www.americanbeejournal.com

AMERICAN BEE JOURNAL

VOLUME 150 NO. 1

JANUARY 2010

AMERICAN BEE JOURNAL.

PUBLISHED BY A. M. SPANGLER & CO., 25 NORTH SIXTH ST., PHILADELPHIA.

VOL. I. JANUARY, 1861. No. 1.

Bee Culture.

One Hundred and Fiftieth Anniversary 1861-2010

Let's Bring the New Year in with a BANG!!!

SAVE ON BUDGET BOXES!!

	1-49	50-249	250-499	500-999	1000+
Hive Bodies	$7.15	$7.00	$6.75	$6.50	$5.95
6 5/8" Supers	$5.00	$4.85	$4.50	$4.25	$3.95

Budget Frames Available!!!
Call for Pricing!!

Hobbyist Special!!

One pair Coveralls (S-XL), One pair Economy Ventilated Leather Gloves (S-XL), Plastic Helmet and Folding Veil. *$59.95!*
Order WWJAN01

WESTERN BEE SUPPLIES, INC.

PO Box 190, Polson, MT 59860
CALL TOLL-FREE 1-800-548-8440.
Website: www.westernbee.com
All prices FOB Polson, MT. Orders under 200 lbs. shipped UPS or USPS. Orders over 200 lbs. shipped commercial freight with up to a 75% discount. January special expires 2/10/10.

Moriha Yetter - Idaho Commercial Beekeeper —71

American Bee Journal

Volume 150 No. 1 January 2010

Our Sesquicentennial: 150 Years of Beekeeping—17

Email
info@americanbeejournal.com
Web
www.americanbeejournal.com

Contents

Editor-**Joe M. Graham** Advertising Manager-**Marta Menn**

Publishing Department- **Dianne Behnke & Amy Hill**

Articles

Departments

Columns

January Cover Picture

2010 marks our sesquicentennial (150 years) for publishing the *American Bee Journal*. We plan to feature articles about our past editors, as well as the history of beekeeping during 2010. In honor of the event we have reprinted the entire Vol. 1, Issue 1, January 1861 as a pull-out souvenir in this issue. Enjoy!

The American Bee Journal ISSN 0002-7626

THE AMERICAN BEE JOURNAL (ISSN 002-7626) is published monthly at American Bee Journal, 51 S. 2nd Street, Hamilton, IL 62341. Periodicals Postage Paid at Hamilton, IL and at additional mailing offices. POSTMASTER: Send address changes to American Bee Journal, 51 S. 2nd Street, Hamilton, IL 62341. In the **United States**, $26.00 a year; two years, $49.30 and three years, $69.55. **Canada** $31.00 a year; two years $59.30 and three years $84.55. **Foreign** $44.00 a year; two years $85.30 and three years $123.55. Subscriptions stop at expiration date printed on label. Available in microfilm form at moderate prices by writing to National Archive Publishing Co., 300 N. Zeeb Road, P.O. Box 998, Ann Arbor, Michigan 48106. 1-800-420-6272.

The Publishers cannot guarantee advertisements in this magazine, but we ask that any advertising complaints be made known to us, so we can further check the company's reliability. Opinions expressed in articles are not necessarily those of the publisher. American Bee Journal, 51 S. 2nd St., Hamilton, IL 62341. (217) 847-3324. Fax (217) 847-3660.

Hummerbee™ Forklifts

Designed To Improve Your Productivity

Hummerbee XL

2 Models Available

XL: 1600 lb Rating

Turbo: 1800 lb Rating

Turbo Tipping Load Straight: Over 3000 lbs

Hummerbee Turbo with Clamp

Turbo Features: 43 HP 4 Cylinder Diesel, Extra Cooling, Hydraulic Foot Pedal is "Very Smooth", Large Floatation Tires

Exceeds All ANSI Certifications At Rated Weights

A&O Forklift 800-943-8677 www.hummerbee.com

Manufacturing More New & Handling More Used Forklifts Than Anyone!

Trust the company with 25 years manufacturing and 35 years commercial beekeeping experience

Attachments: Hive Clamps - Drum Handlers - Mowers - Buckets - Brooms - Augers - Snow Plows

GloryBee® Beekeeping

A. NEW! BELLOWS DUSTER
Protect your bees from mite infestation naturally. Our bellows duster makes powdered sugar application a piece of cake. Use the bellows duster with approximately a cup of powdered sugar to control mites. Beekeepers using this method report 75%-80% fewer mites in their hives. Instructions provided.
16364 **$16.95**

B. NEW! METAL ENTRANCE REDUCER
This tool comes with two side brackets that attach on each side to the entrance of the hive. Once brackets are attached the entrance reducer/mouse guard piece can be inserted from the top. One side of the reducer is used as a mouse guard and the other side (when flipped over) is used as a reducer to close up the hive for movement and/or for the winter.
17008 **$1.25**

C. NEW! QUEEN CELL CUPS ON BAR
Comes with 20 plastic queen cell cups and base bar that can easily be attached to the inside of a wooden frame. Up to 4 bars will fit on a deep wooden frame. Queen cell cups need to be attached to base with wax.
17009 **$1.05**

D. PLASTIC QUEEN CAGE
For shipping/transporting queens.
14343 **$0.70 each**

E. PLASTIC QUEEN GRAFTING TOOL
14513 **$1.65 each**

F. PLASTIC QUEEN CUPS
Pack of 100.
14332 **$2.85 pkg**

G. METAL QUEEN EXCLUDER
This durable, long-lasting excluder is a great value!
13458 **$5.95**

H. PLASTIC QUEEN EXCLUDER
14344 **$2.75 each**

I. SMOKER WITH REMOVABLE INNER CAN
This high-quality, easy-to-clean smoker features circular ventilation for a more consistent burn. 4" x 9", with domed top and removable inner can.
15034 **$21.95**

J. 3" X 6" STAINLESS STEEL SMOKER
with shield & bellows.
15238 **$15.95 each**

K. 4" X 9" STAINLESS STEEL SMOKER
with shield & bellows.
15239 **$19.50 each**

L. STANDARD HIVE TOOL
12805 **$1.95 each**

M. SMALL FRAME GRIP
15001 **$2.95 each**

N. COLD UNCAPPING KNIFE
11753 **$12.50 each**

O. CAPPING SCRATCHER
11392 **$1.65 each**

P. HAND HELD HONEY REFRACTOMETER
- Scale range 12.0 to 27.0% (water content in honey)
- Minimum scale 0.1%
- Contains a temperature compensation scale
- Dimensions are 4 cm x 4 cm x 17 cm

14693 **$59.95 each**

Q. STAINLESS HONEY SIEVE
Metal honey sieve for straining honey from comb. Fits on top of our 5 gallon buckets.
13444 **$17.95 each**

T. THREE FRAME EXTRACTOR
Stainless steel, hand crank extractor
15533 **$239.95 each**

S. TWO FRAME, PLASTIC EXTRACTOR
Plastic, hand crank extractor
14316 **$117.75 each**

Call today to request our free catalog.

Pricing good through March 31st, 2010.
Pricing does not include shipping.

www.GloryBeeFoods.com ◆ (800) 456-7923 ◆ Eugene, Oregon 97402

Give Your Bees The Best When They Need It The Most!

Now get two feed stimulants in one patty! Pro-Len stimulates as well as natural pollen. Pro-Health is a stimulant and also works as a health aid to help your bees fend off disease. Pro-Health is also used in liquid feed products to increase consumption and gives bees the essential oils that helps to keep their digestive track clean from disease.

BALANCED NUTRITION

Bee-Pro® Patties with 4% Pro-Len & Pro Health Offer:

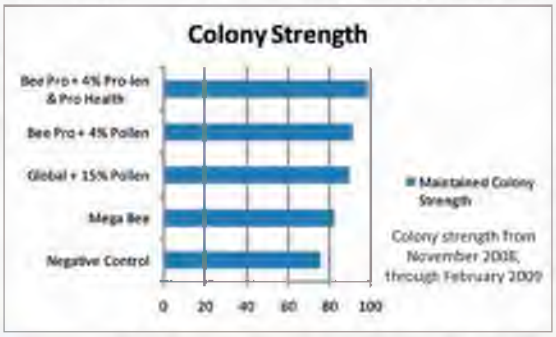
- A complete amino acid profile!
- Beneficial vitamins, lipids and minerals!
- Only the best USA sourced ingredients!
- Free of all animal by-products!
- Packaged for easy use & increased consumption!
- Contains Pro-Health (health aid and feed stimulant)!
- Contains 4% Pro-Len feed stimulant!

NOW! With Pro-Len & Pro Health

Bee-Pro® Patties with 4% Pro-Len & Pro Health

FD-357 4% Pro-Len + Pro Health 10 lb. box.....$28.95
FD-355 4% Pro-Len + Pro Health 40 lb. box

1-20 boxes.....$49.10 per box $1.23 per lb.
21-39 boxes.....$48.10 per box $1.20 per lb.
40-159 boxes.....$46.60 per box $1.17 per lb.
160+ boxes.....CALL for quantity discount



Pickup Locations

- Hackensack, MN
- Woodland, CA
- Hughson, CA
- Bakersfield, CA
- Alvin, TX

Call for pricing and availability.

BEE BUCKS

Mann Lake Ltd.
800-880-7694
www.mannlakeltd.com

Prices are subject to change without notice and do not include shipping charges.

Letters to the Editor

Send your letters to the editor, Attn: Joe Graham, Dadant, 51 S. 2nd Street, Hamilton, IL 62341, Fax: 1-217-847-3660, or email: abj@dadant.com.
Due to size and content, we may be unable to publish all information received. Thank You!

A SWARM OF BEES BY ANY OTHER NAME . . . . TERMS OF VENERY

We've all heard of a herd of cows, a pod of whales, a swarm of bees, a colony of bees or a hive of bees. I was researching the proper term for a group of otters ("a romp") when I ran across a couple unheard of (to me at least) terms used to describe a group of bees – a bike of bees or a grist of bees (evidently because they look like a pile of grain ready to be milled). Terms of venery (collective nouns for groups of animals) were popular among the aristocracy in Old England separating them from the yeomen; aristocrats were expected to discuss hunting in the proper terms. Many of these terms have been relegated to use in crossword puzzles or by erudite Scrabble players; some are fascinating- e.g. a parliament of owls, an ostentation of peacocks - but my all time favorite is a gallon of petrels. Can anyone come up with more bee terms? My Russian customers to whom I sell package bees are always saying "Steve, we need six families of bees." After a discussion with a Russian friend I found the term for a colony of bees is Пчелная семья which, literally translated, means "bee family".

Stephen Petersen
Fairbanks, Alaska

BEEHIVE CAKE

Brian Stiff of Owensboro, KY sent this photo of a beehive cake that his wife made for their bee club's fall meeting.

WINNING TENNESSEE PHOTO

I am sending a photo that I entered in the Tennessee State Beekeeping Convention this past week. The judge was Ann Harman, who writes articles for you from time to time. I won a blue ribbon for the photo and was told by Ann to send it in and see if you would be interested in using it. If so, you have my permission to do so. I am a new beekeeper and enjoy your articles every month; they are very helpful.

Ed Close
Tennessee

"HONEYGATE"?

The published production results for the White House hive seem odd - even suspicious. About 130 pounds of surplus for a colony in D.C.? Questionable, since the annual average surplus in that general area is something like one-quarter of that amount. So, were the results rigged, somehow, and, if so, why? As you know, honey production of a hive can be significantly boosted by adding bees or brood from other hives. Seems to me that the amount of surplus reported is open to question.

Bob Edney

CELEBRATING HONEY BEE SCIENCE WITH L.L. LANGSTROTH'S 200TH BIRTHDAY

Two hundred years after his birth in 1810, Rev. Lorenzo Lorraine Langstroth, known

BEEKEEPING FRIENDS

Girl's best friend: A humungous bee. Okay, actually our dog Mak hanging out with my wife Adrienne, both in their bee suits. (Jay Williams, Franklin, TN)

as the "Father of American Beekeeping," will behonored. Langstroth's discovery of "bee space" and his invention of the movable-frame beehive will be celebrated with a national network of exhibits, workshops and seminars and, with your help, perhaps a commemorative U.S. postage stamp as well.

Langstroth started with "two stocks of bees in common box hives" while serving as a minister in Andover, Mass. in the 1830s. Before long he was studying beekeeping in depth. He observed his bees and sought to understand their ways in order to build hive boxes which would allow him to better combat the destructive wax moths and collect surplus honey without harming the bees or damaging their wonderful honey comb.

This is the essence of the scientific method. Those who might think that Langstroth was an unlikely scientist would be misunderstanding the role of science in our lives. The scientific method involves experiencing the world in which we live, responding to the curiosity that naturally resides inside us, devising a method of observing and recording, testing and confirming our expectations, and evaluating the results we achieve. It is available and important to each and every one of us, just as it was to Langstroth.

Langstroth's efforts gave us a way to raise large quantities of bees, keep them healthy and collect their honey in a truly sustainable way, without destroying their home. We all owe him thanks and, the year 2010, his 200th birthday year is a great time for people across the country to celebrate him in ways that benefit us all.

Our effort to honor Langstroth will include the study and appreciation of his efforts and what they have yielded. Throughout the year 2010, the Down to Earth Program, which I direct for the nonprofit Science Friday Initiative (SFI), will be developing and coordinating a national network of workshops, exhibits and gatherings to teach and learn about the considerable science connected with the honey bee. Please visit the Down to Earth section of the SFI Web site for details. (www.scifri.org/dte)

But there's something we need to do right NOW. We must convince the U.S. Postal Service that America deserves a commemorative postage stamp created in honor of this outstanding under-appreciated American. It is my hope that the beekeeping community, anyone who enjoys honey, and everyone who appreciates the foods we eat which depend on the honey bee, will write a letter encouraging the U.S. Postal Service to honor Langstroth in this way at this special time.

I believe that a flood of letters will help to convince the Postal Service how important Langstroth is to all of us. The U.S. Postal Service Citizens' Stamp Advisory Committee will be considering a Langstroth stamp at their January 2010 meeting, so please send them a letter, today. Get everyone you know on board the postage stamp campaign, and have them enlist their friends.

We will also be preparing a mass petition. Please send an email to me at LLL200@scifri.org and include your Zip Code so that we may show the geographic breadth of this support. This is also a great way to coordinate celebrations in your community with ours.

Carl Flatow
Science Friday Initiative

Send a letter to:
CSAC
c/o Stamp Development
U.S. Postal Service
1735 North Lynn Street
Suite 5013
Arlington, VA 22209-6432
Email me at:
LLL200@scifri.org

WINTER PACKING

I have been trying to come up with a way for providing winter protection for my bees in Nebraska. I thought about providing a fence, or using hay bales around the hive and other methods. All these methods cost money and I am trying to do beekeeping as more than just a hobby. So here is an idea I came up with. This provides the bees with a small hay stack protection. The bags of leaves come from others who are just throwing them away. I just pick them up and pile them around the hives, leaving the entrance for the winter sun.

I plan to put black tar paper on the front so the winter sun can warm the hive. Some grass is placed between the hive and the bags for insulation. In the spring the bags can be removed and either spread in the corn field or given to the recycle man. The people who pack the leaves in the bag are happy their efforts are helping the bees, and I am happy they are doing this so I don't have to pack the leaves. And, the bees get protection from the winter winds.

Robert C. Davis
Cedar Grove Apiary
Eagle, NE

Bags of leaves provide winter packing for this hive. (Courtesy Robert C. Davis)

BIGGER NOT NECESSARILY BETTER, WHEN IT COMES TO BRAINS

Tiny insects could be as intelligent as much bigger animals, despite only having a brain the size of a pinhead, say scientists at Queen Mary, University of London

"Animals with bigger brains are not necessarily more intelligent," according to Lars Chittka, professor of Sensory and Behavioural Ecology at Queen Mary's Research Centre for Psychology and University of Cambridge colleague, Jeremy Niven. This begs the important question: what are they for?

Research repeatedly shows how insects are capable of some intelligent behaviors scientists previously thought was unique to larger animals. Honey bees, for example, can count, categorize similar objects like dogs or human faces, understand 'same' and 'different', and differentiate between shapes that are symmetrical and asymmetrical.

"We know that body size is the single best way to predict an animal's brain size," explains Chittka, writing in the journal *Current Biology*, today. "However, contrary to popular belief, we can't say that brain size predicts their capacity for intelligent behavior."

Differences in brain size between animals is extreme: a whale's brain can weigh up to 9 kg (with over 200 billion nerve cells), and human brains vary between 1.25 kg and 1.45 kg (with an estimated 85 billion nerve cells). A honey bee's brain weighs only 1 milligram and contains fewer than a million nerve cells.

While some increases in brain size do affect an animal's capability for intelligent behavior, many size differences only exist in a specific brain region. This is often seen in animals with highly developed senses (like sight or hearing) or an ability to make very precise movements. The size increase allows the brain to function in greater detail, finer resolution, higher sensitivity or greater precision: in other words, more of the same.

Research suggests that bigger animals may need bigger brains simply because there is more to control - for example they need to move bigger muscles and therefore need more and bigger nerves to move them.

Chittka says: "In bigger brains we often don't find more complexity, just an endless repetition of the same neural circuits over and over. This might add detail to remembered images or sounds, but not add any degree of complexity. To use a computer analogy, bigger brains might in many cases be bigger hard drives, not necessarily better processors."

This must mean that much 'advanced' thinking can actually be done with very limited neuron numbers. Computer modelling shows that even consciousness can be generated with very small neural circuits, which could in theory easily fit into an insect brain.

In fact, the models suggest that counting could be achieved with only a few hundred nerve cells and only a few thousand could be enough to generate consciousness. Engineers hope that this kind of research will lead to smarter computing with the ability to recognize human facial expressions and emotions.

STOPS THE STING TAKES A BITE OUT OF PAIN

Margaret and Mike Fultz display their product, Stops the Sting

by Beth Underwood

The pain was enough to bring a 250-pound man to his knees, screaming like a little girl. The culprit? Fire Ants. The victim? Mike Fultz, owner and developer of Stops the Sting. For several years, Mike and his wife Margaret have distributed Stops the Sting across the country, where it has been used successfully to stop the pain from bee and wasp stings.

Over the past year, though, Mike and his wife Margaret had received numerous testimonials from users who claimed remarkable success with the product after being bitten by fire ants.

"Until this year, we didn't know how bad fire ants were – or how well our product works," Mike said.

Not only was the product neutralizing the venom, it was also alleviating the blisters that typically surfaced as a result of the bites.

It wasn't that Fultz didn't believe the product would work – only that he wanted to see it for himself.

So with the help of a few witnesses, he stuck his hand into the fire ant mound while a video camera taped the footage.

"The pain was so bad, there were a few moments of anxiety as we walked back to the truck to get the product," Mike said. "But once I applied Stops the Sting, the pain was gone – no swelling or blisters."

For some people, though, trying something once isn't enough.

"I believe in the product to the point I've put my hand in a fire ant mound three times, just to be sure."

Each time the results were the same. Fultz even experimented with application as well, discovering that the quicker the ointment is applied, the better the results. The third time he was bitten, he left two bites untreated for about 30 minutes. Small blisters appeared at those sites. But the bites treated immediately - within 5-10 minutes - did not swell or blister.

"There's a huge need out there for something that really works," Margaret said. "We'd tried everything on the market, and nothing worked."

The development of Stops the Sting formula began in 2005. The Fultz's hired a lab in St. Louis, along with several chemical companies to assist in achieving the proper formulation, and then received FDA approval. Today, Stops the Sting is mixed and packaged for them at Memphis Contract Packaging.

"It's odd that adults who normally wouldn't do so are pouring bleach on their bodies to get rid of the pain," Margaret said. "Or they'll suffer through and go on."

"My dad always said, 'If you're gonna be stupid, you better be tough,'" Mike added.

Maybe that's easy to say when it comes to adults, but there are other members of the population who shouldn't be left with that option – especially when Stops the Sting is available, they said.

"People don't think about the children," Margaret said. "It's our responsibility to make sure the kids don't suffer – not only children, but the elderly, too."

Knowing the effectiveness of their product, the Fultz's also want to make clear that anyone who is allergic to bee stings should not replace their current treatment.

"We don't make a life-saving claim. And we do not recommend getting rid of the EPI pens," Mike said. "Use that first. Follow your regular routine, and then apply this to stop the pain."

Oftentimes, the reduction of pain can help with the overall treatment. Intense levels of

pain can also produce anxiety and panic – especially in children.

"This helps calm them because it takes away the pain," they said.

While some products simply numb the pain, Stops the Sting is proven to neutralize venom. In addition to its effectiveness on bee and wasp stings and fire ant bites, the product also works on poison ivy, minor burns, and even jelly fish stings.

"We're very proud of what we're doing," Mike said. "Of course, we want to make money, but what we're trying to do is give people a solution. If we're helping people, that's what matters."

Stops the Sting is available from Dadant & Sons, Inc (**www.dadant.com**). It is also available at the website: **www.stopsthesting.com**, or by calling (931) 403-2464.

Video footage of Mike's fire ant attack is available on **YouTube.com**

THE WORLD'S FIRST ART GALLERY DEVOTED TO BEES

Bees In Art: The world's first art gallery devoted to Beekeeping, Honeybees and Bumblebees depicted in art.

East Yorkshire, UK - Internet based 'Bees in Art' Gallery exhibits artwork by leading artists whose fascination with beekeeping, bees and other Hymenoptera has inspired them.

Bees in Art is curated by Royal College of Art graduates Andrew Tyzack and Debbie Grice.

We exhibit and sell important artworks by contemporary artists: Robert Gillmor and David Koster as well as works by past masters: Graham Sutherland. They deal with all art forms. The gallery is based online and has generated much interest globally. Beekeeping and Bees are an immensely important part of our ecosystem. For the first time, their fantastic life cycle is celebrated through art.

Andrew, 'Bees in Art' founder, is a graduate of the Royal College of Art and a third generation beekeeper. He keeps several beehives in the East Riding of Yorkshire, UK. His earliest memory of beekeeping was helping his grandfather capture a wild colony of bees, established in the wall of a wooden hut: "in the smoky gloom Grandad gently took away the inner wall and there were the bees populating beeswax combs.

Debbie Grice, co-founder, is an award winning artist and graduate of the Royal College of Art. Married to Andrew Tyzack, she is the 'beekeeper's wife', jarring honey and creating the beautiful labels for the jars. Winner of the Folio Society Illustration Award 1998, Debbie produces evocative mezzotint engravings of apiaries. 'The Land Gallery' is Bees in Art's sister gallery and specializes in wildlife art with a special dedication to studying wildlife in the field. The Land Gallery has been featured in BBC TV, BBC Radio, Country Living Magazine, Yorkshire Post and numerous local society publications and newspapers. **(www.beesinart.com)**

BEEKEEPING IN INDIANA

by Steve Doty

Beekeeping in Indiana, 42 pages, 8 ½" x 11", takes its reader through the calendar year, including the basics of getting started with bees, ending up with "tucking down" bees for winter. In between, a full range of topics including races of bees, keeping bees healthy, and removing surplus honey from the hive are addressed.

Using colorful photos to illustrate beekeeping practices, author Doty has written text in simple, easy to follow terms so that beekeepers at all levels of experience and competence can find useful. Well balanced terminology will not intimidate the beginning beekeeper while informing the experienced.

A most interesting diagram is shown on page 12 where an analysis of the Honey Bee Worker's Life History is depicted from the egg stage sequenced through steps including her duties of cell cleaning, feeding larvae, comb building, guard duties and collection of water, nectar, pollen, and/or propolis.

Sticking exclusively to the craft, *Beekeeping in Indiana* leaves to other writers subjects such as marketing of honey and creating various hive products such as honey soaps, etc.

Steve Doty, a Purdue University graduate, resides in Fortville, Madison County, Indiana. A long-time hobby beekeeper, he is organizer/director of the Indiana Bee School, attended by over 500 in 2009, and past president of the 800-member Indiana Beekeepers Association

This publication is a practical gift for beekeepers at all levels, in Indiana, the Midwest and beyond, and makes good reading for anyone keeping honey bees in 2010.

For your copy of *Beekeeping in Indiana* contact the Indiana Beekeepers Association (a not-for-profit organization), Attention: Flo Schneider, Treasurer, 4760 Lanesville Road, Georgetown, Indiana 47122, email **kenny@epowerc.net**. Telephone 812-951-3737. (*Dave Laney*)

Dave Laney, a long-time hobby/sideline beekeeper, is chairman of the Laney Honey Company of North Liberty, Indiana, and co-founder of Indiana Beekeepers Association.

TOURNERET PHOTO BOOK AVAILABLE

French bee photographer Eric Tourneret's stunning new book of photographs of beekeeping around the world, "Cueilleurs de miel" ("Honey Hunters") is now available from Canadian Amazon (Amazon.ca). Photos from a five part series in the *American Bee Journal* offered a sample of this rich collection by a photo-journalist who spent five years traveling the globe, often under perilous conditions, to

ILLINOIS STATE FAIR WINNERS

(left photo) Steve Chard, supervisor of inspection, (left) and Tom Jennings, director of agriculture (right), present Mike Mason the (center) the Illinois Sweepstakes Trophy. He represented the Lincolnland Beekeepers Association. (center photo) Harry Patterson (left) accepts an award for Chuck Lorence, from director Tom Jennings. The 2 1/2 lb. chunk honey sold for $1,100 at the "Sale of Champion Auction." (right photo) Tom Jennings, agriculture director, presents Carolyn Gerberding the trophy for best display for the Lincolnland Beekeepers Association.

gather them. Although the text is in French, the photos tell their stories with rare vividness.

INDIANA ROYALTY

Kelsey D. Salmon (right) and Lacy Dooley are the 2010 Indiana Honey Queen and Princess. They took reign Oct. 24, 2009. Kelsey, from Evansville, IN, has 3 hives and has been keeping bees for about 5 years. Her grandfather taught her as one of her many 4-H projects. Lacy, from Rockville, IN also began keeping bees on her family's farm as a 4-H project. These girls are excited to be teaching children of all ages about the importance of honey bees and serving the Indiana State Beekeeper's Association!

CALIFORNIA

The South Valley Beekeeper's Club would like to invite you to our quarterly meeting January 21, 2010 5:30 p.m. to 9:00 p.m. The meeting will take place at Charlie's, 1531 N. Main Street, Porterville, California 93257.

After pizza/salad bar meal priced at $11.00 including beverage, tax and tip, we will have guest speakers including Dr. Gordon Wordell and Dr. Frank Eischen (if he can get back to California in time).

