DESK OF DR. JAMIE ELLIS

HELLO, beekeepers. My team and I are back from the 2nd Annual University of Florida (UF) Bee College. Like last year, the 2009 Bee College was a HUGE success. This year, we had over 200 participants including people interested in becoming beekeepers, people who have been beekeepers for 50+ years, pest control operators, and first responders. We doubled the number of classes and workshops we offered. Some of the lecture/workshop highlights include: "green" beekeeping, rearing your own queens, instrumental insemination, marketing your bee products in a global market, wax/candle making, gardening for bees, and mead making. There was something for everyone at the 2009 Bee College! We even offered African bee training for Pest Control Operators and first responders. Over 50 people participated in that training!

Like last year, we held Master Beekeeper Program training and examinations one day before the Bee College. I am happy to tell you that we added over 20 new apprentice beekeepers to the UF Master Beekeeper Program. Also, this was the first year that some Apprentice Beekeepers were eligible to take examinations to become Advanced Beekeepers. Over 20 Apprentice Beekeepers passed their examinations and achieved Advanced

Beekeeper status — quite an accomplishment. If you are interested in

knowing what the UF Master Beekeeper Program is all about, please visit UFhoneybee.com and click on "extension." Once there, click on the Master Beekeeper Program logo.

Another highlight of the UF Bee College was the Welsh Honey Judge training and Bee College Honey Show. This year, Robert Brewer (renowned Welsh Honey Judge) "crowned" over 10 Welsh Honey Judges. Now, Florida has a number of qualified honey judges who can (1) help you start quality honey shows in your area, (2) judge honey shows for you, and (3) serve as a wealth of information on honey quality and standards. Please take advantage of this great resource! Finally, the Bee College hosted the second annual Bee College Honey Show, the only state-level honey show in Florida. We had a number of entries ranging from beeswax to bee art, extracted honey, chunk honey, and mead. Recipients of 1st place awards in any of the honey categories can now claim they have the best honey in Florida!!!

I hope this information whets your appetite and encourages you to join us at next year's UF Bee College. Although it may be difficult to do, we already plan for it to be bigger and better than this year's. Please visit UFhoneybee.com regularly for updates.

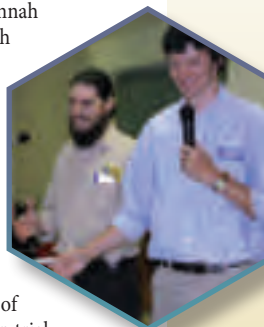
On a final note, the HBREL said goodbye recently to Mike and Hannah O'Malley. Mike served as the extension technician in my lab for about two



Dr. Jamie Ellis
UF Assistant Professor

years while Hannah was the research technician here. Both did a great job with their efforts and they will be missed. They left my lab to begin a through hike of the Appalachian trail. They anticipate finishing the trail in August or September. Good luck to them both.

I have been very fortunate to be able to replace Mike and Hannah with very qualified individuals. I have hired two new Research Coordinators to manage the large number of research projects my lab is undertaking currently (over 25 research projects!!!). They are Jeanette Klopchin and Mark Dykes. Furthermore, I hired Melissa Teems to serve as the Extension Coordinator in my lab. Hopefully, you will be able to meet these fine individuals in the near future. In the meantime, please let us know if there is anything we can do to help you with your beekeeping endeavors. Happy Beekeeping!





The Dance Language of Bees, continued from page 1

than twice the length of herself.

During the dance, the bee will reverse her direction, and do the same at the end of her dance. While dancing, recruits (usually from one to six bees) will begin to follow, touching her with their antennae. The round dance contains no information about the direction of the goods, but only that it is fairly close by.

The wagtail dance is a little more complicated. Like the round dance, the dancing bee dances in a tight pattern but doesn't necessarily stay in the same place on the comb. She may dance a little in one location, then move a few centimeters away and continue her dance. Since the wagtail dance is for food sources more than one hundred yards away, more information is given throughout the dance. The dance basically consists of two

circles being attached with the "wagging tail" action of the bee. The direction taken by the tail-wagging part of the dance reveals the direction of the food source from the hive. For example, if the bee dances straight up the comb, it means the food source is in the direction of the sun. If the bee dances straight down, it is away from the sun. They use angled dances to reveal the number of degrees away from the sun that the food is located. The distance of the food source is shown through the quickness of the dance. The greater number of cycles in the dance, the closer the food is, and vice versa. Every now and then, the bee will pause her dance to share her newfound food to its recruits. This is done to inform the recruits of the odor of the flower. Finally, the liveliness of the dance uncovers whether or not the food is available in great quantity.

In the late 1980s and early

1990s, beekeepers started to question the amount of truth in the information given through bee dances. The January 1990 issue of *National Geographic* hosts a story about a team of scientists near Würzburg, West Germany, who decided to assemble an electronic bee and make it dance in the bee hive. With a little trial and error, these scientists successfully sent 20 to 100 bees to their goal location, proving even further that the dances are the real deal.

Days of study by quite a few ingenious men have been put into figuring out what we know so far about the habits and information hidden in these dances performed by the honey bee. Without these dances, the production of a hive would decrease substantially and hurt the beekeeping industry. Without the amazing and complex ability of dancing bees, the world would not be the same place as it is today.

Jerry Hayes

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