For more information call Jan Eggman 559-535-5267 or email **familyhoney@hughes.net**

CALIFORNIA

2010 Specialized Classes to Promote Stock Improvement

Taught by Susan Cobey and offered at the Harry Laidlaw Honey Bee Research Facility at UCD, in Davis California.

1. THE ART OF QUEEN REARING WORKSHOP. Two, One day workshops will be offered March 31 and April 7th. The class is designed to provide an understanding and appreciation of what it takes to rear high quality queens. Basic biology and principles of queen rearing will be presented. Registration $125 per class. Signup deadline Mar. 15, 2010.

Optional Queen Production Tour, Thursday Apr. 1st. and April 8th., 2010. For those who would like to see large scale commercial queen production, an optional one day tour will be offered following the Queen Rearing Workshops. We will visit several northern California producers during their busy spring season. You will observe techniques and systems involved in commercial queen production. This tour is optional and open to class members only. It will be scheduled the day after the Queen Rearing Classes. Tour Fee $50.

2. INSTRUMENTAL INSEMINATION & BEE BREEDING WORKSHOP, April 14, 15 & 16, 2010. This class is designed for commercial beekeepers who are involved in a breeding program and for laboratory personnel requiring the skill for research purposes. A practical hands-on approach to instruction is provided with emphasis on individual attention, therefore classes are kept small. Registration $425. Signup deadline Apr. 1, 2010.

3. The ADVANCED WORKSHOP ON INSTRUMENTAL INSEMINATION, April 22 & 23, 2010 Designed as a follow-up to the Instrumental Insemination course, the focus of this class will be perfecting insemination techniques and solving individual problems in the laboratory and in the field. The class is recommended for those with some experience. Registration $375. Signup deadline Apr. 1, 2010.

For Information:
Susan Cobey **swcobey@ucdavis.edu**
http://entomology.ucdavis.edu/courses/beeclasses
University of California, Davis
Dept. of Entomology
Harry Laidlaw Honey Bee Research Facility
367 Briggs Hall
Davis, CA. 95616-8584
Tel. 530-754-9390 Fax 530-754-7757

ARIZONA

3rd Organic Beekeepers Chemical Free Conference, Oracle, Arizona March 5-7, 2010

As the Organic Beekeepers yahoo.com discussion group has now grown in numbers to over 3000+ members, we have put together our 3rd meeting for an American Beekeepers Association, for beekeepers into Organic Beekeeping, to come together to associate for clean sustainable beekeeping with ZERO treatments and getting off the artificial feeds and artificial inbreeding parameters..
For more information see: **http://www.tucsonymca.org/site/c.grLOK1PJLqF/b.691235/k.D62C/Retreat.htm** or **http://www.tucsonymca.org or visit OrganicBeekeepers** at **http://groups.yahoo.com/group/organicbeekeepers/** or contact Dee Lusby for information/registration at: 520-398-2474 eve. For payment of registration per person of $150, due in advance of attending, send to Organic Beekeepers c/o Dee Lusby, HC 65, Box 7450, Amado, Arizona 85645, with stamped self addressed envelope for returning receipt and more information on YMCA to sender, plus liability/medical form to be filled out. Note: $150 fee is a straight fee whether sleeping/eating at camp or not. For general information concerning the meeting, other contacts are Keith Malone (Alaska) 907-688-0588, and Ramona/Dean at 978-407-3934

NEBRASKA

University of Nebraska Cooperative Extension

Everything You Need to Know to Succeed in Apiculture

Beginning Beekeeping Workshops
Hastings, NE - Feb. 27, 2010
Nebraska City, NE – March 13, 2009

Beginning Beekeeping Field Day
Ithaca, NE - April 17, 2010

Master Beekeeping Workshop
Ithaca, NE - June 10-12, 2010

Beginning Beekeeping workshops have been scheduled for 2010 at the following sites:

Feb. 27 - Hastings 9:00 AM - 5:00 p.m.
Mar. 13 – Nebraska City 9:00 AM - 5:00 p.m.
April 17- Ithaca 10:00 AM - 2:00 p.m.

Registration fee for the Hastings and Nebraska City workshops is $20 per person plus $6 each for additional family members. Registration includes lunch, refreshments and a workbook for new beekeepers. Preregistration is required for both workshops. The Ithaca Workshop is a hands-on session for participants in both the Hastings and Nebraska City Workshops. There is no registration fee for the Ithaca Workshop, and lunch is pot-luck so bring a dish to share. If you have questions about the workshops or need further information, contact: Marion Ellis at:
Email: **mellis3@unl.edu**
Phone: (402) 472-8696

Send Hastings Registrations to:
Dr. Ron Seymour, Assoc. Extension Educator
Adams county Extension Office
300 North Joseph Avenue
Room 103
Hastings, NE 68901-7597
Email: **rseymour1@unl.edu**
Phone: (402) 461-7209

Make check to: University of Nebraska

Send Nebraska City Registrations to:
Vaughn Hammond, Extension Technologist
5985 G Road
Kimmel Education and Research Center
Nebraska City, NE 68410
Email: **vhammond2@unl.edu**
Phone: (402) 873-3166
Make check to: University of Nebraska

2010 Master Beekeeping Workshop
A 3-day Master Beekeeping Workshop will be offered in Ithaca, Nebraska at the Agricultural Research and Development Center Headquarters Building on June 12-13. This workshop will provide detailed instruction bee biology and practical beekeeping. Training will include both classroom and hands-on sessions. Registration for the workshop is $100 and includes 5 meals, a workbook, a cap and refreshments. The handson sessions will be in an apiary and participants should bring their own protective gear. For a complete program with schedules and a list of presenters contact Jeri Cunningham (contact and registration information provided below).

Send Master Beekeeping Workshop Registrations to:
Jeri Cunningham
University of Nebraska
Department of Entomology, 202 Entomology Hall, Lincoln, NE 68583-0816
Email: **jcunningham1@unl.edu**
Phone: (402) 472-8678
Make check to: University of Nebraska

MISSOURI

Eastern Missouri Beekeepers To Host Third Annual Beekeeping Workshop

Leading Midwestern Educators to Present Courses for Beginners and Experienced Beekeepers

St. Louis, Missouri, November 25, 2009 – The Eastern Missouri Beekeepers Association will offer full-day courses of instruction for beginning and experienced beekeepers on Saturday, Feb. 20, 2010, from 8:00 a.m. to 4:30 p.m. at Maritz in Fenton, Missouri. Space is limited, and will be filled on a first-come-first-served basis.

The courses will be led by Grant Gillard, Vice President of the Missouri State Beekeepers Association, Gary Reuter, Staff Scientist at the University of Minnesota, Department of Entomology, and Joli Winer, 1st Vice President of the Kansas Honey Producers Association.

Lunch and refreshments will be provided. The registration packets will include course materials, beekeeping periodicals, and equipment catalogs.

The February courses will be followed throughout the season by field workshops as well as equipment and honey bee procurement projects, which are sponsored and led by EMBA members.

Registration is available online starting Dec. 4, 2009, at **www.easternmobeekeepers.com**, or by completing and mailing the downloadable registration form.

Tuition cost is $75 per person prior to February 1st. Tuition cost is $90 per person for those registering on or after February 1st. Registration closes February 13th unless filled sooner. There will be a waiting list, if needed. More participant information on the workshop is available by calling 314-894-8737 or online at **www.easternmobeekeepers.com**.

WISCONSIN

The Dane co. (Wisconsin) Beekeepers Association is holding a class called Fundamentals of Beekeeping on Jan 30, 2010. Registration opens at 7:30 a.m., class runs from 8 a.m. to 4:30 p.m. Location is the Warner Park Community Center in madison, WI. All aspects of getting started will be covered. The cost is $60, which includes the full day class, lunch, printed materials, and membership in the Wisconsin Honey Producers Association, as well as the Dane Co. Club. All interested people are invited to attend. To register, contact Jeanne Hansen 608-244-5094 **jeannielabeannie@yahoo.com**

INDIANA

The Indiana Beekeepers' Association (IBA) will hold its **Indiana Bee School VIII** in Indianapolis, Indiana on **Saturday, February 27, 2010.** It will be held at the Southport Presbyterian Church on 7525 McFarland Boulevard. This is an excellent facility with plenty of room for our breakout sessions and is very accessible.

Kirk Webster, a well known beekeeper from Vermont and **David Tarpy**, an associate professor and extension apiculturist from N C State University have both agreed to be two of our speakers for the school. We are especially excited to have them both at our school. Don't you dare miss this one!

We are planning to have four breakout sessions, with each session having five different topics to choose from. Lectures, hands-on workshops and discussions will be held for beekeepers with any level of skill, experience or ability. Topics on introductory beekeeping tools and techniques as well as learning opportunities for the more advanced beekeeper will be available. Along with a great program are a raffle, an auction and a variety of vendor displays and supplies from several of the top vendors (such as Brushy Mtn., Dadant, Walter Kelley Co. and others).

You will have a chance to meet and informally visit with beekeepers from across the state. On-site registration starts at 8:00 A.M. (EST) with program starting promptly at 9:00 A.M. and concluding at 3:30 P.M. Registration fee will be $30.00 per individual or $40.00 per family (lunch included). To guarantee a spot for yourself, your registration form must be received by Feb. 19, 2010.

For future updates join the **Indiana Beekeepers' Association** and get all of the information in the upcoming newsletters or contact Steve Doty 317-485-5593 or jsdoty@indy.net or http://indianabeekeeper.goshen.edu

KENTUCKY BEE SCHOOL

Feb 6, 2010
Allen County Beekeepers School
Scottsville, KY

Contact:Allen County Beekeepers Association, John Pace, President
P.O. Box 577, Glasgow, KY 42142-0577
Phone (270)651-6507
Email: **jlpace@glasgow-ky.com**

OHIO

OSUE/TCBA Spring Workshop
Friday & Saturday, March 5 & 6, 2010

Ohio State University Extension and Tri-County Beekeepers Association of Northeastern Ohio will hold their 31st Annual Beekeeping Workshop on ***Friday & Saturday, March 5 & 6, 2010***, at The Ohio State University, Ohio Agricultural Research and Development Center (OARDC). OARDC is located on State Route 302 south of US 30 in Wooster, Ohio. This is the largest workshop in the United States.

This year's Workshop theme is: ***Modern Beekeeping – New Ways of Doing Old Things. Dr. Dewey Caron,*** Keynote Speaker will speak about *"CCD & AHB: Not Everything Is All Bad".*

On Friday, March 5, 2010, will start the Spring Workshop with an evening program with *Dr. James E. Tew, Ohio State University Extension Specialist, Apiculture* will talk about ***"Good Bees in Bad Places"*** and *Ms. Kathy Summers, Bee Culture Magazine* about ***"Bee Culture Through the Years"*** at OARDC's Fisher Auditorium. Also, that night OSU's Beekeeping Museum will be open for tours. Beverages and cookies will be served to finish the evening.

On Saturday, after the Keynote talk there will be will be breakout sessions on Recognizing Bee Diseases, Beekeeping without Chemicals, Status of Midwest Queens, Urban Beekeeping, Encaustic Painting and a Children's program to list a few. Other interests are the Baking Contest, Door Prizes, Vendor Displays, Bee Museum and a favorite the Hands-on/Demo Room of bee equipment. ***New*** this year will be a 4th breakout session for Basic Beekeeping. Registration starts at 8:00 a.m. with the program starting at 9:00 a.m. until 4:45 p.m. The pre-registration fee is $35.00 per adult over 17 (walk-in registra-

tion is $45.00; TCBA members pre-registration $30.00); Children (17 years and under) registration is $5.00 per child. A hot turkey lunch with mashed potatoes, vegetable, and homemade pie or boxed lunch will be offered for an additional charge.

Vendor registration is $75.00 per table with one person's registration included. *For more information contact: Sherry Ferrell at (330) 263-3684, e-mail:* ferrell.6@osu.edu.

PENNSYLVANIA WORKSHOPS

Beginning Beekeeping Workshop

A Beginning Beekeeping Workshop will be conducted from 9 AM to 4 PM on Saturday, Feb. 6, 2010, at Penn State Beaver Campus in Monaca, PA. The workshop is sponsored by Penn State Cooperative Extension, and the beekeeping organizations of Beaver Valley, Armstrong-Indiana, Northwest PA, West-Central PA and Westmoreland County. Workshop participants will learn how to get started in beekeeping and basic management skills. Registration fees are $45 for the primary registrant, and $20 for spouses/guests and children 18 & under. The registration fee includes an information packet (for primary registrant only) and lunch, and paid registrations are required by January 29. For more information, contact Penn State Cooperative Extension at 724-774-3003 or on the web at http://beaver.extension.psu.edu – click Upcoming Programs & Events.

Western Pennsylvania Beekeeping Seminar

The Western Pennsylvania Beekeeping Seminar will be conducted on Friday and Saturday, Feb. 19 and 20, 2010, at the Pittsburgh Marriott North in Cranberry Township, PA. The program will begin Friday evening from 7 – 9 PM and continue on Saturday, from 8 AM – 4 PM. Presenters for the seminar include Dr. Marion Ellis, University of Nebraska entomologist; Dr. Cristina Grozinger & Dr. Nancy Ostiguy, professors at Penn State University; John McKellup, wildlife biologist and beekeeper; Craig Cella, bee inspector and bee entrepreneur; and Jon Laughner, County Extension Director & Ag Entrepreneurship Educator, and Mary Alice Gettings, Nutrition & Health Educator, both of Penn State Cooperative Extension in Beaver County. This seminar for experienced beekeepers is sponsored by Penn State Cooperative Extension, the Pennsylvania State Beekeepers Association, the Beaver Valley Area Beekeepers, and the beekeeping organizations of Western Pennsylvania. Registration fees are $45 for the primary registrant, and $20 for spouses/guests and children 18 & under. The registration fee includes an information packet (for primary registrant only) and lunch, and paid registrations are required by February 12. For more information, contact Penn State Cooperative Extension at 724-774-3003 or on the web at http://beaver.extension.psu.edu – click Upcoming Programs & Events.

NEW YORK

New York SABA Seminar 9-5 on March 27

Presented by the Southern Adirondack Beekeepers Association at the University of Albany.

Speakers:

Dr. Thomas Seeley of Cornell University

Dr. Marla Spivak of the University of Minnesota

Allen Hayes, EAS Master Beekeeper from Maryland

NEW YORK

HoneybeeLives Winter 2010 Organic Beekeeping

HoneybeeLives is holding their Organic Beekeeping classes with Chris Harp during winter weekends at locations in New York, including the Hudson Valley and Washington and Rockland counties. The Saturday classes are "Intro to Organic Beekeeping: Planning a New Hive for Spring," and the Sunday classes are "Understanding and Caring For Your Bees," with dates available from late January to early March. Visit **www.HoneybeeLives.org** for dates and locations.

CONNECTICUT

On February 13, 2010, the Connecticut Beekeepers Association will host their annual Bee School. Topics will include types of equipment, installing packages and nucs, seasonal management, handling bees and more. The bee school will be held at Jones Hall at the Connecticut Agricultural Experiment Station in New Haven, CT. For more information, see **www.ctbees.com** or email us at **information@ctbees.com**

CONNECTICUT

Back Yard Beekeepers Association January 26, Marina Marchese

On Tuesday, January 26, Marina Marchese, author, artist, entrepreneur and longtime BYBA board member will speak about her experiences on writing her newly published book "Honeybee: From Hive to Home, Lessons from Accidental Beekeeper". Copies will be on sale for signing. Meetings are at 7:30 PM in the Norfield Congregational Church in the Community Room on Norfield Road in Weston, Connecticut. At 6:30 PM there is a New Bees meeting for beginning beekeepers and Wannabees youth group meeting.

Each month we have timely weekend hands on inspection workshops, bee school, mentor program and more. All events are free and open to the public. Please check our web site for the dates and locations or more information at www.backyardbeekeepers.com or contact Serge Boyce 203-259-4861 or **sergeboy@optonline.net** if you have any questions.

Bee School

Mondays, March 1, 8, 15, 22,

Workshops:

January 23: Mead Madness: Howland Blackiston. February 6: Soap Making: Marina Marchese March 20: Hands on Hive set up: Leslie Huston & Board April 10: Hiving Package Bees: Dick Marron. May 15: Hive Inspection Part 1: Dick Marron. May 23: Queen Yard Open House: Leslie Huston & Board. June 5: Wanna Bees kids & family: Bob Kreitler. June 12: Installing a Bear Fence : Jeff Shwartz. June 13: Basic Queen Rearing: David Blocher & Leslie Huston. June 19: Swarming & Making Splits: Win Baum. July 10: Hive Inspection Part 3: Mary Howansky. July 24: Honey Harvest: Ellen Zampino. August 14: Fall Preparation Workshop: David Blocher. September 11: Hive Inspection Part 4: Andrea & Bahman Azarm. November 6: Beeswax Workshop: Ellen Zampino, Patty Pulliam & Marina Marchese.

VIRGINIA

Northern Virginia Teaching Consortium, 2010 Beginning Beekeeping Classes

The Northern Virginia Beekeeping Teachers Consortium is offering Practical Beekeeping for Beginners consisting of weekly classes held from 7-9 pm (unless otherwise noted) late January to early April, 2010. Classes are open to adults and children (age 9 and over) who are interested in keeping bees, as well as to those who are just interested in learning about honey bees. Class Size is limited, so please register early. Teaching materials are included in the class fee of $100 (plus or minus $15 or so) and includes local club membership, Mid Atlantic Apiculture (MAAREC) Beekeeping Basics and Honey Bee Parasites Pests and Predators & Diseases, Kim Flottum's Backyard Beekeeping, as well as power point handouts and a one year membership in the local beekeeper associations. Classes are taught by EAS Master Beekeepers and experienced beekeepers

Beekeepers Association of Northern VA

(Arlington, Alexandria, and Fairfax)

Mondays beginning February 15 or 8 Wednesdays beginning February 17

Falls Church High School Cafeteria, Falls Church, VA

Contact Pat Haskell: **jim.haskell@verizon.net** (preferred) or (703) 560-3484

Open House and Registration: Feb 10

Gateway Beekeepers
(King George, Westmoreland)
8 Tuesdays beginning January 26
VA Cooperative Ext. Office, Village Center, King George, VA
Contact Julie Moore 540-644-1138, **Juliemoore@dirtybirdpottery.com**, or Mike Church 540-775-9740, **Churchmj@verizon.net**

Loudoun Beekeepers Association
(Loudoun)
8 Fridays beginning February 5 or Saturdays beginning February 6
Loudoun County Coop. Extension Office, Leesburg, VA
Contact Bill Bundy, 703-779-0894, **Loudounbee@gmail.com**
See **http://www.loudounbee.org**

Beekeepers of the Northern Shenandoah
(Clarke, Frederick, Warren)
8 Wednesdays beginning February 24 or 8 Thursdays beginning February 25
Virginia Arboretum, Boyce, VA
Contact John Lewis, Day - (540) 686-7280, Evening - (540) 931-4390

Northern Piedmont Beekeepers
(Culpeper, Rappahannock, Orange, Madison, Fauquier)
8 Tuesdays beginning February 9
Verdun Adventure Bound Center, Rixeyville, VA
Open House and Registration: Feb 7, 2-4pm
Contact Mike King or Karen Hunt (540) 937-4792, **Kahu9@juno.com**

Prince William Regional Beekeepers
(Prince William, Fauquier, Stafford)
8 Thursdays beginning January 21
St. Benedict Monastery, 9535 Linton Hall Road, Bristow, VA
Contact Louise Edsall, (703) 369-0756 or **PWRBeekeepers@gmail.com**
See: **http:// www.PWRBeekeepers.com/**

Rappahannock Area Beekeepers Assoc.
(Spotsylvania, Stafford)
8 Tuesdays beginning February 2
Marshall Center, Spotsylvania Courthouse, VA, Ray Simms Room
Contact Kim Fraser, (540-785-8769), **Ubbuny@AOL.com**

Piedmont Beekeepers Association
(Lynchburg area)
8 Tuesdays beginning February 2
James River Day School, 5039 Boonsboro Rd., Lynchburg, VA
Contact Ann Zudekoff, (434-660-6063), **AnnZee@AOL.com**

Northern Neck Beekeepers
(Heathsville, Northumberland Co. area)
(8 Mondays beginning January 25)
Northumberland Public Library, 7204 Northumberland Highway, Heathsville VA 22473
Contact Matt Lewis, Northumberland Extension Office, (840-580-5694), or Jim Schmalz, (804) 580-2071, **jaschmalz@Juno.com**

NORTH CAROLINA

Going beyond the basics: The WNC Bee School is presenting a four-day Intermediate Bee School on the campus of Warren Wilson College. On January 30-31 and Feb. 6-7 of 2010 the School will feature speakers and classes to expand the knowledge and techniques of experienced beekeepers. For more information or to register go to http://www.wncbees.org or call Buncombe County Coop. Extension, (828) 255-5522.

ALABAMA
Auburn University's 14th Annual Beekeeping Symposium

Auburn University, Alabama Extension System will hold their ***14th Annual Beekeeping Symposium on Saturday, Feb. 6, 2010,*** at the Auburn University, Lowder Building, College of Business, 415 West Magnolia Ave., Auburn University, AL.

Keynote speaker is: Dr. James E. Tew, OSU/AU Alabama Extension System, Apiculture Specialist. Some other speakers include Phillip Carter, Sallie Lee, Bill Mullins, Buddy Adamson, and Dennis Barclift.

There will be a wide range of topics which include "Raising & Replacing Queens", "Urban Beekeeping", "Planting and Gardening for Bees", along with a Basic Beekeeping track for those interested in becoming and new beekeepers.

Registration starts at 8:00 a.m. to 8:45 a.m. with the program starting at 8:45 a.m. until 3:45 p.m. Lunch will be provided by the Alabama Beekeepers Association. The registration fee for the day is $17.00. For more information contact Angie Rodgers at 334-844-5006 or e-mail: rodgeas@auburn.edu or Sherry Ferrell at 330-263-3684 or e-mail: ferrell.6@osu.edu

ALABAMA
New Beekeepers Association

On Oct. 20, 2009, a core of beekeepers created a new organization named the Central Alabama Beekeepers Association (CABA). The purpose of this association is to promote beekeeping among fellow beekeepers, agriculture and the general public; in particular, assisting members with bee questions about apiary management.

Thirty plus prospective beekeepers members attended the first meeting Nov. 5, 2009 at the Montgomery Extension Service Office, 400 Eastern Boulevard, Montgomery, AL at 6 p.m. Subsequent meetings will be on the first Thursday of each month.

At this meeting bee hive pest management and control were discussed, with chemicals and equipment use demonstrated. Fred Fulton of the Alabama Beekeepers Association was the speaker. For additional information, call Lisa Fifield, (334) 272-5416, (334) 799-3066.

FLORIDA

The North Escambia Bee Association (NEBA) will be hosting a Beekeeping Chautauqua February 27, 2010. The meeting will begin at 8 a.m. Everyone is welcome to attend. The preregistration cost will be $30.00 for man and wife, $25 for singles, $12.50 school students (12+) children 11- admitted free. If you choose to pay at the door, there will be an additional $5.00 per person. Please make plans to attend.

If you need more information, please email **ekpeach@dpeach.com** or call Diana Miller at 850-968-2676 or Peaches at 850-206-9352. See you there.

GEORGIA
Honey Bee and Beekeeping, An Introduction

Everyone is invited to attend the one-day course An Introduction to Honey Bees and Beekeeping. In this course you will learn basic facts about honey bees, plant pollination, and the fundamentals of beekeeping.

This course is for teachers, master gardeners, both new and experienced beekeepers, students, government employees, and others who are interested in learning new things

SPONSOR: Metro Atlanta Beekeepers Association, Inc. www.metroatlantabeekeepers.org
DATE: Saturday, January 23, 2010
TIME: 8:30 a.m. to 4:30 p.m.
PLACE: Atlanta Botanical Garden, Day Hall, 1345 Piedmont Avenue, Atlanta, Georgia 30309
FEE: $95 which includes:

- Morning coffee and light breakfast, lunch, and afternoon snack.
- First class presentations by Ph.D. educators in entomology and botany, and experienced urban beekeepers.
- Displays of beekeeping equipment and hive products.
- A honey tasting.
- Educational materials related to the presentations.
- Goody bag of honey-bee related items.
- Free Admission to the Atlanta Botanical Garden and free parking.

REGISTRATION: Registration may be made and paid for on-line. You may also download a registration form from the website www.beekeepingshortcourse.com and mail it in with your payment.

For more information, please contact Marcia Radakovich: arciarad@bellsouth.net 770-518-9180

ST. CROIX, VIRGIN ISLANDS
Queen Rearing Class

A three-day queen rearing course will be offered February 19, 20 and 21 on St. Croix in the Virgin Islands. Dr. Lawrence connor is the instructor. There is a very limited number of spaces open for this course. For a fact sheet that includes fees, housing options and course details, go to the **www.wicwas.com** website, or email Dr. Connor at **LJConnor@aol.com**

The Story of the American Bee Journal

The Beekeeper's Companion for 150 Years

The story of the *American Bee Journal*, its origin, and Samuel Wagner, the first editor, must be closely associated with the Rev. L.L. Langstroth. In 1851, Langstroth had invented his movable-frame hive. In September 1851, a few weeks after a call on Langstroth, the Rev. Dr. Joseph Frederick Berg, pastor of a church in Philadelphia, visited Wagner and told him about this extraordinary beekeeper, his movable-frame hive and his beekeeping methods. They agreed that Wagner should go and see for himself, but it was not until August 1852, almost a year later, that he was able to do so.

After visiting Langstroth's apiary and seeing his hive, Wagner made a decision at a personal sacrifice to himself. He had corresponded with Dzierzon, discoverer of parthenogenesis, proponent of a practical system of beekeeping and author of a book entitled *Rational Beekeeping*. He had received permission to translate the book into English to be published for the improvement of American beekeeping. Wagner had made the translation, but it was never published. Recognizing the Langstroth movable frame hive as superior, he decided to encourage Langstroth to write a book instead; for his part, he would place all his store of information at Langstroth's service.

Langstroth quickly prepared the copy for the first edition of his book with the assistance of his wife, and *Langstroth on the Hive and the Honey-Bee, A Bee-Keeper's Manual* appeared in May of 1853.

Inasmuch as there were already two bee journals published in Germany, Langstroth made this prediction: "There is now a prospect that a Bee Journal will before long be established in this country. Such a publication has long been needed. Properly conducted, it will have a most powerful influence in disseminating information, awakening enthusiasm, and guarding the public against the miserable impositions to which it has so long been subjected."

Wagner established the *American Bee Journal* and its first issue appeared in January 1861, and from the start he had Langstroth as a contributor as well as an advisor. But after one year of publication, the Civil War resulted in the suspension of its publication until July 1866, when it was resumed.

To quote from Pellett's *History of American Beekeeping*, "The history of the *American Bee Journal* has been the history of the rise of beekeeping, and the one is inseparably linked to that of the other. Before this first copy of the first bee magazine in the English language appeared, there were few of the implements now in common use among beekeepers. Conventions of beemen had not been held, a practical smoker had not yet been invented, queen excluders were unknown, comb foundation was still to be perfected, the extractor had not come into use, nor had commercial queen rearing been suggested.

The early volumes of the *Journal* contain

AMERICAN BEE JOURNAL.

PUBLISHED BY A. M. SPANGLER & CO., 25 NORTH SIXTH ST., PHILADELPHIA.

Vol. I. JANUARY, 1861. No. 1.

Bee Culture.

Bee Culture need no longer be a precarious and empirical pursuit. Discoveries and improvements comparatively recent, have so elucidated its principles, that its processes can be more definitely regulated than those of almost any other branch of rural economy. Without being divested in the least of that attractiveness which, from the earliest periods of history, drew to it the attention alike of the humble cottager and the inquiring student—making it a subject of unflagging interest and unfailing enjoyment, it now claims additional regard from the fact that it can be so conducted as to become a source of certain and ample remunerating profit. It may be viewed, first, as a *science* having for its object the attainment of a correct knowledge of all that pertains to the life, habits and instincts of the honey bee; and, secondly, as a *practical art*, which regards all the attainments thus made and to be made, as the only reliable foundation of successful management.

The chief cause of the depressed condition of bee culture in general, is not to be traced to any want of attention to the subject. It is to be found rather in an inadequate knowledge of and erroneous opinions concerning the physiology and habits of the insect; in the defective or ill-adapted construction of the hives, however differing in form and material, in which it has been doomed to live and labor; and in an injudicious mode of treatment. This, more than aught else, has prevented bee culture from making progress commensurate with the time and attention devoted to it. Despite the most assiduous observation and study, the interior of the hive and the domestic economy of the colony, remained till recently, and still remain for the masses, *a mystery*. The common beekeeper know that he was the owner of a stock of bees; he know also, if he knew much, that among them was a queen, and workers, and drones. But the peculiar functions of each kind or class, and their respective relations to each other were, and still are with most persons, matters of conjecture and dispute. Of the means, also, of properly directing the labors of a colony, of regulating its operations systematically, so as to secure desired ends, almost utter ignorance prevailed, and still prevails very generally. After the swarm was secured—whether with or without superstitious observances—the hive was placed on its stand, and the bees were allowed to prosecute their labors as best they might. If in peculiarly favorable seasons or locations, the stock happened to thrive satisfactorily, its owner was thought to have *luck;* but rarely had any one the vanity to claim success as the result of his management. And yet, duly allowing for the vicissitudes of seasons, certain and regular success does most essentially depend on management. An adequate knowledge of the nature, habits, and instincts of the insect having once been attained, and a thorough control of the operations of the colony secured by the use of properly-constructed hives, the business fairly and truly becomes a subject of mere management. The means of acquiring such knowledge have now been made accessible, and hence we were warranted in stating, as we did, that bee culture need no longer be a precarious pursuit, but should be one regulated by system. The accumulated discoveries made within the last fifteen years, combined with deductions from facts previously recorded, have totally revolutionized the business, placed it on a firm foundation, and given it an impetus which must cause it to advance and flourish. Having reached this stage of development, it claims a higher appreciation, and deserves

January 1861 American Bee Journal, Vol. 1, No. 1.; the first English language beekeeping magazine published.

American Bee Journal Editors		
Samuel Wagner	1861-1872	Published at Philadelphia later at Washington, D.C.
W.F. Clark	1872-1874	Published at Chicago, IL
W.F. Clark-Editor E.S. Tupper-Editor T.G. Newman-Mgr.	1875-1878	Published at Chicago, IL
T.G. Newman A.H. Newman-Mgr.	1879-1892	Published at Chicago, IL
George W. York	1892-1912	Published at Chicago, IL
C.P. Dadant, Dr. C.C. Miller	1912-1937	Published at Hamilton, IL
G.H. Cale, F.C. Pellett, M.G. Dadant	1938-1940	Published at Hamilton, IL
G.H. Cale, F.C. Pellett, M.G. Dadant, J.C. Dadant	1940-1945	Published at Hamilton, IL
G.H. Cale, F.C. Pellett, M.G. Dadant, J.C. Dadant, and Roy Grout	1945-1947	Published at Hamilton, IL
G.H. Cale, F.C. Pellett, M.G. Dadant, Roy Grout	1948-1949	Published at Hamilton, IL
G.H. Cale, F.C. Pellett M.G. Dadant, Roy Grout and Adelaide Fraser	1950-1951	Published at Hamilton, IL
G.H. Cale, M.G. Dadant Roy Grout, Adelaide Fraser	1951-1956	Published at Hamilton, IL
G.H. Cale, M.G. Dadant and Roy Grout	1957-1965	Published at Hamilton, IL
G.H. Cale, M.G. Dadant Roy Grout, Vern Sisson	1965-1966	Published at Hamilton, IL
Vern Sisson, Roy Grout and M.G. Dadant	1966-1972	Published at Hamilton, IL
Vern Sisson	1972-1974	Published at Hamilton, IL
Joe M. Graham William R. Carlile James R Scheetz	1974-1975	Published at Hamilton, IL
Joe M. Graham William R. Carlile	1975-1977	Published at Hamilton, IL
Joe M. Graham	1977-2010	Published at Hamilton, IL

the names of many men of worldwide reputation in the beekeeping world. From the start, Langstroth was a contributor, but to mention a few of the others we would include Henry Alley, Adam Grimm, Moses Quinby, Elisha Gallup, Charles Dadant, Baron von Berlepsch and Dzierzon. Charles Dadant made his first contributions in November 1867, introducing himself as a newcomer from France. From then until his death in 1902, his name frequently appears as a writer in its pages.

For a long time, much space was devoted to the discussion of patent hives, and hundreds of different kinds received attention. In one year, 1869, more than 60 patents were recorded on hives and appliances, which gives one an understanding of the public interest in beekeeping at that time. Charles Dadant's defense of the Langstroth patented beehive, which appeared in the *Journal*, had an important place in the final judgment which awarded credit to the frail minister who profited little from his effort.

In the 1870s, a number of other bee publications were started, some of which continued publication for a time. Most made their beginnings after the death of Wagner in 1872. The *American Bee Journal* was continued by Wagner's son with the assistance of Langstroth, who may have done most of the editorial work until January, 1873, when the Rev. W. F. Clarke became editor and owner. When Samuel Wagner resumed publication of the *Journal* after the Civil War, it was published in Washington, D.C., but when Clarke assumed its management, he moved the *Journal* to Chicago, Illinois.

Clarke's connection with the *Journal* was short – in July of 1874, Thomas G. Newman purchased the *American Bee Journal*. Thomas G. Newman continued as editor and publisher until April 1892, when George W. York joined the staff and the masthead of that issue lists Newman as editor and York as assistant editor. The announcement of the sale of the Journal to George W. York appears in the June 1897 issue and the masthead reads: "Published weekly by George W. York & Co."

York continued editing and publishing the *American Bee Journal* as a weekly. In the May 1912 issue, is published a letter, dated April 1, 1912 and signed by George W. York, that announced he had sold the *American Bee Journal* and his business to C.P. Dadant, Hamilton, Illinois. The masthead reads: "C.P. Dadant, Editor; Dr. C.C. Miller, Associate Editor." Thus the *American Bee Journal* was moved to Hamilton where it has been published ever since. In 1916 C.P. Dadant hired Frank C. Pellett as staff correspondent. Pellett later was to be designated field editor, associate editor and editor.

M.G. Dadant, returning from college at the University of Illinois, joined the staff of the *Journal* in October 1918, and his name appears in that issue as business manager; a title he was to hold until the death of his father, C.P. Dadant. About the same time, G.H. Cale, Sr., was employed to take care of the Dadant apiaries, and his name first appears in

the October 1928 issue of the Journal as an associate editor, and later he became designated editor on the death of C.P. Dadant in 1938.

During the 1940s through the 1960s, *Journal* editors and associate editors included M.G. Dadant, Frank C. Pellett, J.C. Dadant, Roy A. Grout and Adelaide Fraser. In 1965, Vern Sisson came on board, first as an assistant editor and later as editor during the early 1970s. Others assisting with the *Journal* during the early 1970s included Dale Maki and Jim Sheetz. Bill Carlile, long-time columnist and Dadant beekeeper, also assisted in editorship duties during the 1970s. In 1974, Joe Graham was hired as editor and he has continued in this position until the present day.

C.P. Dadant had earlier written, "I want the *American Bee Journal* to be the finest publication about bees and beekeeping in the world." We, who are continuing its publication, have this as our goal and guiding light.

Next Month—Samuel Wagner, Our First Editor

The Mystery of the Missing Volumes

After only one year of publication, 1861, the Civil War necessitated stopping publication of the magazine for four and one-half years. It did not resume publication until July 1866. Therefore, to be technically accurate, the magazine has only been published for 146 volumes, not 150. How did the magazine regain those missing four volumes?

In 1891 editor Thomas Newman felt that interest in beekeeping had reached a point that a weekly *American Bee Journal* should be published. So, for the next four hectic years, 1891-1894, the monthly *American Bee Journal* became a weekly. However, this made a truly huge yearly volume since Newman retained the same number of pages in each weekly edition as had formerly been published only once a month (in 1891, 1,664 pages). In the January 29, 1891 edition subscriber William S. Barclay of Beaver, PA., said, "Think of 1,664 pages a year and all for $1.00; why, it almost takes the breath away! Will not the volume be immense? How would it do to have two volumes (with two indexes) in the year…?" Editor Newman responded, "We had thought of making two volumes in a year, and may do so yet, giving an index every six months."

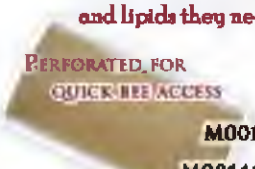
Newman followed through with the idea, so for the years 1891 through 1894 two volumes per year were published. Although at the time Newman probably never thought about the missing four early volumes (1862-1865), his doubling of volumes for these four years neatly made up the difference for the missing volumes of 1862, 1863, 1864 and 1865. Therefore, subsequent editors celebrated the magazine's 50th anniversary in 1910, its 75th anniversary in 1935 and its 100th anniversary in 1960. And so, in keeping with tradition, we are celebrating our 150th year in 2010.

DADANT & SONS, INC.

BEE NUTRITION SPECIALISTS

BROOD BUILDER PATTIES

All NEW Brood Builder Patties are a superior pollen substitute providing your bees more protein with all the amino acids, vitamins and lipids they need. Each patty weighs approximately one pound.



PERFORATED, FOR QUICK BEE ACCESS

AVAILABLE IN 10 PATTY PACK AND 40 POUND BOXES

M0014610 BROOD BUILDER PATTIES 10 PACK . . . $17.50

M0014640 BROOD BUILDER PATTIES 40 LB. BOX

1-20 BOXES . . . $43.75 PER BOX
21-39 BOXES . . . $42.75 PER BOX
40-159 BOXES . . $41.00 PER BOX
160+ BOXES . . . $39.25 PER BOX

DRY FORMULA ALSO AVAILABLE IN 5 LB. BOXES AND 25 LB. BAGS

MEGABEE™

THE TUCSON BEE DIET

MAY BE FED AS DRY FEED, LIQUID OR PATTIES

1 LB. PATTIES*

*APPROXIMATE WEIGHT 1 LB.

M0190010P MEGABEE PATTIES* 10 PACK
1 - 3 . . . . . $25.00
4 - 10 . . . . . $22.50
11 & UP $19.50

M0190040P MEGABEE PATTIES* 40 BOX
1 & UP $58.00

PRICES FOB HAMILTON, IL

DRY FORMULA ALSO AVAILABLE IN 5 LB. AND 40 LB. BAGS

WHY GO TO THE EFFORT OF MIXING PATTIES, A MESSY AND TIME CONSUMING JOB! LET US DO IT FOR YOU!
DADANT MADE PATTIES ARE A CONVENIENT WAY TO PROVIDE YOUR BEES THE PROTEIN THEY NEED.

AVAILABLE UPON REQUEST
MEGABEE
— OR —
BROOD BUILDER
PATTIES

NEW
MADE TO ORDER
WITH ANY
COMBINATION

HONEY B HEALTHY & OR nozevit

— 400 LB. MINIMUM —

Dadant

Dadant & Sons, Inc.
51 S. 2nd Street, Hamilton, IL 62341
1-888-922-1293 · www.dadant.com

· Chico, CA (877) 332-3268 · Fresno, CA (877) 432-3268 · Paris, TX (877) 632-3268 ·
· Sioux City, IA (877) 732-3268 · Watertown, WI (877) 232-3268 · Albion, MI (877) 932-3268 ·
· Waverly, NY (877) 532-3268 · Chatham, VA (800) 220-8325 · Frankfort, KY (888) 932-3268 · High Springs, FL (877) 832-3268 ·

EARLY AMERICAN BEEKEEPING LITERATURE

by M. G. DADANT*

In summarizing the literature of the early years of the *American Bee Journal*, it is only fair to go back previous to that time and get some idea of the events which occurred which influenced the make-up of the *American Bee Journal.* Let us consider in the first place that, although scientists in Germany and on the continent had been active in investigating the bees, it was not until the blind French naturalist, Huber, with his assistant Burnens, made such minute and careful observations and reported them in such a manner as to leave no doubt as to many questions concerning the natural history of the bee—for instance, the fact that the queen is mated in air. This was about the turn of the century 1799-1804.

However, the findings of Huber were not completely accepted, particularly by the English writers, among whom probably the most important was Robert Huish (1817). He not only did not recognize the work of Huber, but, in a manner, "poked fun" at Huber's observations because they were made while he was blind and through a second party, to be recorded even by a third party. Huish maintained that the drone fertilized the eggs in the comb.

These criticisms of the blind Huber were repeated in early American books also, taking quotations from Huish, and I mention here in particular F. Butler (1819) and James Thatcher (1829), both of whom mentioned Huber, but were quick to suggest the possibility of a very grave error in the work of Huber on account of the method in which the material had been gathered. I mention Huber, in particular, because not only was he a great naturalist and observer, but he had also designed a hive with a frame "of sorts". At least Huber's "leaf hive" could be opened and the leaves or frames of the hive could be swung around, each on a hinge, in order to observe the frame next to it.

This is quite distinctive. No doubt when Moses Quinby was writing his book, which was to appear in 1853 (the same year as the Langstroth book), he apparently based the frames on Langstroth's experiments and on the Debeauvois frame. Charles Dadant had read of the Debeauvois frame in France and had used it previous to the announcement of the invention of the actual movable frame hive by Langstroth. Both the Debeauvois hive of France and the Huber hive, as well as the Quinby hive, failed in that they did not allow a bee space on the ends, sides, top and between the frames, so that any time there was an effort made to open the hive, it was a question of cutting loose all the separate sections of the hive or else prying out the sides of the hive. The writer can readily remember in his earlier days of beekeeping when the Dadants bought out an apiary of Quinby hives. They were four sides hooked together with ordinary screen hooks. The frames fitted closely against the ends of the hive, as well as the sides with a close end frame (no spaces) and it was necessary almost to "tear the hive to pieces" to be able to get into it and look at the bees for queen and stores.

So, we have the history of a rudimentary frame and a better idea of the workings of the hive around 1800 or 60 years before the *American Bee Journal* first appeared.

In the interim between these activities and the publication of the *American Bee Journal*, several books were published in America on beekeeping, most of them of course, in the eastern states. It is significant that at about this same time there occurred an infestation of the wax moth, which apparently had been brought over from Europe around 1800 and all the books, as well as magazines, were quite taken up with the necessity of finding a way of combating this pest. Drugs at that time were not even thought of for such a purpose, the principal way of fighting the moth being to light candles in front of the hives in the evening and thus kill most of the moths so they could do no damage within the hive through their offspring. Fortunately, the question of bee diseases did not appear until after the publication of the first volume of the *American Bee Journal.*

In the meantime, Johannes Mehing, in Germany, had invented the bee comb foundation for the base of the honeycomb. Immediately thereafter came the book of Langstroth's "The Hive and the Honeybee," in which his hive, and particularly, his frame with bee space all around, were definitely explained to the public. No doubt Samuel Wagner (first *ABJ* editor), who had been a great reader of European periodicals and books, saw that this offered an opportunity for a definite and strong growth of beekeeping on the American continent, particularly as the U.S. population was increasing from year to year. Natural resources were still at their highest, so bees would thrive anywhere.

Langstroth, like many writers of books in both the U.S.A. and in Europe before him, patented his hive. In fact if we would look through the literature of those early years previous to the *American Bee Journal,* we will see that nearly all the books were founded upon a special patented or designed hive which the author of the book wished to sell. The sad part about it, when a really practical hive was at last found by Langstroth, his inventions, although patented, never yielded him enough to make it worthwhile. His claims were contested by many other beekeepers, who either copied him or claimed as much for their hive or claimed a previous invention of the movable comb.

By this time two other early worthy books had appeared—one by W. C. Harbison, in 1860, and the other by John Harbison, who

*Former *American Bee Journal* editor. This article was originally printed in the January 1961 *American Bee Journal.*

was later to become famed for his large honey production in California and his shipments of carloads to the eastern seaboard.

So, we have the general picture of the literature and the thoughts of the beekeeping public at the time Samuel Wagner came out with his first issue of the *American Bee Journal* in January 1861. He had not only become conversant with all the European bee literature, but also had followed the Rev. Langstroth very closely.

The early numbers of the *American Bee Journal* were devoted to an explanation of the actual history of the bee as it had appeared in the European works and in the "late come" American works of Langstroth, Quinby, and the two Harbisons. In addition, there were, of course, explanations of various methods of handling bees. Also, another feature had just come into the picture, namely, the importation of Italian bees which were considered highly superior to the little black bees of the United States, which apparently had been imported from northern Europe in the early 1600s. Therefore, there was a desire to test this new bee along with other races, such as the Caucasian, Carniolan and Egyptian, which was subsequently done (during the intervening years before the end of the 19th century).

It was also a time of experimentation. Strangely enough, although the extractor, or "honey machine" as it was called in the early American literature, was invented in 1865, it did not reach the United States, or at least become publicized in the *American Bee Journal*, until 1868. And so it was in the early issues of the *American Bee Journal* that a combination of wisdom from abroad, as well as inventions, were interspersed with very definite and sometimes acrimonious criticism both of the other fellow's hive and of the other fellow's method of producing honey. The readers of the early numbers of the magazine were not only highly interested, but willing to express their opinions definitely and vociferously. This was perhaps particularly true of those who had fought against the claims of Langstroth and his movable-comb hive and had set out to sell hives of their own brand, which were in most instances patterned exactly after the Langstroth hive. It was also an opportunity for expression of those like Charles Dadant, who defended Langstroth and his frame,

It is interesting to note that the *American Bee Journal* was the first bee journal published in the English language even though hundreds of books had appeared on beekeeping and magazines had devoted considerable space to bees and beekeeping. During the course of the past 150 years there have been over 100 bee publications begun in the United States; and by this we mean publications which might be considered national in scope, in addition to many county and state bulletins and papers, some of which have gone on for a number of years. Besides the names of Samuel Wagner and Langstroth, two other names still in the beekeeping knowledge appeared in the early numbers. One of these was Charles Dadant, who wrote on various subjects, as well as defending vehemently the claims that Langstroth had the first actually movable comb hive, since he had tried patterns of the others in this country before the Langstroth hive. He had read of other European hives in the French bee papers.

The other party mentioned is A.I.Root, who appeared in the early *American Bee Journal* numbers as "Novice." He was later, in 1873, just twelve years after the beginning of the *American Bee Journal*, to start *Gleanings in Bee Culture*.

These two publications, the *American Bee Journal* and *Gleanings in Bee Culture*, are the only two which have survived throughout the whole of the period between 1873 and the present time.

Other publications which were quite prominent, particularly in the earlier days, were *Beekeepers Magazine* 1872-1887, *The Bee World* 1873-1877, *National Bee Journal* 1870, *New England Apiary* 1883, *North American Bee Journal* 1872, *Illustrated Bee Journal* 1869-70, *Annals of Bee Culture* 1869-72. You will notice that the only ones mentioned above are those which appeared in the interim between the beginning of the *American Bee Journal* and the starting of the second American bee publication, *Gleanings in Bee Culture*.

Those early years were so full of opportunities and the movement of populations so great, that it would be hard to include in one article the change in the literature in the American beekeeping press from 1861 to the present. However, in a general way, the first years were "formative" years, years of argumentation and claims; years of the actual foundation of the industry, which had by this time been given the advantage not only of bee comb foundation, but also of the honey extractor and of the Langstroth hive.

Honey Bee Biology

by DR. WYATT A. MANGUM
Mathematics Department
University of Mary Washington
1301 College Avenue
Fredericksburg, Virginia 22401-5358
e-mail: wmangum@umw.edu

The Bingham Bee Smoker: Innovations Were Key to Success

Today kids grow up never knowing a world without the Internet, digital cameras, cell phones, and that most momentous decision of all – what ring tone to choose. Well, I submit a bit of historical perspective is in order. What about today's beekeeper? For well over a century, we have "grown up" in a beekeeping world never knowing it without our trusty protector – the bee smoker.

Once, before the standard bee smoker became so iconic, smudge pots or other creative contraptions were supposed to waft smoke upon irritable bees. More often the beekeeper disappeared within an eye-blinding cloud of smoke, doubling the pain of opening the hive. Corncobs aplenty littered the old country farms of the 1800's. Many a beekeeper-farmer made use of their smoldering properties trying to subdue their bees – powered by human breath until dizzy. But away the world spun, they were helpless to run, and again the bees won.

These painful tribulations, now mostly forgotten, are scattered through the yellowing pages of the old beekeeping literature. In this article and the next, I will show what made them so obscure – the development of the modern bee smoker. I trace out one historical bee smoker lineage, starting in the late 1800's. That path will eventually lead to the modern smoker for sale today in the catalog of the Dadant and Sons Company. It's a kind of bee smoker genealogy, except we start from the beginning and go forward.

The pivotal year in the development of the bee smoker occurred in 1873, when Moses Quinby of St. Johnsville, New York produced a bellows smoker . His smoker began to resemble the modern form, though the funnel pointed straight up (see Figure 1). His lightweight smoker could be operated with one hand, the funnel directing smoke right to where it was needed. Yet particularly among Quinby's earliest smokers, the fire went out prematurely. Quinby may have corrected this flaw, but in 1875, he died suddenly. Nevertheless, he purposefully did not patent his crucial invention, and instead he gave it freely to the beekeeping community.

Other beekeeper-inventors made improvements on Quinby's breakthrough design. The lineage we will follow is from Tracy F. Bingham of Abronia, Michigan. We will see that he was not only a clever inventor, but a master at marketing smokers too. A patent issued to him in 1878 marked the beginning of a smoker allowing a passive airflow to maintain the fire so it would not go out leaving the beekeeper unprotected. Interestingly, back then there was no patent classification for "bee smoker." Ironically Bingham's invention was classified as a "Device for Destroying Insects by Fumigation." Instead of a solid connecting pipe between the firebox and bellows, as in the original Quinby design, Bingham left a small, but critical, gap between them. This arrangement allowed air to draft upwards from the bottom of the firebox, through the fire, and flow out from the funnel when the bellows were not pumped. In the patent, Bingham explained,

> It will be observed that an open space is left between … the bellows and the … opening of the stove [firebox]; the object of which is … to allow the air

Figure 1. A Quinby smoker (left), the type made in the early1870's before his death in 1875. On the right is a Bingham smoker with a plain funnel sold in the late 1870's.

(l) Figure 2. Comparing the Quinby and Bingham smokers. Note the large connecting pipe on the Quinby (left). The Bingham (right) has a gap to let in the air. The intake hole is partly visible under the curved shield and bottom metal support. (r) Figure 3. Early wire handles on Bingham Smokers. The folded metal deflects the smoke to the side (as explained later).

to pass freely to both the stove and the bellows, and at the same time to enable the air to be forced into the stove to project the smoke in the direction desired.

With this patent description in mind, Figure 2 shows a comparison at the base of the smokers between an original Quinby smoker of the early 1870's and a Bingham smoker. This Quinby smoker was made by Quinby himself. It is not the style of Quinby smoker manufactured by Quinby's son-in-law L. C. Root after Quinby's death in 1875. The large prominent connecting pipe on the original Quinby smoker would definitely help inject air into the bellows. This solid connection would not, of course, allow a passive air draft to keep the fire lit when the smoker was not in use. In contrast, the Bingham design left a gap allowing a passive flow of air through the bellows.

Figure 4. A Bingham smoker with the funnel fitting inside the fire box (can). See how the bare edge of the can is visible. On a modern smoker, the base of the funnel overlaps the can hiding it. Note the simplified wire handle compared to the ones in Figure 3.

On your modern smoker, that humble but decisive gap is still there – a silent testimony to Bingham's lasting innovation. It continues to make our beekeeping lives infinitely easier. In use for well over a century, who knows how many millions of stings we have been spared due to this simple and immensely effective idea.

But wait! The Bingham innovation story is still far from complete. Notice that with a hot smoker, having a simple cone-style funnel makes refueling it easy to burn one's fingers. So, in addition to stings, one can get nasty finger burns. Bingham wanted his smokers refueled without that danger. His 1892 patent announced the solution – a wire-handle. Although the smoker gets hot, the slender wire efficiently radiates heat and remains cool. The wire loops on the earlier funnels tended to be elaborate while the loops on the later funnels became simpler, apparently making them easier to mass-produce with less material (see Figure 3). Today it's hard to imagine how we could get along so easily without the coil wire handle on the top of our smoker, letting us refuel it quickly and burn-free.

Another of Bingham's smoker designs really baffled me for a few years, mainly because it did not stand the test of time. It started in earnest when I acquired a Bingham smoker in mint condition, still factory shiny inside, never touched by a fire's black soot. The smoker though was built in a weird way. The funnel fit on the *inside* of the cylindrical barrel forming the firebox (see Figure 4). Usually the funnel fits on the outside like the modern version. I thought perhaps this might be a defect, thus accounting for the lack of use. However, the cylindrical barrel was rolled with an inward projecting rim just below where the funnel fit into it. This internal rim stopped the funnel from going too deep where it could not be removed. So it seemed all this was done for some purpose, a reason buried in the past. Why?

The answer to my micro-mystery came in Bingham's 1903 patent, and is reminiscent of an annoying problem we still see today. With repeated use, soot and tar accumulate in a smoker. Black tar condenses in the funnel (because it's cooler) and runs downward. If the cap fits on the outside of the rim, the tar leaks out and runs down the outside of the smoker. These tar streaks are commonly seen on the outside of modern smokers. Bingham wanted a smoker without these tar streaks. Furthermore, he wanted to prevent the smoker from blowing bits of condensed tar and ash onto newly built white comb-honey sections, where its removal was exceedingly difficult. His solution: make the funnel fit on the *inside* of the rim, forcing the tar to run down the inside where it would be burned again. Hence advertisements sometimes called these smokers soot-burning or self-cleaning smokers.

This design was also supposed to keep the joint between the funnel and rim clear of tar deposits that harden when cooled. As those deposits accumulate, fitting the funnel to the outside rim becomes awkward when the smoker is closed. Again, my workhorse modern smoker would be a good example of this condition. Occasionally, I must scrape away those hard deposits so the smoker will close properly.

Along with this soot-burning feature, Bingham also claimed in the same patent a way of keeping the inside of the funnel so hot that burned materials would not condense within it. He lined the outside of the funnel with asbestos (which is a hazardous material), felt, or some other nonconductive material to insulate the heat. In addition this lining was to keep the funnel cool to the outside touch. However in all my years of collecting bee smokers, I have never seen any Bingham funnels lined in this manner. I wonder if this design was ever put into production, although I have been able to find soot-burning Bingham smokers in different sizes (see Figure 5).

The funnel on the original Bingham, like the Quinby before it, pointed straight up. To use either, the smoker must be inverted, pointing the funnel downward to direct the smoke on the bees. This position created an annoying problem. Burning embers could fall on the bees and get between the frames, a condition sometimes called "fire dropping" in the old

bee literature. Bingham's simple solution was to deflect the smoke to the side with a small piece of metal attached around the opening of the funnel (see Figure 3 again). This improvement avoided having to redesign the shape of the funnel (like we see today). With the deflector, the smoker could be used upright, making it easier to handle. In later production, the smoke deflector was simplified to just a curved piece of metal, instead of the more elaborate folded piece used earlier.

Having innovative ideas is only part of surviving in the bee supply trade, beset with intense competition and copycats. To keep selling smokers through the years, one must be innovative at marketing too. Next time we will see how Bingham mastered the marketing game. As a mark of that success, the only thing that would drive him out of the bee smoker business was – old age.

Acknowledgments

The author thanks Suzanne Sumner for her comments on the manuscript.

Literature Cited

[1]**Root, L. C. (1883).** Quinby's new bee-keeping. The mysteries of beekeeping explained. Orange Judd Company. New York.

Figure 5. Three sizes of soot-burning Bingham smokers. The internal fitting funnel is particularly evident with the smoker on the right. I have the two larger size soot-burners, but could not fit them in the picture. We will see one of them in the next article. These are exotic smokers with an old design feature, soot-burning, now long forgotten.

World Honey Market

UNITED STATES

Our reporters indicated that thousands of colonies were being transported to California for the 2010 almond pollination season. Prices may be down this season by an average of $10 or more (see Joe Traynor's comments in the **West** section). Many beekeepers have locked in contracts. However, some beekeepers without contracts are waiting to see if a shortage might develop that would increase offering prices from growers.

Colonies are going into the winter season with good populations of bees, but stores are a major concern, according to a number of our reporters. They cite poor 2009 honey crops that left colonies in many locations with below average winter stores. Many beekeepers had been feeding until colder weather forced bees into winter clusters. A few regional bee losses have already been reported, but no nationwide trend is evident as when thousands of colonies died in recent years from the so-called "colony collapse disease". Demand for package bees, nucs and queens is expected to heavy again this year as beekeepers recoup their losses and interest in hobby beekeeping continues to grow.

Demand for honey at both the wholesale and retail levels remains strong. Beekeepers also noticed a nice increase in sales during the holiday season. Unfortunately, with record poor honey crops in many parts of the United States, honey is in short supply. Prices also have increased at the wholesale level, but probably not as fast as they might have since huge amounts of honey are being imported. Beekeepers suspect that much of it is Chinese honey, ultrafiltered honey and honey blends being transshipped through third-party countries illegally to avoid the tariff on Chinese honey (see Ron Phipps' article in this issue).

NORTHEAST—As this was written, colonies were mostly clustered for winter since temperatures had dropped considerably. Some commercial beekeepers had just finished their winter movement of hives to the South. Thanks to a better than first expected fall flow, many established colonies went into winter with adequate stores. The problem colonies at this point are the many new colonies started by both established beekeepers and new hobbyists. In a number of cases these bees had not built up sufficiently to make it through the winter without significant help from their keepers. Demand for package bees, nucs and queens is expected to be heavy again this coming spring.

Honey is selling well in the Northeast at both the wholesale and retail levels, but the main problem remains the serious shortage of locally produced honey. The problem likely will not be solved any time soon since the Northeast is a major population center, but its honey production is small in comparison to other areas of the United States.

MIDEAST—After major flows were washed out in much of this area, beekeepers were relying on late wildflower flows for winter surplus, in addition to significant feeding of sugar syrup in some cases. Feeding continued well into November, according to several of our reporters. Beekeepers will be checking and feeding again as winter weather breaks after the first of the new year. Package bees, nucs and queens are expected to be in good demand again in 2010. Many new beekeepers have started and established beekeepers are trying to rebuild their colony numbers after several years of heavy losses.

As in the Northeast, honey surpluses were short again this past season, so beekeepers are fast running out of supplies for customers. Specialty honeys such as sourwood are especially short. Unfortunately, some vendors are labeling other honey varieties and selling them as sourwood since this varietal honey is so popular and always sells for a premium. One reporter says that his local association sponsored a public honey tasting and that it was a big success since many people do not realize that there are different varieties of honey. Due to the economic downturn, some beekeepers are trying to save a bit on packaging by printing their own labels or jar jackets.

SOUTHEAST—Beekeepers in several Southeast area states were worried about stores due to the rainy late summer and fall that hampered foraging. However, colony health is better than in some recent years when many colony losses had already occurred by this time. Some beekeepers were feeding until maple and wildflower pollen and nectar sources were again available. Many migratory beekeepers have moved their colonies to the Southeastern states until the worst of winter is over. In addition, many migratory beekeepers have or will be making the long trek to California for almond pollination in February and March. Beekeepers are being urged to have rock solid pollination contracts before attempting to make this arduous and expensive trip.

Due to the continuing honey shortage, wholesale honey prices are showing some increases, especially for the lighter grades. Unfortunately, not many beekeepers still have honey to sell at this late date. Retail honey sales also remain strong, fueled by interest in natural foods, as well as a concern for the welfare of honey bees by the general public.

SOUTHWEST—A number of migratory beekeepers have moved colonies into this area for the winter months to build up for almond pollination or to make spring divides. The fall was rather wet and unsuitable for good bee foraging. However, the added moisture promises to help early spring nectar and pollen sources. Bees are generally in good health and few reports of significant bee losses have been sent to us. Beekeepers are currently feeding colonies where necessary, as well as medicating for mites and bee diseases. Colony numbers may increase some in 2010 since hobbyist interest remains high and commercial beekeepers want to take advantage of higher honey prices. On the other hand, the demand and prices offered for 2010 almond pollination are down some.

Honey remains in short supply due to poor honey crops. Prices at both the wholesale and retail levels have increased. However, the flow of imported honey remains unabated, despite the significant tariffs in place on Chinese honey. This honey is being rerouted through third-party countries in order to avoid the tariff, yet continue to supply the U.S. market.

EAST CENTRAL—Most migratory beekeepers in these states have finished their moves to the South or California. Meanwhile, beekeepers who overwinter in the area are worried about bringing their colonies through the next few harsh winter months. In some cases autumn honey flows were sparse due to cool, rainy weather. This has forced a number of beekeepers to feed their bees earlier and heavier than normal. In addition, some beekeepers have told us that a warmer than normal November allowed colonies to eat above normal amounts of their stores. Package bee, nuc and queen demand is expected to be heavy again this spring as commercial beekeepers continue to restock deadouts and new hobbyists start beekeeping.

A combination of poor honey crops and strong consumer demand has increased honey

U.S. HONEY, BEESWAX AND POLLEN PRICES FROM OUR REPORTERS

	North-east	Mid-east	South-east	South-west	East Central	West-Central	Inter-Mountain	West
Wholesale								
White lb. Bik	$1.40-$2.20	$1.45-$2.00	$1.30-$1.70	$1.35-$1.60	$1.50-$1.75	$1.40-$1.65	$1.30-$1.60	$1.25-$1.60
Amber lb. Bik	$1.25-$1.60	$1.20-$1.75	$1.20-$1.50	$1.20-$1.40	$1.35-$1.60	$1.20-$1.50	$1.10-$1.45	$1.15-$1.50
1 lb. CS 24	$70.00-$98.00	$60.00-$80.00	$65.00-$82.00	$65.00-$85.00	$65.00-$87.00	$60.00-$83.00	$65.00-$85.00	$62.00-$88.00
2 lb. CS 12	$69.00-$75.00	$65.00-$78.00	$60.00$75.00	$60.00-$75.00	$59.00-$75.00	$58.00-$75.00	$60.00-$85.00	$55.00-$78.00
5 lb. CS 6	$75.00-$90.00	$65.00-$75.00	$60.00-$72.00	$72.00-$78.00	$70.00-$75.00	$73.00-$80.00	$72.00-$85.00	$75.00-$85.00
Retail								
Jars 8 oz.	$.96-$2.50	$1.00-$2.25	$.89-$2.50	$.90-$2.25	$.95-$2.75	$1.05-$2.50	$.99-$2.20	$1.00-$2.75
Squeeze Bear 12 oz.	$1.89-$3.50	$2.00-$3.75	$1.75-$3.20	$1.40-$3.25	$1.99-$4.45	$1.59-$3.75	$1.55-$3.50	$1.50-$3.60
Jars 1 lb.	$2.50-$5.50	$2.55-$5.25	$2.40-$4.75	$2.50-$5.00	$2.45-$5.25	$2.95-$5.25	$2.75-$5.00	$2.70-$5.25
Jars 2 lb.	$3.99-$6.75	$3.95-$7.00	$3.99-$5.49	$3.00-$6.25	$3.25-$8.00	$3.29-$6.50	$3.25-$6.25	$3.50-$6.50
Jars 1½lb. (Pint)	$4.50-$6.75	$4.25-$6.00	$3.50-$6.00	$3.58-$6.50	$3.25-$5.50	$3.50-$5.50	$3.75-$6.00	$4.75-$7.00
Jars 3 lb. (Quart)	$5.50-$9.75	$5.95-$15.00	$5.79-$10.00	$5.25-$9.25	$5.00-$11.50	$4.50-$10.00	$5.10-$9.75	$5.00-$10.50
Jars 4 lb.	$7.50-$9.25	$5.00-$10.00	$7.00-$8.75	$6.00-$9.70	$8.00-$12.00	$5.50-$13.00	$6.00-$9.00	$5.95-$9.25
Jars 5 lb.	$8.99-$19.00	$7.00-$19.50	$7.50-$17.50	$7.25-$18.00	$8.00-$21.00	$7.75-$18.00	$8.00-$19.25	$8.50-$18.00
Creamed 12 oz.	$2.50-$4.25	$2.50-$4.00	$2.49-$3.20	$2.25-$3.99	$2.00-$3.90	$1.99-$4.00	$1.75-$3.75	$1.75-$3.85
Comb 12 oz.	$3.00-$5.00	$2.50-$5.00	$2.25-$4.25	$2.50-$5.50	$2.50-$4.75	$2.50-$5.50	$2.50-$4.75	$2.75-$5.50
Round Plas. Comb	$3.00-$5.50	$2.25-$4.50	$2.50-$4.00	$2.00-$5.25	$2.25-$4.99	$2.00-$5.50	$2.25-$5.00	$2.50-$5.50
1 Gallon	$15.00-$25.00	$12.50-$26.50	$14.50-$25.00	$15.00-$25.00	$15.00-$30.00	$15.00-$27.00	$15.00-$30.00	$15.00-$30.00
60 lb.	$115.00-$145.00	$84.00-$125.00	$85.00-$120.00	$80.00-$130.00	$82.00-$140.00	$80.00-$135.00	$85.00-$130.00	$80.00-$130.00
Beeswax								
Light per lb.	$2.20-$3.50	$2.20-$2.75	$2.20-$3.00	$2.20-$2.50	$2.20-$2.50	$2.20-$2.50	$2.20-$2.50	$2.20-$2.50
Dark per lb.	$2.05-$3.00	$2.05-$2.35	$2.05-$2.25	$2.05-$2.25	$2.05-$2.25	$2.05-$2.25	$2.05-$2.25	$2.05-$2.25
Pollen								
Wholesale per lb.	$3.50-$6.50	$3.50-$8.00	$3.00-$6.00	$3.00-$5.00	$3.25-$6.00	$3.25-$6.00	$2.50-$6.00	$2.50-$5.50
Retail per lb.	$5.50-$15.00	$7.00-$15.00	$6.00-$15.00	$6.00-$10.00	$7.00-$15.00	$7.50-$15.50	$7.00-$12.00	$7.00-$15.00

The above prices are not meant to provide a realistic picture of prices in all states of the particular area. They are intended merely to show what a few beekeepers are receiving for their honey, beeswax and pollen and we realize prices may vary tremendously, even within individual states. The bulk prices for honey are stated per pound, delivered buyer's warehouse, containers exchanged or furnished by buyer, unless otherwise noted. Where prices are not shown, insufficient data were available.

HONEY MARKET FOR THE MONTH OF OCTOBER 2009

In volumes of 10,000 pounds or greater unless otherwise stated

(From November 2009 USDA National Honey Report)

Prices paid to beekeepers for extracted, unprocessed honey in major producing states by packers, handlers & other large users, cents per pound, f.o.b. or delivered nearby, containers exchanged or returned, prompt delivery & payment unless otherwise stated.

-Report includes both new and old crop honey-

(# Some in Small Lot — +Some delayed payments or previous commitment)

Arkansas Soybean extra light amber $1.35
Soybean light amber $1.20
California Alfalfa light amber $1.24
Dakotas Alfalfa white $1.45
Clover white $1.38 - $1.45
Wildflower extra light amber $1.37 - $1.40
Florida Galberry extra light amber $1.30 - $1.42
Idaho Wildflower light amber $1.25 - $1.31
Mississippi Soybean extra light amber $1.28 -$1.35
Montana Clover white $1.38 - $1.45
Oregon Wildflower extra light amber $1.39 - $1.42
Wildflower light amber $1.25 - $1.27
Wisconsin Wildflower extra light amber $1.40

Prices paid to Canadian Beekeepers for unprocessed, bulk honey by packers and importers in U. S. currency, f.o.b. shipping point, containers included unless otherwise stated. Duty and crossing charges extra. Cents per pound.

Province Not Reported
Too Few to Report

Prices paid to importers for bulk honey, duty paid, containers included, cents per pound, ex-dock or point of entry unless otherwise stated.

Argentina Mixed Flowers white $1.42 - $1.49
Mixed Flowers extra light amber $1.42 - $1.51
Brazil Mixed Flowers extra light amber $1.30 - $1.59
Vietnam
Mixed Flowers light amber $1.12 - $1.20

prices at both the wholesale and retail levels. On the other hand, larger packers continue to import huge amounts of foreign honey and honey blends.

WEST CENTRAL—Approximately 90% of the commercial colonies in this area are moved to either the southern U.S. or California for winter in order to build up and be ready for pollination work, mainly in the California almond groves. Sideliners and hobbyists stay on location, but many take extra winter hive protection cautions such as providing winter hive-wrapping and windbreaks. A number of beekeepers had poor honey crops in 2009, although good fall flows in some states provided some badly needed winter stores. Others began feeding this fall and will resume feeding as soon as weather permits. In some cases, reporters told us that excellent fall pollen flows encouraged good winter cluster populations, but poor nectar flows will force above normal feeding to prevent a lot of colony starvation. Beekeepers plan to retain their present colony numbers or make a few increases. Demand for package bees, queens and nucs is expected to remain steady or increase slightly, depending on how colonies overwinter.

Both wholesale and retail honey markets remain active and prices are increasing. Holiday buying, in addition to the increasing demand for local and varietal honeys, is fueling the retail market surge. Meanwhile, wholesale honey prices have increased due to the very short honey crop again this season. Unfortunately, packers are buying huge amounts of foreign honey and "funny" honey in order to keep their prices down, as well as continuing to supply the industrial and retail honey demand. Prices being paid for foreign honey are generally much below the domestic wholesale price. If not for this major switch to cheaper honey and honey blends, wholesale honey prices being offered beekeepers would even be much higher than they are currently.

INTERMOUNTAIN—Most commercial colonies have been moved to winter holding yards in California or the South. These colonies are being fed and medicated in preparation for pollination work and then honey flows after being returned to their home yards. The honey harvest was generally below average with a few exceptions. However, the fall months were mild, which not only allowed colonies some additional foraging time, but also permitted more time for feeding and medicating colonies. Colony populations were generally strong going into the winter months. Some precipitation in the form and rain or snow had been helping ground moisture conditions.

As cold weather and the holidays approached, retail honey sales were picking up. Due to the short crop around the country, producers do not anticipate having any trouble sell-

ing their honey before the new season gets underway. Wholesale honey prices had been running at between $1.40 and $1.45, but were inching up as packers attempted to rebuild their inventories.

WEST—As thousands of colonies are being transported into California for almond pollination, beekeepers say that rental prices are averaging $10 or more per colony less than last season. Most colonies are being placed in holding yards where they are being fed and medicated until needed for almond and later crops. Some wildflowers are still blooming in the southern half of the state, but no major flows.

"Many growers are cutting back from the standard two colonies/acre to 1.5 or 1.8 cols./acre (and making sure they rent strong colonies), thus increasing the pool of bees available for almonds," according to Joe Traynor of Scientific Ag. Company. A recent letter from Traynor also says that "the picture on hive losses won't come into complete focus until Jan.-Feb., but current indications are that problems will be more severe than last winter and equal to or worse than the winter of 2007-2008 when 35% losses were recorded (30% in 2008-2009)." Traynor is basing his estimate on the fact that honey crops were so poor across the nation in 2009. Not only are colonies going into winter stressed, but some beekeepers left honey supers on so long that they did not have time to perform varroa treatments before transporting these colonies to California holding yards. Traynor also says that most bees being transported into the state are already under contract. Other beekeepers without contracts are moving their bees to southern states until later in the season, hoping that a shortfall in colonies will necessitate a bidding war for remaining colonies not under contract.

"A large grower-processor in the Fresno-Madera area has gotten with his almond friends to form a cartel consisting of around 60,000 acres. This cartel informed their list of beekeepers that they will be paying $117/colony for bees in 2010—take it or leave it. The cartel is already showing fracture lines as some growers are paying much higher prices to beekeepers they feel have done a good job for them in the past." (From Joe Traynor's Dec. 3, 2009 Almond Grower Newsletter)

Traynor says, "Almond planting has come to a halt, but the total bearing acreage has actually increased (from 700,000 to 730,000 acres) as 2 and 3 year old orchards enter their prime bearing years. Water shortages have had some, but not a major impact on almond acreage. If we have another dry winter, it will have more of an impact on the 2011 acreage. Almond growers are pulling out all the stops (via water trading and purchasing from other growers) to secure enough water for the 2010 crop and to protect their costly investment in orchard development."

A workshop was held in early December on "Using Blue Orchard Bees in California Almonds" sponsored by the University of California Cooperative Extension and the USDA-ARS Bee Biology & Systematics Laboratory in Logan, Utah.

Honey sales and prices have gone up in the West following the trend in the rest of the country due to another very poor honey crop year in 2009. Competition from illegally transshipped cheap Chinese honey and honey blends continues to be a major stumbling block to orderly and fair marketing.

CANADA

Provincial and national honey production figures should be released by Statistics Canada soon. Reports from some beekeepers are that earlier dire forecasts for a possible record poor honey production season have not come true due to good late honey flows in several provinces. Bees also went into winter with better stores than earlier believed, although many beekeepers still fed heavily. Overwintered colonies will need to be watched carefully in late winter and early spring for signs of starvation or stress.

ARGENTINA

Argentina is approaching the end of the spring season with quite different weather patterns in its many beekeeping regions. No doubt, climate conditions already have had an impact on the prospects for honey production for the last month of year 2009, as well as over the decisive crop months of both January and February 2010.

The eastern part of Argentina is under the effect of excessive rains. The paradox is that only one year ago, this same region was suffering one of its worst drought crises of the last 80 years! In the three Mesopotamic provinces, floods from the major two rivers Uruguay and Parana required the evacuation of civilians from many cities. Agricultural activities have stopped because of constant showers. Meteorologists warn that this geographic region of Argentina is suffering the peak of El Niño condition. Beekeepers, who were extremely optimistic during late September until mid-October, are now seriously concerned about the lack of foraging activity caused by a long period of confinement due to inclement weather.

The general picture in these regions is one where hives are light in stores. Pollen collection has been curtailed and chances of visiting apiaries for feeding purposes are nil due to the poor condition of rural roads. For example, the northern part of Santa Fe province has lost the possibility of a major sunflower crop because of continued rain. Some beekeepers are noticing a few outbreaks of European foulbrood associated with poor nutrition.

On the other hand, during October, a full week of extreme heat conditions averaging 115ºF in the subtropical west and central region of Argentina affected several provinces like Santiago del Estero, Chaco and Tucuman. As a consequence, over 300,000 beehives suffered the melting down of combs. At the same time, the southern and eastern parts of La Pampa, southwest and west of Buenos Aires, are still under drought conditions and severe water restrictions for domestic use. Unless the weather cooperates, it is difficult to forecast a bumper crop in these provinces.

Argentine beekeepers are facing two additional major difficulties. Since most beekeepers use sugar syrup instead of HFCS, the recent increase of 50% in the price of cane sugar is a new burden for the local beekeeping industry. By the way, one liter of diesel fuel is now equivalent to half a kilogram of honey, a ratio never seen in previous years.

Honey exports during the period January-October 2009 are estimated at 48,975 MT sold for US$134 million, equivalent to US$2,742 per MT. This volume is 21% shorter than the quantity exported during the same period of year 2008, while the price is only 7% higher. Exports of bulk honey during October 2009 only reached 1,827 MT and sold for US$5 million. Exporters still hold some 9,000 MT of unsold honey. Lighter grades are unavailable and according to exporters, demand from European buyers was slow during October and November. However, in spite of the revaluation of the EURO, American importers are getting a larger share of Argentina honey.

International Honey Market

by RON PHIPPS
President, CPNA International Ltd.[1]
Co-Chairman,
Committee for the Promotion of Honey and Health

As the second decade of the Third Millennium commences, the American honey industry confronts a turbulent market. That turbulence reflects: 1) a global shortage of honey, 2) turmoil in foreign exchange rates that are tending to increase prices for honey and other commodities, 3) a two-tiered honey market reflecting the conflict between legal and circumvented honey, 4) volatile weather patterns and 5) stress on the health and vitality of pollinators, including honey bees.

The Crops

Both the U.S. and Canadian 2009 honey crops were short. The Canadian honey crop had less pure clover and more wildflower and canola than usual as the cool summer weather extended the canola bloom to an unusual duration of 2 months. Because of the extension of the canola bloom, Canada produced marginal amounts of clover, since canola bloomed at the same time as clover and the bees chose to forage on the canola. Although the color is white, the tendency of this excellent canola honey is to crystallize rapidly. The Canadian crop due to very nice September weather had some recovery and is now estimated to be 55 million pounds plus or minus 5 million. Nonetheless, this is far less than the normal 75-80 million pounds.

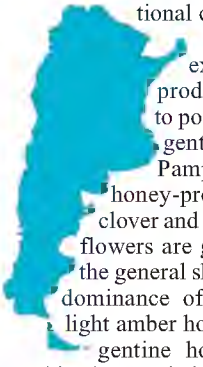
The U.S. clover honey crop was normal in some areas of the Dakotas and weak in other areas where bloom was good but the bees were absent or inactive. The normal U.S. crop is about 200 million pounds and the 2009 crop is estimated to be only about 155 million pounds. The loss of bees is not universal, and some beekeepers are satisfied with the condition of the bees as winter commences; but concern for CCD has not vanished.

The decline in the U.S. crop, coupled with the short and darker honey crop in Argentina, has created a shortage of white honey, especially premium grades of clover honey. The current Argentine honey crop has been retarded by a recurrence of drought. It is likely that there will be a struggle from March to September 2010 both to secure white honey and to keep prices from escalating to possibly historic levels. North American packers are generally well aware of this situation and have started to look hopefully South to Argentina to secure and book honey on a forward basis.

Argentina

By the end of October 2009, Argentina exported 50,000MT to the world out of a total crop of only 55,000MT, which was half of the size of a good Argentine honey crop. This was Argentina's worst honey crop during the past 5 years. There is consequently no carryover as 2010 approaches.

The early spring in Argentina began with good weather and optimism. Then, by mid-spring, 80% of Argentina suffered an extended drought that has both delayed the crop and damaged hopes for a bumper crop. During this period, the price of soybeans on the international market steadily rose as a consequence of the drought. As late spring (end of November through mid-December) in Argentina came, rains returned and in some areas floods occurred. If rains abate and become periodic, regular and adequate, an increase in the 2010 crop of 10% to a little more than 60,000MT is expected. The colors will tend more towards LA and ELA than in the past. The primary reason is the conversion of grazing lands to production of soybeans, which is now Argentina's largest and key export, with China becoming their major international customer.



As the production and export of meat and dairy products have declined due to policies initiated by the Argentine Government, the Pampas is no longer a key honey-producing area making clover and alfalfa honey. More sunflowers are grown in Argentina and the general shift has been from a predominance of white honey to extra light amber honey. Since the early Argentine honey crop is typically white honey, it is already clear that the

[1] **CPNA International, Ltd.**
100 Jericho Quadrangle, Suite 228
Jericho, New York 11753
Tel: (516) 935-3880
Fax: (516) 935-3959
e-mail: info@cpnaglobal.com
Report distributed Nov 30, 2009

Mr. Phipps is president and founder of CPNA International, Ltd. and is currently Secretary-Treasurer of the National Honey Packers & Dealers Association. He is an importer of honey, natural foods and tea from various international producers. Ron is also the former personal research assistant to the president of the American Philosophy Association. He is a recipient of the National Science Foundation fellowship for philosophy of theoretical physics. Mr. Phipps is a founding member of the Tea & Health Committee, which organized three major scientific symposiums on tea and health and the role of antioxidants in the prevention of disease. He has worked with FDA to develop a research protocol for the global diversity of honey.

drought that affected 80% of the country in mid-spring will significantly diminish the current availability of white honey from Argentina's developing honey crop. Buyers from Japan and the Middle East are bidding up U.S. dollar prices for Argentine honey.

Brazil

The orange honey crop was very poor and the Cipo-Uva crop was a huge disappointment. For example, if a beekeeper has 800 hives in the Cipo-Uva area, they expect to produce 20,000 kgs., but in reality they produced only 2,500 kgs.

In the northeast of Brazil, the beekeepers are optimistic because they anticipate the rains will arrive just in time to maximize the flowering and flow of nectar. The State of Piaui needs rain and can produce limited amounts of excellent marmeleiro white honey. White honey from the northeast will probably be available in March. There are good prospects for the Maranhão crop that produces the dark honey for which the European market is willing to pay a high price. In Santa Catarina Province, prospects are good for conventional and organic light amber. Rains caused the loss of 80% of the crop in Rio Grande do Sul and Parana.

During the 4th quarter, Brazilian domestic buyers have been paying high prices. In contrast to Argentina, Brazil has a significant domestic honey market. The strength of the Euro relative to the dollar may direct more Brazilian honey to Europe in 2010. The growing strength of the Brazilian real is exerting significant upward price pressure on the Brazilian export prices.

Vietnam

Vietnamese honey production will commence in full strength in February, 2010, when the rubber honey crop begins. For now, only modest amounts of cashew and coffee honey can be harvested.

The Vietnamese honey industry is working hard to improve quality and to strictly and effectively implement the Monitoring Program designed to prevent circumvention and transshipment of Chinese honey. Some efforts by Chinese in Taiwan have reportedly been stopped by the Vietnamese authorities. Vietnam realizes that implementing the Monitoring Program will enhance their reputation and long-term ability to export to the U.S.A.

Bee Conditions

In addition to concerns regarding the volatility of weather patterns, concerns persist regarding the health and vitality of the bee population in the U.S.A. During September and October, several large beekeepers reported significant and unexpected losses of bees. For example, in South Dakota a beekeeper who had 6,000 hives that were vigorous during clover bloom, found only 200 hives active and well. The bees from the other hives just disappeared and did not return to their hives. As acreage that was previously pasture land has been converted to corn (for ethanol) and soybean production, there has been a concurrent surge in application of pesticides administered by planes and helicopters that regularly sweep across the fields now spraying potent pesticides on corn and soybeans. The hypothesis is that these pesticides may be affecting the brains of the bees and their navigation systems. As cultivated crops encroach upon and increasingly surround pasturelands and the remaining wild fields, pesticide-induced damage to bees looms as a growing problem. Similar problems exist for the application of toxic pesticides on the extensive citrus groves in Florida. Since the health of bees and the broader interests of agriculture are so inextricably bound together, an integrated macro solution will be required to protect agricultural interests.

During Apimondia, I had occasion to talk with several scientists who are experts on bee health. One professor from Sao Paulo University in Brazil, who has been studying Africanized bees for decades, had several relevant observations from his scientific studies of Africanized bees. On the one hand, these bees are not only good propagators, but they are highly resistant to disease. This is one underlying reason Brazil can produce the world's largest quantities of organic honey. But the Africanized bees are very sensitive to and become anxious under conditions of darkness and chaotic noise. Such stress can increase their vulnerability to pathogens and pesticides. Mono-flora source diets during the short life-span of worker bees may also contribute to abnormal stress and subsequent vulnerability to disease. When we think about these scientific studies in the context of modern large-scale agro-business and modern migratory beekeeping practices that transport bees over large distances as the bees emerge from winter stress, the variables and environmental factors that may affect colony collapse disorder may come into sharper focus.

The Role of Foreign Currency Rates

The U.S. economy is facing significant declines in the value of the dollar. This derives from: 1) the mammoth U.S. national deficit which has reached over $12 trillion dollars, 2) the drastic increase in money supply (printing of U.S. dollars) to support the "bailout" given the Great Recession that threatened the solvency of the global financial system and 3) the projection of the continuation of high government deficits during the next two years. Since approximately 65% of the honey consumed in the U.S. is imported, currency changes represent a major variable affecting honey prices.

During the past 6-12 months, several changes are important to note: 1) The Canadian and U.S. dollars have attained parity, which means that during the past year, the U.S. dollar has weakened relative to the Canadian Dollar by almost 25%. This makes the prevailing prices of Canadian honey in U.S. dollars rise abruptly.

The Euro has moved from a rate of 1.25EU/$1 this summer to over 1.50EU/$1, as I write this report for publication in January 2010. This significant strengthening of the Euro will give European packers and importers a significant price advantage in purchasing South American honey, including Argentine, Brazilian, Uruguayan and Chilean honey. The Brazilian Real has also significantly appreciated in value moving up 14% against the dollar since July 2009. Only the Vietnamese currency has weakened relative to the U.S. dollar, falling 8% since January.

The greater and more persistent the national deficit and the larger the money supply becomes, the more serious are prospects for further erosion of the U.S. dollar, which has served as the global reserve currency for many decades. The strong inflationary pressures affect commodity prices, whether agricultural, mineral or energy. The rise of the price of gold to $1,200 per ounce in early December

Table 1: U.S. Honey Imports

Country	2001	2008	2009 (9 months)
		(million pounds)	
India	-0-	27.8	23.2
Malaysia	-0-	9.	12.
Indonesia	-0-	4.	8.7
Taiwan	-0-	3.2	8.2
Thailand	2.7	2.	3.
China	41.4	24.7	0.1

Source: National Honey Board

manifests the impact of the decline of the U.S. dollar on commodity prices.

Given the volatility of honey production patterns and relative currency valuations, most packers are very cautious not to extend prices to their retail and manufacturing customers beyond 1 quarter.

U.S. Import Patterns

There is widespread belief among U.S. honey packers and importers that the American honey industry is experiencing disruption and distortions due to the phenomena of transshipment of honey through third nations to avoid anti-dumping duties. Two Chinese nationals were arrested and pleaded guilty in 2009 to transshipping honey, misidentified as a product of Thailand and Philippines, in an effort to evade antidumping duties. The case against a third is pending in Seattle.

When a study is made of the dramatic changes in export patterns over the past 7 years, and of the productive capacities of newly emerging honey-exporting countries, stark aberrations appear. We can compare U.S. imports in 2009, 2008 and 2001 from several countries as shown in Table 1.

The changes are not merely quantitative but qualitative. For example, some tropical countries are exporting vast amounts of "white honey," which is very difficult to find in the latitudes where the countries of origin are located, barring some botanical "miracle." We note that in 2009, 100% of the honey imported from Indonesia is white and 42% of honey from India is white. Import values indicate prices much lower than white honey from Canada, the United States and Argentina. Published reports from Indonesia indicate that consumption of honey in Indonesia exceeds its production, which provides only 30% of its needs. Similar reports exist from Malaysia and Mongolia.

The phenomenon of blending or falsely labeling products is contributing to the confusion. Numerous trade samples have been evaluated and found to be either blended from several origins or ultra-filtered honey, which the FDA holds to be illegal to sell as honey. It is clear to all members of the honey industry that many emerging honey-exporting countries do not have the technical capacity to ultrafilter honey, nor any economic reason to suffer the expense, even if they have the capacity. And yet huge amounts of this product are being offered to U.S. buyers.

It is interesting to note that the price of Chinese white honey imported into the United States in 2008 averaged $0.22/lb. (less than $485/MT), according to the *National Honey Report*. Canadian white honey imports during the same period averaged $1.41/lb. Chinese honey prices reported to Customs in 2008, were 30% lower compared to 2001, when the antidumping case was effected. The unbelievably low valuations, no less the subsequent transshipments, have taken the sting out of the antidumping rulings of the U.S. Department of Commerce. Chinese honey imports decreased dramatically from 25,000,000 pounds in 2008 to zero in 2009.

It would appear that the availability of extremely cheap Chinese honey worldwide has contributed to the 2-tiered price structure for honey which has persisted and increased throughout 2008-2009 in the United States, and that honey laundering continues unabated until today. This phenomenon has aroused concern among American beekeepers and American honey packers throughout the country North to South, East to West and all regions in between. If honest members of the industry are to be left standing, a timely and comprehensive solution to honey laundering is imperative.

During the period March-August, 2009, domestic and imported honey transactions were 29% and 71%, respectively, according to the NHB. The consumers clearly need imported honey to complement domestic production. But the industry also needs a level playing field that allows legal honey to compete with legal honey.

Conclusion

Future tendencies will be influenced by: 1) changes in the pattern of imports; 2) changes in foreign exchange rates; and 3) climatic and environmental changes. Of course, the industry awaits the day when the market will have a more level playing field which, in turn, will allow the creative and positive marketing of honey to play the decisive role in the competition of honey with other sweeteners.

U.S. Pollination Markets: Recent Changes and Historical Perspective

by MICHAEL BURGETT[1], STAN DABERKOW[2], RANDAL RUCKER[3], and WALTER THURMAN[4]

Acknowledgements: The authors acknowledge the assistance of Eric Mussen and Daniel Sumner in providing the California pollination fee data used in this report. Fritz Baird provided valuable research assistance.

Key Words: Managed beekeeping industry, pollination rental fees, honey income, pollination income, California almond industry, Colony Collapse Disorder.

Introduction

This article is the second of two to discuss trends in honey and pollination markets in the United States. The first focused on honey, discussing historical data on colony numbers, honey yields, aggregate honey production, imports and prices. The present article focuses on pollination markets: their defining characteristics, fees received by beekeepers, the size of the colony rental market in the United States, pollination income relative to honey income for the past two decades, and the growing importance to the managed beekeeping industry of California almond pollination in the spring. We also discuss the economic impacts of the latest "disease" to affect beekeepers—Colony Collapse Disorder—as well as pollination market conditions for the 2009 almond crop.

The sources for much of the information presented here are annual Oregon State University (OSU) surveys of beekeepers in the Pacific Northwest (PNW) and an annual survey of beekeepers conducted by the California State Beekeepers Association. The OSU survey has been conducted since 1987 by one of the authors {MB}, and the results of each of those surveys have been summarized in annual publications in *Honey Market News*. In the past five years, Burgett's survey has received responses from beekeepers who own (on average) 52 percent of the managed honey bee colonies in Oregon and Washington (based on annual estimates of colony numbers by the USDA). The California survey, which was modeled to some extent after the PNW survey, dates back to 1995.

Defining Features of Pollination Markets

Markets for pollination are unique in several respects. The flowering period for pollination is limited for most crops, and in some cases, colonies must be removed from the fields shortly after pollination to allow for the treatment of the crop with pesticides toxic to bees. Moreover, crops in different parts of the country require pollination at different times, with the brief pollination windows typically being later for crops grown at higher latitudes and altitudes. These features of crop pollination have encouraged the development of a migratory managed pollinator industry. Those who choose the livelihood of a mobile pollinator face considerable logistical management challenges. Nonetheless, a robust migratory pollinator industry has evolved, aided by the interstate highway system and an efficient trucking industry, and spurred on by the significant economic incentives of pollination fees.

An important feature of the industry is the considerable economies of scale available to mobile pollinators, who can use the same bees to pollinate several crops over the course of a crop year. Semi-commercial beekeepers (defined here to be less than 300 colonies) typically concentrate on honey

Table 1. Migratory Pollinators' Annual Rental activities

Year	Annual Rentals per Hive		PNW Rental Activities	
	PNW	California	Crops/Year	Counties/Year
1989			4.24	5.03
1990				
1991			4.34	5.06
1992	2.51		7.76	
1993	2.82		8	
1994	2.74		6.06	6.06
1995	2.61		5.33	6.16
1996	3.05	1.67	5.06	4.71
1997	2.95	1.77	5.88	
1998	2.74	1.66	5.4	
1999	2.74	1.85	5.1	6.53
2000	2.32	1.60	5.09	6.91
2001	1.91	1.41	4.67	6.4
2002	1.74	1.30	4.19	6.69
2003	2.37	1.82	5.17	8.5
2004	1.92	1.51	5.8	8.38
2005	2.25	1.63	4.43	5.5
2006	2.05	1.68	5.53	8.33
2007	2.54	1.55	5.71	6.83
2008	1.91	1.66	6.92	10.5
Average	2.42	1.62	5.51	6.77

[1] Emeritus Professor of Entomology, Department of Horticulture, Oregon State University, Corvallis, OR 97331
[2] Daberkow and Associates, University Park, MD.
[3] Professor, Department of Agricultural Economics and Economics, Montana State University, Bozeman, MT 59717-2920
[4] Professor, Department of Agricultural Economics, North Carolina State University, Raleigh, NC 27695-8190.

production, primarily because their scale of operations is not large enough to economically move colonies long distances.[5]

Consistent with this, the PNW surveys reveal that commercial beekeepers rely on pollination to a much greater extent than do semi-commercial beekeepers. Over the 1989-2008 span, commercial beekeepers received on average 63 percent of their income from pollination, while semi-commercial beekeepers received on average 32 percent of their income from pollination. Further, whereas there is no significant trend in the percentage of income from pollination for commercial beekeepers, there is a significant downward trend in this percentage for semi-commercial beekeepers. The data also indicate that since 1994, the semi-commercial beekeepers have earned on average more income from honey than from pollination in every year. Commercial beekeepers, on the other hand, have reported a larger percentage of their income coming from pollination than from honey in every year since 1989.

[5] **Semi-commercial and commercial is the taxonomy used in the annual reports of the PNW survey. Other researchers have used other taxonomies, with a common breakdown being hobby (1–25 colonies), part-time (25-300 colonies), and full-time (more than 300 colonies) beekeepers. Hoff and Willett (1994) discuss issues related to economies of scale and mobile pollination operations.**

Supply Factors

A basic determinant of the supply of pollination services is the number of managed honey bee colonies. In our previous article (Daberkow et al. 2009), we presented U.S. Department of Agriculture data indicating that the number of colonies has declined over time. A change in the survey methodology used by the USDA in the mid-1980s makes it difficult to draw conclusions regarding the actual extent of the long-run decline in colony numbers. Since the mid-80s change, however, the inventory of colonies has fallen by roughly 25 percent.

Holding other factors constant, a reduction in colony numbers will lead to a reduction in pollination services. But the quantity of pollination services from a given number of colonies is not fixed. Beekeepers make tradeoffs between the quantities of honey they produce and pollination services they provide. Pollination arrangements often call for placement densities that are too high to yield commercial quantities of honey (and typically require supplemental feeding of the bees). Further, movement of colonies from orchard to orchard and field to field places stress on the bees and reduces their honey productivity. Thus, a reduction in honey prices, or an increase in pollination fees, can induce beekeepers to shift their emphasis from honey to pollination, resulting in an increase in pollination services supplied—and a reduction in the quantity of honey produced.

Another factor affecting the quantity of pollination services from a given quantity of colonies is the number of pollination sets for which each colony is used. The number of pollination sets increases with the willingness of beekeepers to move their colonies from their home bases to distant orchards and fields. The migratory aspect of beekeeping has been well-documented. The national migratory calendar begins with movement of colonies into California during December and January in anticipation of almond pollination during February and March. For at least the last 15 years, a considerable number of beekeepers have migrated to California from the Pacific Northwest to pollinate almonds. More recently, in response to dramatic increases in almond acreage and almond pollination fees, more beekeepers have migrated to California, some from as far away as the East Coast.

After the almond crop is pollinated, some colonies (primarily those that are California-based) then pollinate other crops in California. Colonies whose home base is in the Pacific Northwest migrate back north and pollinate such crops as apples, pears, cherries, cranberries, and blueberries. Other colonies are moved to the Northern Plains and Lake States primarily for honey production in the nectar-rich fields of alfalfa, clover, and sunflowers.

On the eastern side of the continent, another important migration occurs starting in the Southeastern states, then moving northward along the East Coast for apple, cranberry and blueberry pollination. In the fall,

Table 2. Value, acreage, and estimated colony rentals for major crops that require or benefit from pollination.[a]

Crop	Major Producing States	Colonies per Acre	Crop Value		Crop Acreage		Colony Rentals	
			2000	2007	2000	2007	2000[m]	2007
			$1,000		Acres		Number	
Almond	CA	2.5	908,090	2,360,254	510,000	615,000	1,275,000	1,537,500
Apple	WA, NY, MI, PA, CA	1.5	1,799,344	2,434,626	433,650	363,440	650,475	545,160
Melons, all	CA, FL, TX, AZ, GA, IN	1.5	963,249	884,772	315,410	272,240	473,115	408,360
Cucumber, all	MI, FL, GA, NC, CA	2	520,012	402,199	163,510	155,020	327,020	310,040
Alfalfa seed	CA, ID, WA, OR, NV						220,000	220,000
Avocado	CA	2.5	451,529	327,122	65,220	73,250	163,050	183,125
Cherry	WA, MI, OR, CA	1.5	446,196	634,565	103,330	118,250	154,995	177,375
Plum/prune	CA, OR, WA, MI, ID	1	336,718	214,257	128,110	105,370	128,110	105,370
Blueberry	MI, ME, NJ, OR, GA, NC	2	303,205	597,921	40,820	52,120	81,640	104,240
Pear	CA, WA, OR	1.5	355,103	351,260	66,910	59,530	100,365	89,295
Squash, all	GA, MI, CA, FL, NY	1.5	286,517	231,008	56,800	56,600	85,200	84,900
Vegetable seed	CA, OR, WA						55,000	55,000
Pumpkins	IL, OH, PA, CA, MI	1.5	119,474	119,294	41,000	47,100	61,500	70,650
Sunflower	CA, TX, MN						45,000	45,000
Cranberry	WI, MA, NJ, OR, WA	1	137,410	284,194	37,200	38,800	37,200	38,800
Macadamia nuts	HI	2.5	40,194	21,931	17,700	15,000	44,250	37,500
Specialty citrus	FL	0.5	113,613	90,133	37,400	21,100	18,700	10,550
Kiwifruit	CA	2.5	18,922	22,862	5,300	4,000	13,250	10,000
Total (value and acreage for food crops only)			6,799,576	8,976,397	2,022,360	1,996,820	3,933,870	4,032,865

[a] Sources for table entries available from authors.

Table 3. Real (2008 dollars) average pollination fees per colony for selected California crops, 1995-2008[a]

Year	Almonds	Plums	Cherries, early	Cherries, late	Alfalfa Seed	Avocados	Vegetable Seed	Watermelon	Melons, Other	Sunflowers	Apples	Prunes
1995	$58.96	$57.45	NA	NA	$39.45	NA	$32.27	NA	NA	$24.14	$22.23	$12.90
1996	$58.05	$57.84	NA	NA	$37.99	$31.23	$33.57	NA	NA	$23.45	$20.29	$15.32
1997	$60.62	$57.68	NA	NA	$39.58	$35.89	$30.76	NA	NA	$23.22	$19.67	$14.89
1998	$64.72	$61.11	NA	NA	$45.25	$39.51	$34.34	$36.67	$32.39	$26.59	$28.25	$15.46
1999	$67.48	$61.79	NA	NA	$47.07	$44.63	$44.54	$34.86	$31.13	$24.56	$25.77	$16.64
2000	$65.89	$58.38	NA	NA	$43.42	$39.79	$37.68	$36.90	$32.84	$26.68	$23.63	$15.55
2001	$68.62	$66.25	NA	NA	$42.89	$36.38	$34.96	$28.10	$28.01	$24.85	$30.42	$13.98
2002	$67.74	$65.12	$60.31	$23.41	$40.27	$39.87	$30.35	$40.68	$32.14	$25.40	$20.78	$15.71
2003	$74.21	$65.06	$59.88	$26.49	$37.13	$36.81	$30.19	$30.01	$23.91	$25.12	$20.81	$31.94
2004	$72.67	$68.80	$63.95	$24.29	$37.37	$33.48	$28.72	$35.47	$39.09	$26.61	$21.55	$11.14
2005	$92.83	$95.48	$91.82	$33.80	$47.58	$51.64	$39.65	$48.06	$28.85	$30.85	$32.04	$19.18
2006	$166.06	$107.05	$150.32	$43.54	$41.78	$36.46	$40.57	$31.11	$26.85	$31.72	$26.23	$17.96
2007	$162.86	$133.50	$148.55	$30.92	$43.48	$39.19	$37.06	$33.71	$26.92	$30.32	$23.47	$17.74
2008	$148.50	$55.95	$86.13	$36.99	$43.33	$44.01	$40.34	$40.29	$25.98	$30.60	$23.54	$13.99

[a]Source: California State Beekeepers Association survey. Prices are deflated using the Index of Prices Paid by Farmers, Commodities, interest, taxes and wage rates, 2008=100 (found at www.nass.usda.gov webpage).

a reverse migration flow occurs as beekeepers move colonies into milder climates for over-wintering.

Quantitative insights into migratory pollination are provided in Table 1. In California, the average number of pollination rentals per hive for the years 1996-2007 is 1.62 and there is no evidence of a significant trend in this variable. It appears from the available data (discussed in more detail below) that almost all California commercial beekeepers pollinate almonds. Following that, on average between one-half and two-thirds of colonies are used to pollinate one more crops. In the Pacific Northwest, the average number of rentals per hive for the years 1992-2008 is larger, at 2.42 pollination sets per colony–about 50 percent higher than in California.

These numbers mask, to some extent, the complexity of beekeeper migration. Available data from the PNW surveys suggest that on average, over the time span of the data, an individual beekeeper contracted to pollinate 5.5 different crops per year. Moreover, they contracted to pollinate crops in an average of 6.8 counties per year. Thus, while a typical *colony* in the PNW pollinates almonds and then is used to pollinate another 1.4 crops, a typical PNW *beekeeper* contracts with almond growers in one or more counties in California and then with producers of four or five more crops distributed across several counties in Washington and Oregon.

Another important pollination supply factor is the rate of winter mortality. All else equal, an increase in winter mortality leads to a reduction in the supply for pollination. From the mid-1980s until recently, the "normal" winter mortality rate increased as a result of the North American arrival of two devastating species of honey bee mite parasites (*Acarapis woodi* and *Varroa destructor*). Recent research suggests that since the winter of 2006/07 mortality has increased again, as a result of Colony Collapse Disorder. (See Burgett et al. 2009, for a historical perspective on these mortality increases.) Beekeepers can and do, however, regularly replace lost overwintered colonies. The predominant method, at least in the PNW, is to split existing colonies. Purchasing package bees to re-populate dead colonies is a less frequently used alternative.[6] Furthermore, with the exception of a period during the late 1980s, a limited supply of queens and packaged bees have been imported from Canada for a number of years and since 2004, New Zealand and Australia also have been permitted to export bees to the United States. These methods increase the supply of pollination services—but at a cost—which one might expect to be reflected in the prices for pollination services.

Demand Factors

Pollination is an important input in the production of numerous economically significant crops. Table 2 lists crops that are major demanders of pollination services, as well as the major producing states for the crops. It also lists recommended colony densities, and for both 2000 and 2007, pollinated crop values and acreages, as well as estimates of the number of colony rentals. The values of production for the pollinated crops in Table 2 have had the effects of general inflation netted out and are expressed in terms of 2008 dollars. For 2007, the total value of the crops was nearly $9 billion, which represents an increase of 34 percent in inflation-adjusted terms over 2000. Other specialty crops, less dependent on insect pollination and not included in the table, would add to the crop values. With only a few exceptions, such as alfalfa seed and sunflower seed, the crops listed in Table 2 are not considered good nectar sources. Moving colonies multiple times during the year among a number of nectar-limited sites does rarely yield sufficient honey for sales or even over-wintering.

Although the total acreage of the pollinated crops in Table 2 has not changed much since 2000, almond acreage has increased substantially and almonds are clearly the dominant crop influencing demand for pollination services—certainly for California and PNW beekeepers, but nationally as well. Of the roughly 4 million rentals reported in the table for 2007, almonds account for 38 percent of the total, with apples a distant second at about 14 percent. Although the total estimated number of colony rentals has changed little, the importance of almonds in pollination rental markets has increased since 2000, when they accounted for about 32 percent of total rentals.

Forecasts of almond acreage by the Almond Board of California suggest nearly a doubling of acreage from around 400,000 acres in the late 1990s to almost 850,000 acres by 2012 (Sumner and Boriss, 2006, Table 2). Assuming a hive density for pollination of 2.5 per acre, almond colony rentals would need to increase to over 2 million colonies to pollinate that number of acres. Based on the 2008 colony estimate for the United States of 2.30 million and almond acreage of 660,000, almond pollination required about 72 percent of all U.S. colonies during the 2008 almond pollination season. If colony numbers remain constant and the almond acreage projections are realized, by 2012 almonds will require over 90 percent of all U.S. colonies during the early spring pollination season.[7]

Pollination Fees

Average pollination fees from the annual surveys of California and Pacific Northwest beekeepers are shown in Tables 3 and 4. The fees in the tables, deflated to correct for inflation, are expressed in terms of 2008 dollars. Looking first at almonds, it can be seen that fees increased gradually through 2004. After that, almond pollination fees reported by both California and Pacific Northwest beekeepers increased rapidly—more than doubling in real terms. It is noteworthy that CCD was first reported in the Fall of 2006, but that fees for almonds increased sharply in the spring of 2006, prior to the initial re-

[6] **See Burgett et al., 2009 and van Engelsdorp et al., 2007 for additional discussion of these replacement methods.**

[7] **In figure 1 of our previous article on honey markets we presented data indicating that colony numbers have actually fallen over time. See Palerlow, Rucker, Thurman, and Burgett (2009).**

ports. Figure 1 displays almond acreage and prices. The rapid increase in almond pollination fees is likely due in part to increased almond acreage, which likely resulted from substantially increased almond prices (the average real price of almonds for 2003–2006 was almost double the price for 1999–2002.)

Tables 3 and 4 also reveal that pollination fees for most pollination-dependent crops in California and in the Pacific Northwest have not risen nearly as sharply in recent years as have almond fees. Exceptions to this are plums and early cherries in California, both of which require pollination at about the same time as almonds, implying that producers must compete directly with almond producers for colonies.[8] Table 3 shows the considerable increases in pollination fees for plums and early cherries from 2004 to 2007, roughly in line with pollination fees for almonds.

To what extent has the increased demand for pollination from almond producers affected pollination fees for other crops? An examination of Tables 3 and 4 reveals that although pollination fees for most other (later season) crops increased following 2004, none of them increased as dramatically as almond fees. Moreover, whereas almond fees remain high relative to pre-2005 levels, no comprehensive statement can be made regarding the level of other pollination fees relative to their pre-2005 levels—some are higher, some are lower, and some are about the same. Explaining the changes in all pollination fees in Tables 3 and 4 is beyond the scope of this article. It is noteworthy, however, that the annual year-to-year variation in pollination fees can be considerable. But the fact that the number of beekeepers sampled for some crops is relatively small suggests that a portion of the observed variation may simply be due to which beekeepers happen to respond to the survey in

[8] Sumner and Boriss (2006) also make this point.

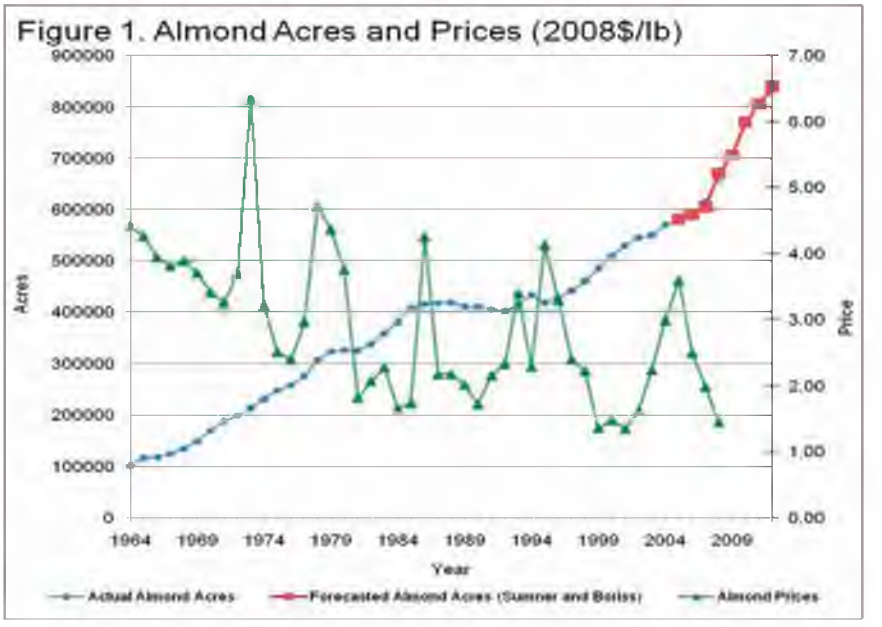


Table 4: Real (2008 dollars) average pollination fees per colony for selected Washington and Oregon crops, 1987-2008

Year	Cranberries	Blueberries	Clover Seed	Sweet cherries	Pears	Apples	Almonds
1987	$57.10	$27.30	$28.93	$41.76	$38.06	$39.05	NA
1988	$54.77	$31.75	$19.60	$38.59	$36.92	$40.87	NA
1989	$55.23	$32.01	$27.89	$34.78	$30.84	$29.12	NA
1990	$54.21	$35.00	$12.18	$36.04	$33.44	$42.34	NA
1991	NA	$29.31	$20.33	$36.84	$39.38	$34.48	NA
1992	$51.73	$31.61	$21.38	$38.79	$38.07	$42.20	NA
1993	$52.59	$40.67	$19.11	$47.68	$45.05	$48.12	$55.40
1994	NA	$49.58	NA	$49.41	$50.52	$48.13	$55.91
1995	NA	$42.04	$18.81	$49.45	$49.87	$46.21	$57.61
1996	$48.23	$37.48	$22.61	$48.39	$47.43	$51.08	$57.32
1997	$56.13	$38.94	$27.45	$45.73	$45.67	$43.81	$56.10
1998	$55.94	$41.25	$19.75	$45.67	$42.11	$44.17	$58.39
1999	$47.53	$41.43	$34.23	$50.07	$50.07	$51.97	$63.22
2000	$55.95	$43.15	$47.42	$46.80	$48.25	$49.93	$45.74
2001	$56.48	$37.86	$28.09	$42.62	$48.54	$42.22	$60.17
2002	$57.51	$31.64	$47.18	$44.28	$45.49	$47.62	$66.37
2003	$57.10	$35.26	$28.91	$40.83	$43.04	$46.17	$66.38
2004	$32.50	$43.13	$44.14	$45.56	$42.38	$38.25	$65.94
2005	$38.37	$47.78	$48.22	$48.24	$49.11	$47.16	$101.55
2006	$53.82	$39.24	$36.16	$47.89	$45.80	$48.51	$156.61
2007	$50.46	$40.56	$50.14	$48.03	$46.30	$48.71	$156.04
2008	$50.00	$36.92	$31.16	$42.36	$42.34	$45.39	$148.15

[a]Source: Michael Burgett, Department of Horticulture, Oregon State University. Prices are deflated using the Index of Prices Paid by Farmers, Commodities, interest, taxes and wage rates, 2008=100 (found at www.nass.usda.gov webpage).

Table 5: The Role of Almonds in California and PNW Pollination Activities

YEAR	Proportion of Pollination Income from Almonds[a]		Proportion of PNW Commercial Beekeepers who Pollinate Almonds	Almond Rentals as a Proportion of Pollination Rentals[a]	
	PNW	California		PNW	California
1993	0.336		0.833	0.243	
1994	0.372		0.909	0.319	
1995	0.507		0.850	0.434	
1996	0.438	0.784	0.895	0.382	0.595
1997	0.392	0.715	0.885	0.333	0.537
1998	0.416	0.660	0.813	0.334	0.510
1999	0.325	0.621	0.867	0.270	0.488
2000	0.291	0.687	0.905	0.246	0.538
2001	0.436	0.807	0.824	0.361	0.664
2002	0.443	0.824	0.786	0.358	0.707
2003	0.470	0.888	1.000	0.368	0.770
2004	0.543	0.877	0.800	0.431	0.765
2005	0.517	0.884	1.000	0.333	0.736
2006	0.689	0.931	1.000	0.394	0.823
2007	0.583	0.942	1.000	0.301	0.781
2008	0.659	0.891	1.000	0.366	0.671
Average	0.464	0.808	0.898	0.342	0.660

[a]For the PNW, these proportions are for commercial beekeepers. For California, because we do not have information on the number of commercial and non-commercial beekeepers, these proportions are for all beekeepers.

a particular year.

Perhaps the most puzzling change seen in Tables 3 and 4 is the precipitous decline in the 2008 fees for plums and early cherries. If the decline in almond fees in 2008 is partly the result of a positive supply response on the part of both local and distant beekeepers, then competitive market forces should also result in a decline in plum and early cherry fees. Why these fees fell so much more dramatically than almond fees, however, remains unanswered.

Our data on pollination fees are from California and Pacific Northwest beekeepers. The vast majority of these beekeepers have been pollinating almonds for many years. We speculate that the primary change facing these beekeepers in recent years is that they are now receiving higher fees for almonds, and that their pollination schedules have not been much affected otherwise. Insofar as CCD is a serious continuing problem, there may, of course, be increased costs of operating, but the increased pollination fees for almonds likely have offset all or part of these increased costs.

It seems likely that much of the increase in the quantity of pollination services being provided to California almond producers is due to beekeepers coming from more distant home bases. Although it is possible that this change has resulted in important changes in pollination fees for later crops in those areas, without data on those pollination fees we can only speculate on this issue.

The Growing Role of Almond Pollination

Information from the California and PNW pollination surveys documents the expanding role of almonds in the activities of U.S. beekeepers. The second and third columns of Table 5 display the proportions of pollination income for PNW and California beekeepers that are derived from almond rentals. For both groups, this proportion has trended upward at a statistically significant rate. In the PNW, income from almond pollination has increased from about one-third to about two-thirds of total pollination income since 1993. For California, almond pollination income has comprised 90 percent or more of total pollination income in recent years.

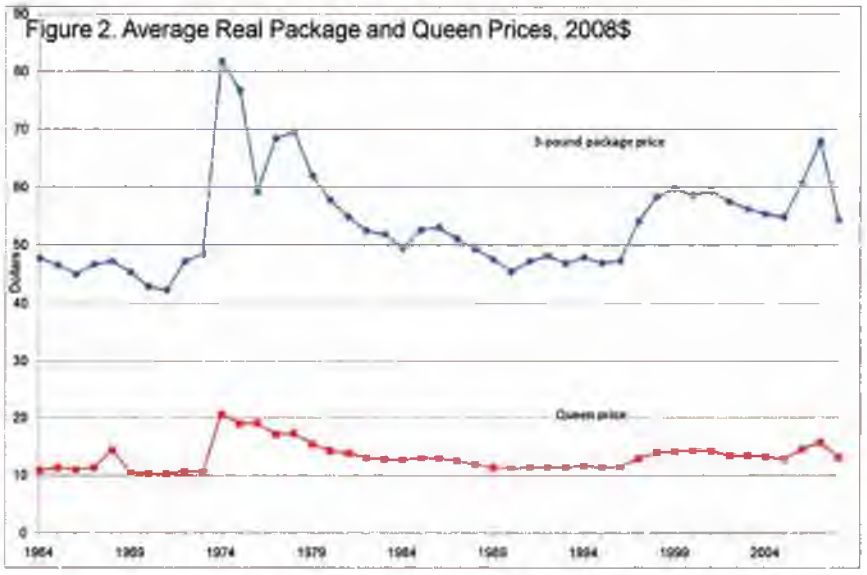
The next column in Table 5 indicates that all PNW commercial beekeepers who responded to the OSU survey have pollinated almonds in all but one year since 2003. The last two columns show the annual number of hives rented for almond pollination as proportions of all hive rentals for the PNW and for California. In California, on average about two-thirds of all pollination rentals have been for almonds and this fraction has increased (at a statistically significant rate) over time. In Washington and Oregon, about one-third of hive rentals are for almonds, and this fraction has been relatively constant over the time span of the data.

Recent Events: Market Evidence of CCD?

Since the fall of 2006, Colony Collapse Disorder (CCD), has received extensive media coverage. Current research indicates that it has affected beekeepers throughout the country and that mortality rates in the winters of 2006/07 and 2007/08 were likely between 30 and 35 percent. We discuss above how beekeepers are able to respond to winter losses by replacing lost colonies, primarily through splitting healthy ones and, to a lesser extent, rebuilding lost colonies with purchased packages of bees. That beekeepers have done this is supported by the fact that the average USDA-estimated number of U.S. colonies in 2007 and 2008 is only about 4 percent lower than in 2004 and 2005, despite the overwinter loss of over 30 percent of colonies.

But is there any evidence from market data that CCD is affecting prices paid by consumers, farmers, or beekeepers? Perhaps most directly, one might look at pollination fees. If CCD has caused a decrease in the supply of pollination services, then we should be seeing increases in pollination fees. We point out above that while there *have* been dramatic increases in pollination fees in the past several seasons, they appear to have been restricted to almond pollination fees and crops that are pollinated contemporaneously with almonds. Further, the almond fee increases began at least one year before any evidence of abnormal winter losses. Both of these facts argue against attributing recent pollination fees to CCD.

A second place to look for an economic CCD impact is the prices that beekeepers pay for colony-replacing inputs. While the dominant method by which beekeepers augment their colony numbers is by splitting healthy colonies, an alternative is to buy a



package of bees (typically weighing three pounds and containing about 12,000 worker bees and a queen) and place them in an empty hive unit. It generally takes 60 to 90 days for hives restarted with this method to reach full strength. The estimated cost of replacing lost colonies through splits is about $19 per hive, considerably less than the $52 estimated cost of replacement with packaged bees and queens (see Burgett, et al., 2009). But is there evidence from the package and queen segment of the beekeeping industry that such costs have risen due to CCD?

Suppose that CCD is having important impacts on *Apis* pollinators. Suppose further that there are economic constraints on the ability of suppliers of packaged and queen bees to expand their operations to meet the CCD-induced increased demand. In this case, one would expect to see substantial increases in the prices for queens and possibly packaged bees.[9]

Figure 2 shows real prices for these products since the 1960s, obtained from advertisements in the *American Bee Journal*. The prices shown are the real prices (in 2008 dollars) per three pound package (or per queen) for an order of 50 packages (or queens). Note first, that there has not been a strong upward trend in the real prices of packaged and queen bees—the trend rate of increase for three pound packages of bees is $0.12 per year and for queens is slightly greater than $0.01 per year. Note second, that package and queen prices increased substantially in 2006, prior to the appearance of CCD. Although prices were again up substantially in 2007, they were down considerably in 2008, back roughly to their levels in 2005. This pattern is inconsistent with what would be expected if CCD were having substantial impacts. More formal statistical analysis of these prices suggests that although increases in almond acreages have had significant impacts on queen and package prices, there is no support for the hypothesis that there has been either a statistically or economically significant increase in prices that could be attributed to the appearance of CCD.

Finally, and most recently, reports from California's almond orchards in the spring of 2009 are noteworthy. In response to a recent 30 percent drop in almond prices, combined with drought-induced water shortages, orchard owners reportedly cut their costs, including those associated with pollination (*The Economist*, March 7, 2009). Reports indicate that there was a glut of bees in spring 2009, that some almond growers reduced their honey bee stocking densities, and that beekeepers who went to the orchards without advance contracts received considerably lower pollination fees than they had in the previous two years. While not definitive by themselves, these facts are inconsistent with there being drastic economic effects from CCD.

Conclusion

In this article we have presented and discussed economic trends in honey bee pollination, using data drawn from two decades of surveys of PNW beekeepers and 13 years of CA surveys. These data suggest the following:

- Commercial beekeepers in the PNW make roughly 60 percent of their income from providing pollination services, whereas semi-commercial beekeepers make about 60 percent of their income from selling honey. Although the percentage of income from pollination has not changed significantly for commercial beekeepers, it has decreased in recent years for semi-commercial beekeepers.
- PNW beekeepers make about 50 percent more pollination sets (per colony) than California beekeepers. On average, California beekeepers pollinate almonds and then use one-half to two-thirds of their colonies to pollinate one additional crop. PNW beekeepers, on the other hand, contract to pollinate almonds and then on average, use each of their colonies to pollinate another 1.4 crops. Moreover, each PNW beekeeper pollinates more than five crops per year in about seven different counties.
- Whereas the acreage of crops pollinated and the number of colonies rented in the United States changed little between 2000 and 2007, the aggregate value of the crops pollinated increased by about one-third. The relative importance of almond pollination has increased considerably.
- Over the time span of our data, real pollination fees have increased for most crops in California and the PNW. The rates of increase have, however, been relatively low, with the notable exception of almond fees, which increased dramatically in 2005 and 2006, more than doubling in just two years.
- In recent years, 90 percent or more of the pollination income of California beekeepers was from almond pollination. Although the proportion of PNW beekeepers' pollination income from almonds has increased over the past 15 years, they still receive a third or more of their income from pollinating other crops. Virtually all commercial PNW beekeepers have pollinated almonds in recent years.
- A multitude of factors drive pollination fees: the costs of beekeeping (which are influenced by honey bee disease); demands for pollinated crops; and honey sales income opportunities for beekeepers chief among them.[10] Looking at recent data, it is difficult to construct an explanation for recently high pollination fees that involves increased mortality due to CCD.

References

Anon. "*The Bees are Back in Town*," *The Economist*, March 7, 2009, pp. 85-86.

Burgett, M., R. Rucker, and W. Thurman (June 2009). *Honey Bee Colony Mortality in the Pacific Northwest (USA) Winter 2007/2008. American Bee Journal*, Vol. 149, No. 6, pp. 573-576.

Daberkow, S., R. Rucker, W. Thurman, and M. Burgett (2009). *U.S. Honey Markets: Recent Changes and Historical Perspective., American Bee Journal*, Vol. 149, No. 12, pp. 1125-1129.

Hoff, F. and L. Willet (1994). The U.S. Beekeeping Industry. AER No. 680, Economic Research Service, U.S. Dept. of Agriculture, Wash. DC.

Robinson, W., R. Nowogrodzki, and R. Morse (1989). *The Value of Honey Bees As Pollinators of U.S. Crops. American*

[9] **Splitting colonies requires a new queen, which is typically purchased from queen suppliers. Creating new colonies with packages appears to be used to replace lost colonies much less frequently than splitting colonies, at least in the PNW (see Burgett et al., 2009).**

[10] **See Rucker, Thurman, and Burgett (2008) for a statistical and economic model of the various factors influencing pollination fees.**

Bee Journal, June.

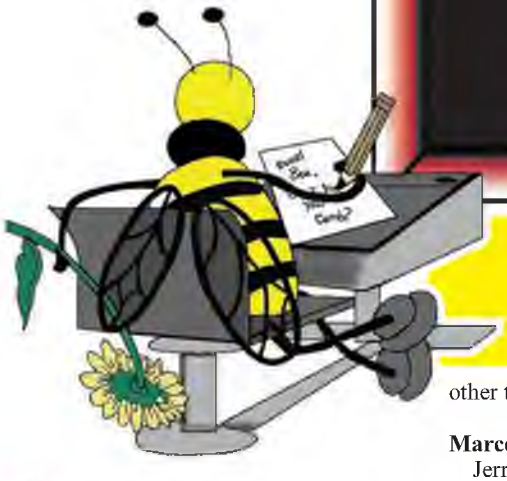
Rucker, R., W. Thurman, and M. Burgett (2008). *Internalizing Reciprocal Benefits: The Economics of Honeybee Pollination Markets.* Unpublished working paper.

Sumner, D. and H. Boriss (2006). *Bee-conomics and the Leap in Pollination Fees,* Agriculture and Resource Economics Update, Vol. 9, No. 3. Giannini Foundation of Agricultural Economics (April).

Van Engelsdorp, D., R. Underwood, D. Caron, J. Hayes, Jr. (2007). *An Estimate of Managed Colony Losses in the Winter of 2006 - 2007: A Report Commissioned by the Apiary Inspectors of America, American Bee Journal*, July 2007. [http://www.ento.psu.edu/MAAREC/ColonyCollapseDisorderInfo.html#reportsResearch]

The Classroom
by Jerry Hayes

Please send your questions to Jerry Hayes,
17505 NW Hwy 335, Williston, FL 32696
Email: gwhayes54@yahoo.com



Happy New Year

This is my shortest suggested New Year's advice ever
DO YOUR BEST . . . .FORGET THE REST

Q IS IT VSH or VHS or DVD?

Dear Mr. Hayes,

Please give us some detailed information about the Minnesota Hygienic stock and the VSH (Varroa-selective Hygienic) stock developed at the USDA lab.

Thanks,
Marcel LeBlanc
Houston, TX

VSH & Minnesota Hygienic

A

The difference is VSH (Varroa Sensitive Hygiene) is a genetic trait of the honey bee that allows it to recognize capped cells with mite-infested pupae. The bees in a communal way get together and cut through the cap, drag out the infested pupa and the mites and dump them outside as trash.

Minnesota Hygienic Bees have the genetic trait that is one of a high degree of hygienic behavior that targets diseases like American foulbrood and chalkbrood. So, VSH targets "varroa mites" and Minnesota Hygienic target "diseases". Theoretically, one could have both traits simultaneously from 1% to 100% and everything in between. Honey bees have survived for millions of years by having a wide selection of genes for different situations and scenarios. Having a hyper-trait may adversely affect other traits, so everything is a trade off.

Marcel answers:

Jerry, thanks for the reply, but that is not what I have heard. You haven't helped me!

Classroom Readers: I do not know everything, but I generally do know who knows, so I handed this one off to Dr. Jeff Harris at the USDA/ARS Bee Breeding Lab in Baton Rouge to see if he could help me out. Thanks Jeff

Reply from Jeff Harris

Hello Jerry, I can understand the reader's problem with accepting that there are differences because we are not really sure ourselves as to how or why these two types of honey bees are different. So, I'll try to say what we know as briefly as possible:

It seems likely that hygienic removal of varroa-infested pupae (or Varroa-Sensitive Hygiene) is really the same behavior or a subset of general hygienic behavior that is found in the Minnesota Hygienics. The difference is in selective breeding methods that were used to obtain the two types of bees. Marla Spivak selected for improved performance in removal of freeze-killed brood. The VSH team selected initially for bees that reduced the reproductive abilities of mites. It was only later that we discovered that this disruption of mite reproduction was caused by VSH activity.

As with MN Hygienics, bees with high levels of the VSH trait are also very hygienic towards freeze-killed brood, and our experience suggests that they are also good at controlling chalkbrood, American foulbrood, small hive beetles and wax moths (we just have not published these kinds of data). So, what are the differences between MN Hygienics and VSH bees? The biggest difference is that the VSH bees remove many more mite-infested pupae per unit time. They can uncap and identify 100s of mite-infested pupae in just a few hours. The MN hygienic bees find varroa-infested pupae at a much lower rate. In pure VSH colonies, varroa mite populations decline. In pure MN Hygienics, mite populations continue to grow, but at a rate slower that is significantly slower than in non-hygienic controls. So, it is quite possible that both bees are utilizing the same mechanisms to find mite-infested pupae (in fact, it seems likely), the difference may only be in degree. However, there is also evidence that the genetics controlling general hygiene is different than the genetics controlling VSH behavior. I'll just leave it at that for now. I hope this helps.

Sincerely,
Dr. Jeff Harris
USDA/ARS Bee Breeding Lab
Baton Rouge, LA

Q NEW YORK CITY BEES

Dear Mr. Hayes: I am a New York City beekeeper. My colony is three years old. Last year I suffered colony collapse disorder (CCD). I wonder if after a CCD episode, or in general, beekeepers replace their bottom boards or other equipment "to be safe". Also, in NYC it is so dusty and there is a black mold on the side of my bottom board that is hard to get off.

So, my question is: Is it advisable to replace the bottom boards every few years? And after CCD, should we consider replacing any or all of the equipment we used?

Thanks for being there!

Dana in NewYork

A

Dana, was your experience a true CCD event with classic CCD symptoms such as loss of the majority of the population; brood open and capped is still in the hive; the queen is left behind, with a few of her retinue; and there is honey and beebread in the frames and wax moths and SHB fail to move in and take over? If we can say that chemical, pesticide, miticide, environmental toxin residue, as well as pathogens and parasite pressure are major forces in CCD, then these inputs/residues will be concentrated in the beeswax comb. Replacing three old combs with new foundation on a yearly basis may be the best protective health action you can take.

Cleaning your bottom board, treating with household bleach and coating it with a good coat of garage-sale paint are all you need to do. Your bottom board is not a major factor as a chemical and disease reservoir. Also, your empty hive bodies and supers should be fine to reuse. Dispose of old brood combs and replace them with new foundation.

Q LOTS OF VARROA; WAY TOO LATE

Parasitic varroa mites attached to a sticky board removed from the bottom of a beehive. Photo by Peggy Greb (Courtesy USDA - ARS Image Gallery)

Jerry, just a few weeks ago you helped me regarding feeding stimulants. Now I have a real problem to deal with and need some advice. During a visit to observe the activity at my one hive, I noticed about six bees dead or dying in front of the hive. I took one of the sick bees back to the house, examined it closely and found a mite. I immediately ordered a Varroa Sticky Trap, which I have installed in place of the bottom board. When I installed the sticky trap, I treated the super and both brood boxes with powdered sugar. The next evening I pulled the drawer to check the trap and found an estimated 1700 mites.

From the results, I think the powdered sugar treatment is working, but I live in North Idaho where we are now (Oct.) experiencing over night lows in the mid teens and daytime highs in the low 40's. The bees are clustering. With these kinds of temperatures, can I continue the powdered sugar treatment on the recommended seven-day schedule or should I try some other means of cutting down on the Varroa population?

Thanks a million,
Lew Beebe

A

Lew, when there is no brood and all of the adult mites are phoretic (exposed, not in a cell) is the perfect time to treat with powdered sugar. But, *and there is always a but*, even though winter is a time with little brood rearing, with cold temperatures, honey bees respond by compressing the nest and clustering, grouping together to conserve and manage heat. This causes a decision conundrum for the beekeeper. The beekeeper does not want to disturb or break up the cluster because in cold temperatures, the bees may not be able to reform it before they chill and possibly freeze to death. All that to say—this would be the perfect time to treat, but you have to use your head as to when and how to treat without major disruption to the cluster.

Honey bees cluster at about 57 F. You are already in the 40's. I would suggest you pick out the days that the temperature will be in the 50's and treat at the peak of the daily temperature. Quietly, smoothly just remove the top of the hive and do not remove anything (boxes) that would disrupt the cluster...unless the temperature is 60 degrees F or higher.

It may be too late with a 1700 mite powdered sugar mite drop, but either they die of mites or you gamble and treat through the winter, late winter, early spring when temps allow you to, remove mites and cross your fingers with powdered sugar. It's a cheap treatment and if you save the colony, you will save $50 to $100 by not having to purchase a nuc or package next spring. Chemical or formic acid treatments may be even more harmful at this late date on the calendar.

LEW REPLIES

Hi Jerry, we managed to get a day above 60 yesterday so I treated the hive again with powdered sugar. That was seven days after the first treatment. This afternoon I changed the sticky board and counted the mite drop of the last 24 hours. The estimate for this drop was 590 mites, which is about 65% less than what I got seven days earlier. If I get lucky and have another warm day next week, I will treat them again to see if I can get a similar reduction again. Thanks for your help.

Lew Beebe

Q SEASONALITY OF VENOM STRENGTH

Dear Jerry, has there been any research as to the seasonal variability of bee venom? Is the venom more powerful in spring than summer or fall? What about the strength of venom among the different races? The stings seem to hurt me less in fall, but is that a human rather than a bee characteristic?

Thanks,
Jim Lyons
Bellingham, WA

A

Seasonal variability of bee venom is a good question. I thought I might know, but I wasn't confident enough in my answer, so I did a little research for both of us.

If you are a stinging venomous insect like a honey bee, and actually all of your hymenoptera cousins, there are only a few ways to protect your colony, your queen, your sisters and maintain your genetics. That is to repel attackers from the colony/nest using **pain**, **swelling**, **tissue damage and sometimes death**.

Honey bee venom contains peptides, which cause the pain. It contains enzymes that destroy and dissolve red blood cells in humans, and other small molecules, which cause dilation of blood vessels and the resulting swelling. In fact, there are 20+ components found in honey bee venom that make up this chemical arsenal. It is really an impressive chemical cocktail that is designed for protection. Honey bees are armed and are prepared to pull the stinger trigger to assure survivability of the species if they can.

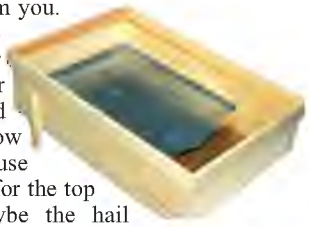
There is seasonal and age variation in many of the venom components. Mellitin is one of the "lethal" components in honey bee venom. According to work done by Dr. Michael Owen from the University of Western Ontario, Canada, the amount of mellitin in a honey bee increases from the time of emergence up to about 4 weeks of age. After this time period, the mellitin levels decrease by as much as half, even by 5 to 6 weeks. As summer progresses, the amount of mellitin decreases with lower levels in August than in June.

I think we can understand the increase in "mellitin" in young bees as they prepare to fill their age-based responsibility as guard bees. And, I guess as winter draws near, the need for and the energy requirements to make venom is just too great of a resource/energy tradeoff with older bees, less brood to protect and cold weather which may preclude a full winter time attack on an invader. Life is a gamble and honey bees have obviously evolved over the millennia so that these physiological changes are best provided and used for survival.

Regarding your question on variations in venoms among different races of honey bees, I am sure there are slight differences, but probably not enough to make any difference in how the sting feels or affects its victim. Some research was done years ago trying to prove that Africanized honey bee venom was more potent than venom from other honey bee races, but the research was never conclusive. Thanks for making me work on this one.

Q Solar Wax Melter

First I want to thank you for myself and the many other readers for the information we get from you.



I am building a solar wax melter and would like to know if I can use plexiglass for the top glass. Maybe the hail won't break it as easy as glass.

On page 279 of your *Classroom* book you mention the *Hopkins method of queen rearing*. Would you please send me a copy of the method?

Merlyn Votaw Quapaw

A

I think any kind of clear acrylic will work if thick enough. I would suggest 3/16 or 1/4 inch will give you the structural strength you want and the thermal (heat tolerance) you need. A solar wax melter can capture and retain heat in the + 200 F. degree range. The plexiglass will get scratched up over time, so you should replace it if it becomes too opaque, but otherwise, it should last for years.

Go to www.beesource.com/.../the-hopkins-method-of-queen-rearing/ for a copy of the *Hopkins method of queen rearing*. It works pretty well.

Q First Honey Harvest

Hello, we have harvested our honey. We bought the whole works to harvest. Really

fun, but what do we do with the frames—store them? We have your book, *First Lessons in Beekeeping*. My husband read the book, but I have not. I'm the slave labor, NOT.....Ha Ha!!!

Thanks much,
Linda

A

Depending on where you live, in the northern tier of states you can put them back in the super and put it back on the colony. The bees will clean up the frames and they will be ready for use in spring. Cold weather/winter is your friend. It prevents wax moths and small hive beetles from doing any damage to your combs.

In the South you can do the same thing, but only if you have a large enough bee population to cover every inch of comb to protect them from the wax moth and small hive beetle. If you just have a few frames and a freezer with some room, put them in a trash bag and store them in the freezer for protection until next year.

Sideline and commercial beekeepers with thousands of frames must store them in warehouses and they may use wax moth crystals (Para dichlorobenzene) to fumigate the supers against moth damage, especially if the temperatures are warm enough to allow wax moth damage.

Read the book Linda, that way you will know when your husband has goofed up and it will be ammunition for you at some time:)

Q Is It Help or Hindrance?

Dear Jerry, is it OK to replace the plastic foundation used for comb—the stuff that comes with a new nuc—with just a deep frame and some wireless starter foundation? It seems like a tough time (winter) to do this to them. I've already had them since June, but there are so many things to think of in beekeeping; sometimes these questions show up after the fact. And, I personally want to get rid of all the plastic foundation if I can.

Also, this weekend I had the idea to switch the bottom "hive" with the middle, placing the middle at the bottom because it was full of honey, while the "hive bottom" only had a little honey and most of my bees. Is this OK? There was brood in both, but more brood in the bottom...I worry that if the new bottom is filled with honey, the queen might not have enough space to lay eggs there. In the top I have some fresh wax that was drawn and not filled with honey yet. Would it be good to put some of that in the bottom for her to lay her eggs in? Thanks for your help. It is so appreciated.

Dana

A

Dana, you certainly could give the bees a starter strip of beeswax and let the bees free form the comb. But, this will create potential problems for you as well. You may (will) have more drone cells and if you do not have fully drawn comb in frames on either side of this free-form comb attempt, the comb may not be straight—it may be attached to the comb next to it, which will make it very difficult to remove and inspect for diseases and just be a pain—more stuff to think about. I would wait until spring to do this type activity, as bees will be more attuned to producing beeswax and building comb.

Bees over wintered will move vertically up (heat rises) and access stored honey. Leave the boxes where they are and as late winter early spring comes, you can reassess resource needs and move individual honey frames around if needed. Remember, honey bees have been doing those things to survive most efficiently for a very long time. They have been successfully doing these activities of brood rearing, storage of pollen and nectar and division of labor ever since our ancestors were on a permanent campout. You are the helper, collaborator and assistant for the bees.

Manipulation of hive parts and pieces can further your goals or put everything behind, depending on whether or not you are positively using the honey bees' biology to advance your cause. If not, you are just meddling, slowing things down and causing stress. Let's say I came to your house and decided that your living room furniture needs to be closer to your garage because I think it will be more convenient for you. Maybe that should be your decision and not mine.

FOLLOW UP

Dear Jerry, thanks so much! I totally agree with your approach. They are so wise and inventive. I feel like they are my teacher, but they are also amused by my heartfelt efforts. Thank you again for your time and perspective.

Best wishes,
Dana

Q What Is ORGANIC and Does It Help?

Hello from New Mexico. I was distressed to read your reply to the question in "The Classroom" section of Volume 149, No.10 of *American Bee Journal*. I suggest you look up the word "organic", then take

some time and read the latest research on high fructose corn syrup (HFCS). "Organic" is as close at it gets to "pure. Many articles discuss the dangerous levels of HMF in high-fructose corn syrup, as it pertains to supplemental feed for honey bees.

I feel that your reply was exact opposite of what it should have been: Do not feed HFCS; if you feed, find an "organic source", but an even stronger recommendation would be to not rob your hives of all their natural honey.

Best regards,
Phill Remick

A Phill, I have friends who are "organic" blueberry producers, so I know a little bit (actually more than I wanted to know) about their journey to USDA Organic Certification. In my mind it is all a bit of smoke and mirrors, as you can use some synthetic materials and not some non-synthetic. You can use cow manure from a feed lot as it has few "organic" restrictions and yet cows are fed huge amounts of antibiotics, growth hormones, supplements, etc., that are excreted out in their manure. Organic farmers can use sodium nitrate from Chile only if it is 20% or less of total nitrogen needed for a particular crop, etc. I guess at least it is a standard for the US, but it sure isn't as pure as the public may think it is.

I am very familiar with HFCS research done by Dr. Diana Sammataro, USDA/ARS Tucson Bee Lab, and comparisons of it with other "sugar" food supplements or substitutes. The largest identifiable problem with HFCS is when it has been heated/aged. A product called hydroxymethylfurfural (HMF) is formed. This HMF has significant effects on honey bee health directly from the indigestible nature of HMF and its toxicity. (But, don't forget that honey also develops higher HMF content as it ages and/or is heated.)

My recommendation for feeding high fructose corn syrup is that you check with the HFCS manufacturer for the "batch analysis" and then use it sparingly only if you need to feed your bees to save them from starvation. Be sure that you are buying your HFCS or syrup blend from a reputable dealer and don't shoot yourself in the foot by trying to save a buck by buying cheaper "off-spec" syrup.

Organic is many times a wonderful goal and a great feel-good word, but may ring somewhat hollow when one really knows what the definition is, especially with sugar syrup production that requires lots of chemical inputs to gain a competitive commercial product. At the end of the day, it is all marketing.

ROUND TWO

Jerry, I disagree completely.... "Organic" is not a "feel good" word. When a product is certified "organic", it must pass stringent tests to receive the USDA "organic" seal. Organic cane syrup, which was the original topic in the answer you wrote, is much safer and purer when compared to HFCS. True, marketing does play a role in some pseudo-organic products, I grant you that. However, because you happen to have had a different experience does not make the entire "organic" realm invalid and make HFCS any safer!

You of all people should be encouraging keepers to do their homework and seek truly clean, chemical-free feeds for their bees, not gloss over it and say it's a marketing wash, because that simply is not true.

This is a major issue, Jerry! All over the country CCD is playing a major role in depleting honey bees from the planet. We all know chemicals are the culprits here in many shapes and forms. One more item of note; the majority of corn products, including highly processed and manufactured HFCS, are genetically modified, which adds even more of a sinister twist to this dilemma.

If keepers continue to stay this chemical course, the outcome is already obvious. Beekeepers should be encouraged to seek only USDA certified organic sugars or again make certain enough honey is left on their hives so they can completely bypass this feeding step altogether.

Best regards,
Phill Remick
Albuquerque, NM

A Good Morning Phill. Not to make this similar to or drag it out, so it feels like an episode of *Oprah,* but let me briefly share with you some of my life. We as a family are as aware as any of the precarious nature of the U.S. food supply, not in quantity but in perceived and real quality. Maybe our problem at this moment is semantics. In a perfect world "organic" to me is the abandoned field behind our house where we pick blackberries each summer. No direct inputs from man. We grow a small garden and because it is small we can hand pick bugs or treat with "soaps" or horticultural oils. We have a few chickens that seem to be pretty happy being "free range". We read labels in the grocery store for country of origin and content. We make purchasing decisions based on what we think will be least "exposure" and lowest price. Being a family of modest means, we do this balancing act between value and perceived value. We recycle when possible.

We just might have to disagree without being disagreeable because USDA Organic Standards may result in a product better than one from China, but because of the USDA Organic Standards, there are a bucket load of compromises, back peddling and marketing of the Organic "label". USDA organic is not chemical free, mineral free or antibiotic free. Is it better than food not produced under these standards? Probably.

The price of sugar is controlled and supported with tax dollar subsidies. HFCS is used by large beekeepers because it is cheap and convenient. When you have hundreds, thousands or tens of thousands of honey bee colonies, this is not beekeeping any longer; it is industrial production agriculture. This is no different than 500 acres of squash, watermelons, blueberries or sugar cane or sugar beets. I am not aware of any sugars produced "organically" that are available in the multiple tanker truckloads that are cost effective and produce the value-added perception that commercial beekeepers require.

As I have said for years, honey is the honey bees' best food. Part-time beekeepers can manage for this. Commercial beekeepers cannot because their business model is different. Until this changes, the *feel good* about organic "sugar" pragmatically makes no difference.

Having been on the CCD Working Group since its inception, I can tell you that honey bee health is not good. Sixty-one different variables have been identified as impacting honey bee health. The main ones are: 1. Varroa; 2. viruses vectored by varroa; 3. open wounds from varroa that allow bacterial entrance and growth; 4. agricultural pesticides; 5. pesticides used by non-agriculture *i.e.* golf courses, homeowners, urban and suburban governing bodies; 6. Fungicides that increase toxicity of pesticides (see 4 & 5); 7. Poor nutrition; and 8. Secondary pathogens moving in on an immune-compromised honey bee colony

Are all of these going to disappear? I don't think so. Phill, I can feed you a diet of chocolate bars exclusively, run you around the block until you are exhausted, keep you up for three days in a row without sleep, have someone with H1N1 cough in your face, spray you with Raid (won't kill you) and then load you on a plane for a flight multiple time zones and datelines away to Ulan Bator, Mongolia and I guarantee that you will get sick! This is what we are doing to honey bees in some cases of commercial migratory beekeeping. Thanks for your comments and input.

The Beekeeper's Wood Shop: Empowering Women

by T'LEE SOLLENBERGER
photos by KRAIG SOLLENBERGER

I'm not Thor. I don't wield a mighty hammer. In fact, my favorite claw hammer weighs a mere 7 ounces and my tiny, tiny tack hammer even less.

Sure, I own heavier hammers like the 27 ounce framing hammer I found hanging in the barn shortly after we bought the place. Or the 15 ounce metal-whacking ball-peen hammer bequeathed to me by my Dad, who decided I needed it for God knows what. All useful, all purposeful, if wielded by a hefty guy like my friend Harold, but for us bantamweights, it's a real killer on the wrist whacking forty-four 2" nails when making a deep brood box, not to mention the need for great accuracy! Ouch!

Over a score of years in making bee equipment for my precious girls, I realized there had to be a way to minimize the wrist wrenching and finger mashing. So, naturally, I asked my mentor, no tiny petite guy either, (I seem to be surrounded by giants) for his advice.

I need more power, I said to him. My itty bitty claw hammer doesn't have any uhmph, no matter how accurately I hit the nails. It takes a gazillion whacks to get one lousy nail seated, I said with a certain hint of frustration. Is there any reason why screws couldn't be used instead of nails or a drill instead of a hammer, I asked him. And why not a cordless portable drill, instead of a corded variety? It allows for so much more flexibility. And freedom! And when it needs recharging, I can slap it on the charger and in about 15 minutes, the time it takes to snag a cup of coffee, it will be ready to go.

Well, said my wise, blue-eyed mentor, commercial guys have to look at the upfront cost of the stuff for makin' bee boxes and such. The speed of gettin' the job done must be considered, not how refined and pretty the box looks at the end of it all.

But, I'm not a commercial beekeeper am I? And I'm not 6' 4" and 200+ pounds of pure steel either. I don't think a couple of boxes of screws are going to break the bank and I'm in no particular hurry to build my boxes as long as I have them by spring. Let's use a drill to do the job, says I.

My mentor winks and smiles at me. He says he's learned a thing or two from me and one of them was how to use brains and beauty to solve a simple problem, just like this one.

That being the truth of the matter, this is how us girls solve the problem of strength and size.

Once upon a time, I had a 12 volt Black and Decker portable drill that was on the verge of death after a great many years of overuse. It had about as much uhmph as my tack hammer. It was time to death do us part and off it to salvage. I then drove over to my local home improvement store to find a suitable replacement.

Recently, it seems more sales guys lurk in the background of these stores than ever in the past, always asking politely if I need assistance. Must be this recession thing, and the value of a satisfied customer. All very nice, but I said no for the moment. If I hadn't been a former drill user, his assistance would have been most helpful. (Never be shy about being a bantamweight. Smile; wear a skirt and bat those pretty eyelashes

Photo 1 A: Rotate the keyless chuck to the right. 1 B: Insert the countersink, drill bit or hole saw. 1 C: Rotate the chuck to the left to tighten. The drill is ready to use.

Photo 2: Use a combination countersink drill bit to prepare the bee box for the screws. The countersink makes it easy to do two jobs at once—drill a pilot hole, (if needed), as it whittles a neat circle to create a well for the screw head.

Photo 3: Clamp-It® System, tack hammer, PVA glue, claw hammer and a rubber mallet are some of the necessities for assembling bee equipment.

Photo 4 from L to R: Coated deck screws, standard drill bit, long and short screw driver bits, clay coated frame nails and a countersink.

and ask the cute guy with the know how! He'll trip over himself trying to assist you. I know, that's a pretty chauvinistic statement coming from a feminist!

I examine the literature posted in front of each drill. My first issue is the amount of torque the drill can deliver when driving a screw, countersink or using a hole saw. Drills vary a great deal in this area and it really depends on how much money you want to spend for the amount of torque you will be getting.

I hefted several different drills made by various manufacturers from DeWalt to Ryobi. For a bantam, weight in hand is a big issue. Some drills weigh as little as 3 1/2 pounds and most a great deal more in the 18 volt category.

I palmed one then another, checking to see how they felt in my long, small hand until I understood the advantages and disadvantages of each drill. These drills accommodate up to a 1/2" size bit. This is the most common shank size and more than 1/2" in this department is not necessary for us chick-a-dees, who are not doing heavy construction. All these drills are keyless chucks, meaning you don't need to do more than rotate the chuck to tighten it around the drill bit before it's ready to go, (photo 1).

Before keyless chucks, a star-like key was used to open and close the chuck. If your are not purchasing a new drill and have inherited this type from some member of your family, I recommend strapping the key to the cord, (as your drill will most certainly have a cord), to keep from misplacing it. There is nothing worse than losing the chuck key!

All this took a few minutes. I didn't rush. Finally, I made a selection. By converting over to a portable drill in assembling bee boxes, I found it was no longer a fatiguing, haphazard job of constructing bee equipment. My thumb and fingers thanked me too! Any kind of drill improves accuracy over using a hammer, plus converting over to screws and glue to hold the boxes together is far better than nails and glue. Nails tend to pull away from the woodenware as it ages in the heat of summer and the cold of winter.

Along with buying a new drill, consider purchasing a combination countersink-drill set. The countersink combination pre-drills the hole for the screw, while boring out a small circle of wood, (photo 2). As you drive the screw into the countersunk wood, it is less likely to split and the screw head will be flush with the exterior, when it is fully embedded. Screws really are the ultimate way to go!

Also, women need to rethink the traditional double deep brood box arrangement. Why toss around a 100 pound deep box when checking your bees? Just 'cuz a lot of guys do it, doesn't make it right. I love my back, don't you? I have very little problem waltzing with a 40 pound box filled with brood and bees or honey; not so, when I first started with double deeps. Plus, uniformity in equipment sizes, i.e. mediums, gives a greater versatility with minimal strain on our backs.

When strength is no longer the issue, what else helps us build a better bee box? A portable workbench for starts. My current workbench is a Black & Decker Workmate®, which I've beat up for over 25 years. It's been painted on, sawn on, clamped to and been shuffled all over the garage and outside. The adjustable clamp brackets secure most projects at a comfortable working height and because it's portable, it folds up and can be stowed away when it's not in use. Although the price of portable workbenches start around $35.00, as with the drill, spending more buys more cool features and infinitely more flexibility.

What else do you need to construct bee equipment? PVA glue, clamps, some sort of square, tack hammer, a claw hammer, and a rubber mallet, (photo 3). Deck screws, cement coated frame nails, drill bits, a countersink that matches the deck screw head size and screw driver bit, (photo 4), are all very necessary and a frame-nailing jig makes short work of producing 10 frames at a time, (photo 5). After your bee boxes are constructed, select a paint or stain to make your equipment resistant to the weather, thus insuring a certain element of longevity for your bees' home. All these things are essential ingredients for the basic beekeeper's wood shop.

In the glue department, the best option is PVA, (polyvinyl acetate or aliphatic resin), wood glue. This type of glue is specifically designed for interior and exterior woodworking. PVA does not bond to nonporous materials like metal or plastics. However, it is water resistant or waterproof, (depending

(l) Photo 5: A frame nailing jig setup with end pieces and wedge top bars. Use PVA glue on the end pieces, tap in place with a tack hammer and nail the top bar with long clay coated frame nails. (r) Photo 6: Use the Clamp-It® system to square up the bee box before joining the glued countersunk sides with deck screws.

Photo 7: Use a Frame/Form Board for inserting pure wax type foundations like hook wire, (shown). The wedge top bar is removed before inserting the wax sheet and then nailed in place with 3/4" clay coated frame nails.

on the brand); it has superior strength, durability, resists solvents, heat and mildew. It is nontoxic and easy to clean up with a splash of water.

PVA glue has sufficient open time to make adjustments before the glue sets up, (5-10 minutes depending on the brand), especially useful when squaring up the corners of the bee boxes. Also, PVA glue may be used at much lower temperatures than other types of glue with similar attributes, (47-55°F), which is very nice during the cool months of fall and spring.

Once PVA glue has dried, give it a touch or two of sand paper to smooth off any excess making it ready for painting. Probond Exterior Wood Glue made by Elmer's and Titebond II Premium Wood Glue, (water resistant) & Titebond III Ultimate Wood Glue, (waterproof), made by Franklin International are several types of PVA glue I have used. Most home improvement stores carry at least one of these brands.

Among the other needful things for a beekeeper's wood shop is a clamping system to square up the corners of the bee boxes during assembly. There are many different styles and types of clamps available, bar clamps to strap clamps, but one of the easiest systems to use is called a Clampit-It® Assembly Square and Clamps exclusively sold by Rockler at: www.rockler.com . The plastic square is easy to secure to the inside or outside of a bee box with the small clamps that slip over specially designed notches in the square, (photo 6). This holds your freshly glued box edges together. Finger joint type boxes may need the tap, tap of a rubber mallet to whack them together after gluing. The joints are then secured with deck screws and allowed to cure in place. Rockler sells the Clamp-It® as sets of large clamps and mini clamps. Mix and match to your heart's content.

After pricing other types of clamping and squaring hardware, the Clamp-It® system is comparable to bar clamps or pipe clamps. However, some type of triangular square will be needed for these other types of clamping systems unless you like parallelogram bee boxes, (I've inherited a few of those!) Like the drill, buy the best, most versatile clamping system you can afford as you will use it for a variety of beekeeping projects, which will no doubt require gluing, squaring and securing.

About screws—buy good quality deck screws that are coated to resist weathering. They are sold in several colors. A one pound box will do quite a number of projects.

One of the easiest ways to square, glue and nail frames for foundation is a frame nailing jig or frame nailing device as it is called in the Walter T. Kelley catalogue at: **www.kelleybees.com**. Kelley carries two sizes, one for deep foundation, (us bantams don't need that size), and the other for medium and shallow foundation. If you want to to build your own jig, plans can be found at **www.beesource.com**.

The frame nailing jig, (photo 5), allows 10 frames to be constructed at once. The frame end pieces are held upright by a spring-tensioned padded board against the short sides of the jig. The ends are glued and the long, thick, grooved top bars are tapped into place using a trusty tack hammer or a small claw hammer to form a bridge between the two end pieces. The top bars are then nailed to the end bars using 1 1/4" cement coated frame nails. Turn the jig over and glue the bottom end pieces. Tap the narrow grooved bottom bar into place with the tack hammer. Nail the bottom bar to the end pieces using 1 1/4" frame nails, (**do not use** the 3/4" frame nails; that's not what they are for). To release the frames from the jig, slip the padded board out of the way. Let the frames dry overnight before inserting foundation.

There are several different styles of frames to choose from—the **grooved** top, grooved bottom style is used with rigid plastic foundations like Duragilt, Plasticell, and Pierco. These are for extracted honey production.

A **wedge** top bar and grooved bottom bar frame is used to produce comb honey using thin surplus foundation; hook wire foundation, (a pure wax sheet with vertical wires running through it), is used for brood rearing and honey extraction.

To make inserting the foundation of choice easier, a Frame/Form Board, (photo 7), is available from Dadant at: www.dadant.com. To use it, lay the **wedge** top frame on its side over the foam insert matching the frame's size. Remove the wedge board, (use a utility knife, then scrape the excess wood splinters off the frame). Insert a sheet of pure wax type foundation into the grooved bottom slot of the frame; the foundation will be supported on the foam board which keeps it from breaking and bending. The top of the thin surplus or the upright hooks on the hook wire foundation will lay on the edge vacated by the wedge. Nail the wedge bar back in place using the **3/4" nails**. Ta-da, easy as makin' cherry pie!

Let's review the necessities of the beekeeper's wood shop:

- 1 tack hammer, a 7 ounce claw hammer and a small rubber mallet
- 1 portable workbench
- 1 portable drill with drill bits
- 1 combination countersink bit set
- Clamp-It® Square Assembly and Clamps or something equivalent
- A box of 2" deck screws for the hive bodies 1 Frame nailing jig/device for 6 1/4" & 5 3/8" frames
- 1 pound or so, of 1 1/4" cement coated frame nails for the tops and bottoms
- 1 pound of 3/4" cement coated wedge nails
- 9-10 grooved top frames or wedge top frames per medium bee box, (10 for the brood nest, 9 for the honey supers)
- 1 Frame/Form Board for inserting foundation
- Beeswax coated rigid plastic foundation and/or a pure wax type foundation like Dadant's Crimp-wired.

So, there you have it bantamweights. A fresh new hive body with frames and foundation, plus your wood shop has all the basic ingredients necessary to assemble and repair other bee hive equipment as you continue to farm your honey bees. This tiny, but adequately stocked, beekeeper's wood shop will serve you for many, many years to come.

Useful Websites

www.beesource.com All kinds of beekeeping information.
www.dadant.com Beekeeping supplies.
www.doitbest.com Wood glue.
www.homedepot.com Home improvement center.
www.kelleybees.com Beekeeping supplies.
www.lowes.com Home improvement center.
www.naturalhandyman.com Woodworking advice and information.
www.rockler.com Woodworking tools.
www.titebond.com Wood glues.

John Kefuss: Keeping Bees That Keep Themselves

by M.E.A. McNEIL

John Kefuss began experimenting with the possibility of breeding resistant bees before it was known it could be done. He promotes his "Bond Method" of selection as both more healthy and economical than chemical treatment for both bees and their keepers. He now proposes a more gradual approach to weaning an apiary.

Photo credit: Jerry Draper

A winding dirt road thickly lined with blackberries and oak leads to a French apiary that has been sought out by researchers from around the world. The guest book in the ancient brick honey house reads like a Who's Who in the world of bee scientists, and they came to find John Kefuss, breeder of survivor stock.

Some, bumping up the brambly drive, 24 kilometers north of Toulouse, may well have wondered if they were going to a great deal of trouble to visit a huckster – the 007 Bond Method beekeeper. He is in fact some kind of reverse snake-oil salesman, peddling the rewards of giving up remedies with a side of good humored showmanship.

A kindly bear of a man, Kefuss warmly welcomed visitors one day last fall to his Rucher d'Oc (which means Apiary of the Oc, a region in the South of France). He sat down beneath an enormous oak tree to tell his story, surrounded by the pilgrims — some Polish and American beekeepers. He dubbed one, Krzysztof Loc who breeds 12,000 queens a year, "The Henry Ford of Polish Queen Insemination." And then he was off into the story of the tree — planted some 400 years ago to commemorate a visit of King Henry IV of France to the hunting grounds there. The story of the storyteller himself seemed remarkable, too.

Kefuss is an American who arrived some forty years ago to these lightly wooded rolling hills, which are native to his French wife, Josette. He came by his own circuitous route, a life journey that has somehow repeatedly landed him in the right place at the right time. Looking back from under his oak tree, he says, "Sometimes you have luck. You don't realize until later just how lucky you have been."

He started beekeeping at 11 years old. He worked his way through Ohio State University with a job at the bee lab of the legendary researcher Walter Rothenbuhler, who Kefuss calls "a kind and good person, a very good bee geneticist, a world class scientist." In the lab, Kefuss counted American foulbrood in bee cells. Kefuss saw that some strains of bees were killed by a couple of scales, and some strains tolerated a full comb filled with dried scales. Rothenbuhler told him, "John, you have to test against the actual disease."

When he finished his B.S. in entomology, with a minor in chemistry, he decided to join the Marines. Rothenbuhler, a World War II veteran, turned him instead to a job at the USDA lab in Logan, Utah. There he ran a study on photoperiods in bees under William P. Nye and, at 24, wrote the resulting paper that was published in the *Journal of Apicultural Research*. He remembers hitchhiking back to Ohio for a family visit with a quarter in his pocket.

Rothenbuhler was known as a systematic, careful researcher, and he admired those characteristics in the work of Frederick Ruttner in Frankfurt, Germany. He convinced his young protegee to enter a doctoral program under Ruttner. Not only did Kefuss speak no German, but he had been pronounced irredeemably language-challenged by his high school French teacher Mme Cory. Whether it says more about him or Mme Cory, he completed a PhD from the J.W. Goethe Universitat in zoology with work in biochemistry.

While he was a graduate student, Kefuss traveled to Apimondia in Maryland in 1967. He counts this story as the best of his good fortune: The first day of the congress he met a young French woman and had Ruttner translate for them both, including, on the last day, his proposal of marriage, which she accepted. "Like choosing queens, you have an idea what's a good queen," he said.

The newly titled Dr. Kefuss moved with his wife to her native Toulouse, where he established a commercial apiary. His education not withstanding, he insists he is not a scientist but a beekeeper (a fine line once you see what he is up to). "If you want to conduct an experiment, bring a scientist. I have the bees." And so it was that he supplied bees to Wolfgang Ritter in Germany and Jacques Ducos de Lahitte in France, who were testing chemical treatments used in hives. From 1983 through 1991, such treatments as Folbex, Apitol, Perizin, Amitraz, Apistan and Bayvarol were evaluated. "We did not work with the chemicals ourselves. But we saw the results." It was a turning point for Kefuss, who concluded

"The Bond Test keeps you very busy doing nothing" says John Kefuss, illustrating the point that the best selection is done by nature. In this gag shot, Kefuss and assistant Maria Bolt take an illustrative break in front of one of the centuries-old apiary buildings. Photo credit: K. Spitzel

Kefuss is sympathetic to the main reason most beekeepers do not follow his path and has come up with "The Soft Bond Method" to reduce the intimidating risk of crossing into a non-chemical protocol. Graphic courtesy John Kefuss

Beekeepers who have taken Kefuss's "World Varroa Challenge" to find mites in his apiary have been beekeepers from (top left, clockwise) Wales, China, France and Morocco. Photo credit: John Kefuss

that "Using chemicals is caveman beekeeping."

Now it is known that bees can be bred for resistant behavior, so it is hard to imagine that it was at most a guess and a hope only 17 years ago when Kefuss began to experiment with the idea. His respected doctoral mentor, Ruttner, opined that bees could not be bred against mites, saying, "Sheep can't be bred against wolves."

Kefuss saw, though, that in a project by Ritter in Tunisia with farmers too poor to treat their hives, survivor bees resulted. Was it a local effect, or was it genetic? In 1993, at Rucher d'Oc, Kefuss crossed the black Tunisian bees, *A.m. intermissa,* with yellow Dadant Starline *A.m. ligustica*, and it seemed that the resistant characteristic was genetic. The aggressive progeny could be selected for gentleness as well. He went to Tunisia, looking for hygienic bees: "I was asked, What will you do if you find none? I said, I'll go to the mosque and pray." He did find resistant bees; both he (in Toulouse) and Ritter (in Freiburg) tested them from 1993 to 2004.

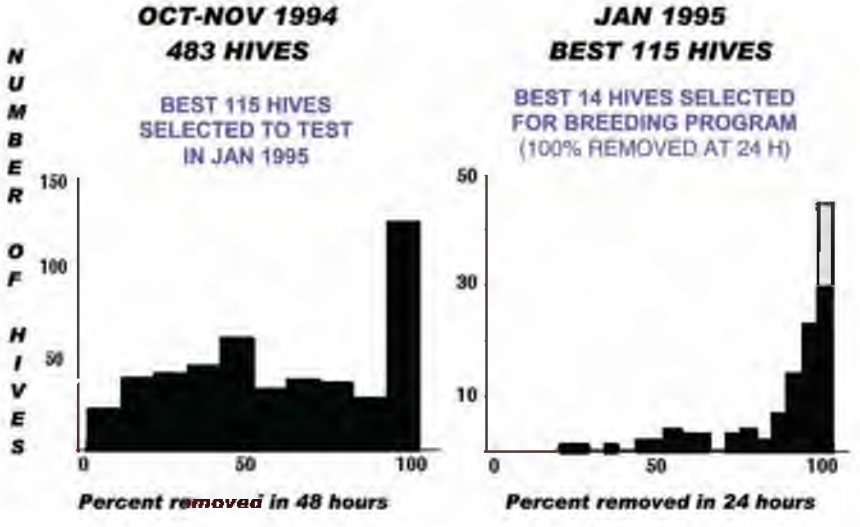
It was a heady time. In 1993, promising Urguayan stock was tested at Toulouse as well as at the Oberursel Bee Research Institute in Germany and the University of Warmia and Mazury in Olsztyn, Poland. At the same time, Kefuss began testing European stock by withdrawing all treatment. "By 1996 we knew we could select for Varroa resistance," he said. In 1999 he stopped all treatment of his hives in France. From 1999 to 2005, Ralph Buchler tested 13 lines of bees from different areas in Europe on the island of Unije in Croatia for resistance to Varroa without treatment. Kefuss' bees from Toulouse were the last to die out. "Ruttner told me that it turns out that sheep can be bred against wolves."

Was Kefuss first? It's not his kind of question. "I don't think about that. Danny Weaver was doing selection tests about the same time, '93. I learned queen rearing with the Weavers in Texas — Father Binford and Uncle Stanford Weaver. What's important is that you can develop bees through selection."

What sub-family of bees is best? That's not his kind of question either. "I don't know if it is very relevant to list the different races we have worked with (Carniolans, Caucasians, Chinese Italians, K-Stars, from our old Starline lines, *intermissa*). What is important is that all races can be selected for better tolerance to Varroa. What we are trying to do is develop bees with as many different types of alleles as possible because there are many types of resistance."

Perhaps one reason Kefuss eschews being called a scientist is that he is more practical than analytical. "It's not important to know" just *why* a particular strain is surviving (although he is assiduous in recording *how*). "You flew here to Europe and didn't know the mechanics of the plane, but you got here."

The term "Bond Test" was first coined at a meeting of the German Bee Research Institutes at Bremen "to describe our principle of 'Live and let Die' for the testing we had been doing since 1993. You don't do any treatments and wait until the non-resistant lines die out through natural infestations." Kefuss subsequently intensified the process with the Bond Accelerated Test — "Survive or Die Now" (BAT). "In the BAT test we give frames of brood with large quantities of Varroa (40 per 100 cells) to accelerate the



This chart shows the results of the first hygienic tests in Chile, showing two steps that Kefuss recommends for all beekeepers in selecting resistant stock: First test for 48 hour removal of inserted frozen brood. The best hives are later tested for 24 hour removal, and the best few with 100% removal are selected for the breeding program. Chart courtesy of John Kefuss

John Kefuss, in the red shirt, leans against a 400 year old tree at his apiary, Rucher d'Oc, in Southern France. He is explaining his selection and breeding techniques for resistance to a group of Polish and American beekeepers. Photo credit: Jerry Draper

elimination of non-resistant lines. That way instead of taking three to four years we can do the job in about six months. The Bond test is slow but you probably end up selecting for more different types of resistance. The BAT test is fast and probably will not take into account mechanisms of resistance that require a long period for the effects to be observed."

Either way, he has found that most beekeepers see the choice between treating or withdrawing treatment from their apiaries as a catch-22. Kefuss said, "It took me three years to decide to stop because I knew there was a good chance I would lose my shirt, or even more." To convince reluctant beekeepers, he now teaches a more gradual approach, which he calls The Soft Bond Method.

He now keeps his commercial apiaries without treatments and cites 15% loss – the same or less than beekeepers who treat. To answer the skepticism his results have produced, he has announced "The World Varroa Challenge," inviting beekeepers to Rucher d'Oc to count mites in his apiary, offering one euro cent for every mite found.

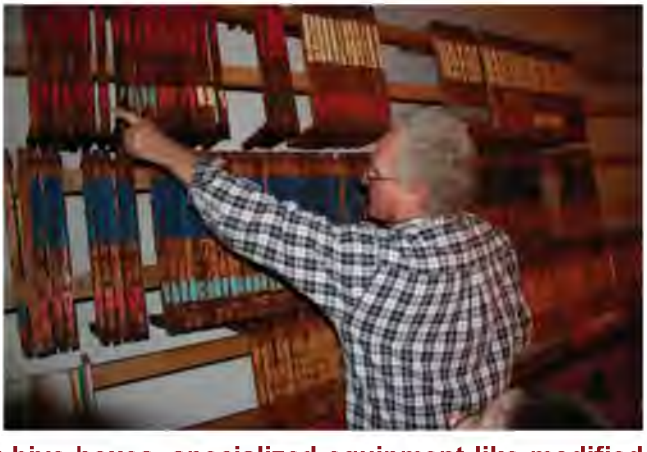
The assembled beekeepers that fall day followed Kefuss from beneath the old oak to a tour of his bee house, stacked with homemade boxes. He makes or adapts all his own equipment, including frames, queen cells made of German hair curlers, and ice cream boxes used for emerging queens. His hybrid Cloake boards, a blend of Brazilian and New Zealand methods, have a five-frame nuc above; he explained that they produce heavier queens, and he finishes no more than 20 at a time.

Then he suited up the group and took off down a dusty side road, trailed by a carload of beekeepers, to an apiary of some 35 hives. There, the foreigners pulled and ogled frames, resorting to opening cells to earn some change – after all, it was high mite season. Amid the placid bees, they soon shed their suits and then their veils. At last, the group came up with a couple of sickly looking pupae and three Varroa mites. Kefuss was having fun. "It's cheaper to have visitors from time to time to try to find mites in my hives," he said with a twinkle. "Don't believe what I say. Look at it for yourself and you will believe your own eyes."

That evening, Kefuss' long-time apiarist, Maria Bolt, appeared at the bee house. He clearly respects her skill, introducing her with the story of his lost line of bees, which she was able to replenish, improved, from her own apiary. She brought a feast of French food — a great coil of saucisson, breads, roasted vegetables and wines. The party was joined by local beekeepers, toasting and talking bees in multiple languages around the table, laughing: "Hey, the mites will become an endangered species," "No kidding, he raises them in Petri dishes," "Ha, I even advertised for them in the French bee journal," "There's a better business — mites." In a glow of bonhomie, everyone dispersed into the night, headed for Apimondia, the international bee conference, in Montpellier.

If Kefuss found himself often at the right place at the right time in his life, his talk at Apimondia might be added to that list as timely. Like no other presentation at the congress, the lecture hall was crammed to overflowing with people who wanted to hear how to get off chemicals without losing the store. They were, he told them, in for a big surprise.

Kefuss' message, simply put was: Most beekeepers have not assessed the cost of chemical treatments, which have to be repeated every year, in contrast to a breeding protocol. An analysis of the risks and benefits of selection will show that it is not economic to treat. In addition to the up-front cost of gas, labor and chemicals is the cumulative resistance created in pathogens and pests requiring increasingly stronger treatments, the contamination of honey and beeswax, and the negative effect of chemi-



(l) Kefuss makes all of his own equipment – sturdy hive boxes, specialized equipment like modified Cloake boards, queen cages and an incubator. (r) Kefuss keeps meticulous paper records for selection. He also has color codes in the hives, which he shows here, to help keep track of the lineages as he works. Photos: Jerry Draper

Kefuss shows his Hybrid Cloake Board, a device with elements invented in New Zealand and Brazil which he has adapted for use with a five-frame nuc for queen rearing. Photo: Jerry Draper

The Kefuss Hybrid Cloake Board on a colony in his apiary in Chile. He and his partner in the apiary, Francisco Rey, rear no more than 20 queens at a time in the nuc and find they get better queen size. Photo: John Kefuss

The queen rearing operation at Pacific Queens, Kefuss' commercial apiary in Chile. Photo: John Kefuss

cals on colony fitness.

"Think like a lazy man," he said. The Bond test is "a test that runs all by itself" – the process of natural selection. He illustrated the point with a gag slide of himself and Bolt snoozing in front of the bee house.

Mites? Good, he says. They are valuable selection tools, not to be eliminated but kept at a level that does not hinder the bees. "If your dog has fleas and I bust into your house, he's not going to worry about his fleas" — a Kefussian explanation.

Colony loss? A gift. In 2001– 2002, two-thirds of his hives died out in the selection process. "I would have been happy with 10% survival." But most commercial beekeepers, he concedes, could hardly celebrate heavy loss. What's more, selection costs time with skilled labor, and beekeepers have little leisure to work out a plan. Simply put, the Bond and the BAT test involve too much risk. To answer the need for a cross-over program that is simple and cheap, with fewer risks, he presented the Soft Bond Test. It is a way to do the time-intensive testing on a limited number of hives.

As a variable example, he set out a procedure for the selection of up to 20 breeder queens from an apiary of 500: 1) From the initial group of hives, select the 100 best producing colonies. 2) On those, perform 24-hour hygienic tests. (Kefuss carries squares of worker brood cells already frozen to insert immediately as he cuts, saving a trip. 3) Of those, select the most hygienic 40 for Varroa count. Tabulate all adult, daughters and immature Varroa in the cells to give a present and future evaluation. 4) Spread this breeding material by rearing daughters and requeening in all bee yards to produce selected drones. 5) Leave the best 20 of the selected hives without treatment – the Bond test – to produce breeder queens.

He calculates the time investment for selecting a breeder queen for disease resistance for this size example: 7.25 hours per queen (50 hours for hygienic testing plus 95 hours for the mite count, which comes to 145 hours divided by 20 queens). In addition, he notes the time per queen to select for, in this case, pollen collection: 3.73 hours. His total is 10.98 hours invested in each breeder queen.

He suggests that beekeepers: graft from the Bond Test queens with the lowest number of Varroa; monitor Varroa levels in colonies not in the Bond Test and stop chemical treatment when infestation is below 5% (the fleas-on-the-dog situation).

This Soft Bond approach has the advantages of limited loss, natural mating, better resistance to brood disease, and a time investment rewarded with less work and money spent on treatments.

Kefuss produces 3,000 mated queens a year in France, which he sells worldwide. His breeder queens sell for 650€ each. His apiary in Chile, Pacific Queens with partner Francisco Rey, has 4,000 hives for pollination, queen rearing and honey production. With opposite seasons, they can provide 6,000 queens to France in February and March. "In 1994 we had European foulbrood, chalkbrood and mean bees. We started to select for hygienic behavior, and in about two years time these problems were eliminated. We've been running the Bond test there for over 10 years."

For eight years, Maria Bolt has worked with the breeding program at Rucher d'Oc. She now breeds resistant bees at Rucher Bolt while continuing to collaborate with Kefuss. Photo: Jerry Draper

Time brings change. Kefuss has turned over honey production in the French apiaries to his son Cyril, remarking "It's easier to lift a queen than a deep super of honey." And he deeply misses the camaraderie of his neighbor down the road Steve Taber, the American bee expert who died last year.

But Kefuss is moving into the future. He

is in a cooperative project with Danny Weaver, who is doing DNA analysis to identify survivor stock. And he is training beekeepers from around the world in his Bond protocols, spreading the word that bees do not need to be kept with chemicals. Notably, a researcher from China returned home to train 400 beekeepers with a goal of producing chemical-free honey. It is hoped that Kefuss and Bolt will speak and teach two-day workshops in the U.S. in 2010-11: "It would be mainly practical manipulations with a little bit of theory. People would get their hands dirty and be involved."

He considers this work to bear "a certain moral responsibility to future beekeepers to show that it is not only possible but cheaper to keep bees without chemicals." He invites beekeepers to his Varroa Challenge at Rucher d'Oc, where they are welcome to sleep on the hay.

"This is what we do. I hope you take it and improve on it, and we can copy what you do."

To inquire about hosting a U.S. visit of John Kefuss and Maria Bolt, contact **nuc@survivorstockqueens.org**.

John Kefuss can be reached at **jkefuss-bees@wanadoo.fr.**

M.E.A. McNeil is a journalist and graduate of Marion Ellis' Master Beekeeper program at The University of Nebraska. She lives on a small organic farm in San Anselmo, California with her husband and son, beekeepers all, and participates in the Marin County Survivor Stock Queen Rearing Project. She can be reached at mea@onthefarm.com.

Managed Pollinator CAP
Coordinated Agricultural Project

A National Research and Extension Initiative to Reverse Pollinator Decline

http://www.beeccdcap.uga.edu/
http://www.extension.org/bee%20health

Detect *Nosema* Parasite in Time to Save Bee Colonies

by KATHERINE ARONSTEIN
Research Molecular Biologist, USDA/ARS

Those of us working with bees have experienced significant changes in beekeeping practices in recent years. It seems that difficulties of keeping bees healthy has transformed routine management into an epic struggle for colonies' survival. Some of the problems can be explained by the introduction and spread of new diseases and microbes that have become resistant to drug treatments. We recently described one of these mechanisms for drug resistance in AFB bacteria (Murray and Aronstein, 2006). The increased use of synthetic insecticides inside and outside of beehives has not helped either. Combinations of different pesticides (even when they are not highly toxic to bees when used alone) can produce unintended results by affecting the overall health and immune response of bees, making them susceptible to a variety of diseases and stressors (Reed et al., 2009).

Threatened with losing essential pollinators, the US Congress has approved increased levels of bee research funding to discover and mitigate the causes of bee decline. Did bees experience the effect of a new yet un-identified factor (e.g., disease, pesticide etc) or is this the same old problem showing its ugly and exaggerated forms? This problem is now a major focus of several investigations. Scientists are looking at the root cause of the Colony Collapse Disorder (CCD) syndrome, searching for new diseases, harmful chemicals or a combination of these factors which could inflict stress on bee colonies pushing them over the edge for recovery. Many of these urgent questions will be addressed in our new multi-institutional USDA Coordinated Agricultural Project (CAP) by systematically analyzing bees, pollen and wax samples collected from stationary apiaries.

Among multiple suspects identified so far, bee viruses and a microscopic *Nosema* parasite have attracted the most attention in the press, and rightly so. Most of these are intracellular parasites which are undetectable by visual colony examination. When bees are finally showing sign of the disease, it is for the most part too late to save

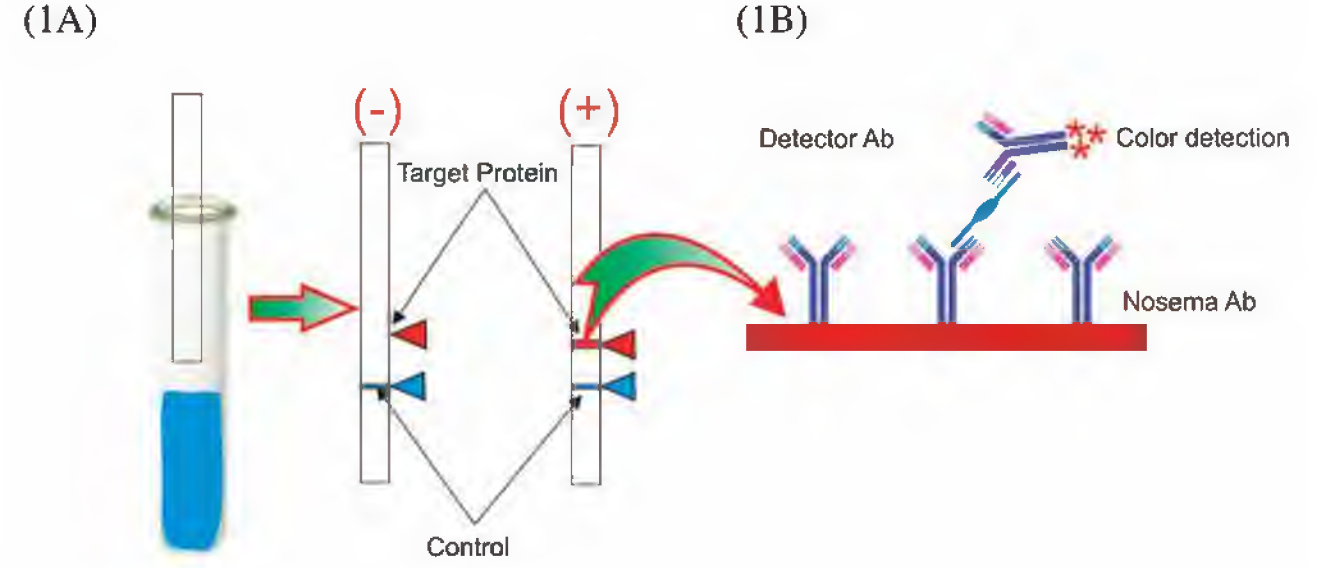


Figure 1. How the test works
1 (A). A cellulose strip is inserted into a vial filled with a mix of reagent (provided) and bee gut homogenate. A few moments later color bands (one or two) will appear on the cellulose strip indicating (-) a negative result if only a lower band (control) is visible, and (+) a positive result when two bands are visible. 1 (B). Schematic presentation of the immunological reaction. *Nosema ceranae* antibodies (Ab) are incorporated into a cellulose strip and serve as a "red flag" and an anchor for the immunogen (*Nosema* protein). The immunological reaction is based on a very strong bond that develops between *Nosema* Ab and the *Nosema* protein which was originally used for the development of the Ab. When *Nosema* spores are added to the reaction mix, the Ab will bind to the *Nosema* protein and form a very strong bond. If this reaction is coupled with color detection using secondary antibodies (Detector Ab), the appearance of two color bands (control and *Nosema*-specific) indicates the presence of *Nosema* spores. The appearance of a single color band (control) indicates a negative result.

the colony since most of the bees are infected and dying.

Nosema apis has been known to occur in the United States since at least the 1950s, but its presence in bees has been a matter of mixed concern. When infected bees were found crawling in front of the colonies leaving yellow strips of diarrhea, they were normally treated with antibiotics (Higes et al., 2009), and that took care of the problem. Then why is it that scientists now suspect *Nosema* in recent losses of bees? Some scientists even point to *Nosema* as the primary reason for CCD (Higes et al., 2009). Apparently, a new species of *Nosema* (*N. ceranae*) is now widely spread in the U.S. and around the world, silently replacing *N. apis*. Little was made of this discovery in 1996; but concern was reawakened in 2005 when bees in Asia were observed suffering from the disease. In 2006 *N. ceranae* was detected in Europe causing heavy losses of colonies in Spain, France, Germany and Switzerland (Higes, et al., 2006). Since this new species is not readily detectable in the apiary, infection goes unnoticed for a long time. Bees could be infected for weeks and not show clinical signs of the disease. The microscopic identification of this new species is also a challenge since both *N. apis* and *N. ceranae* spores look similar when observed under a microscope. Therefore, for species identification, bee samples are normally sent to a laboratory capable of DNA amplification. In the laboratory, scientists can determine genetic differences between the two species of *Nosema* using PCR. Since *N. ceranae* infected colonies can die much faster, survival of the colonies depends on a timely detection and treatment of the disease. However, precious time is lost waiting for lab results. Therefore, development of a rapid and simple identification tool could save an entire apiary and prevent disease epidemics.

Dipstick assay

The idea behind this tool is not new, being based on the principles of immunology (antibody-protein interaction). The tool is often designed in a dipstick format for easy use in the field or home. Although antibody-based dipstick tests involve sophisticated technology derived through research and development, the actual products are user-friendly and packaged as a kit of reagents. Such methods have been developed for the detection of medically important diseases and their insect vectors and the detection of HIV in human blood. Perhaps the most familiar use is the home pregnancy test.

By adapting this technology to beekeeping needs, it will be possible to develop a simple and error-free method for the detection of the *Nosema* infection in bee samples. This research is currently conducted at the Weslaco Honey Bee Research Unit (USDA/ARS) as part of the CAP project. The final product, a dipstick assay for the detection of *Nosema* spores in bee samples, will be developed in collaboration with private biotechnology companies. Some of the companies have already received our proposal.

How does it work?

A kit will contain multiple strips of cellulose, each of which is intended for a single use. After crushing a bee or the dissected guts from several bees in a vial with reagent, a strip of cellulose is inserted in the homogenate. A few moments later, either a single or a double band will appear. A negative result is indicated if only one blue band (control) is visible (see (-), Fig. 1A). A positive result is indicated if two bands are visible, one blue for the control and the other red indicating the target *Nosema* protein (see (+), Fig. 1A).

Nosema ceranae antibodies (Ab) are incorporated into the cellulose strip and serve as a "red flag" and an anchor for the immunogen (a *Nosema* protein). The immunological reaction is based on a very strong bond that develops between *Nosema* Ab and the *Nosema* protein which was originally used for the development of this Ab (Fig. 1B). When *Nosema* spores are added to the reaction mix, the Ab will bind to the *Nosema* protein and form a very strong bond. If this reaction is coupled with color detection using secondary antibodies (Detector Ab), the appearance of two color bands (control and *Nosema*-specific) indicate the presence of *Nosema* spores. The appearance of a single color band (control) indicates negative results.

Since the basic idea behind the test is not new, many before us have attempted to develop such tests. However, a poor quality of antibodies, a lack of specificity, and a low level of sensitivity are the main difficulties that have prevented the successful development of a quick test. Antibodies are usually produced by injecting a foreign protein (immunogen) into animals such as goats, rabbits, rats, or mice. The animals' immune system then detects a foreign invasion and responds by producing antibodies. Clearly, the quality of the antibodies can make an immunological assay a success or a failure. How well antibodies detect the original immunogen depends on its type and purity.

When immunogen is produced in the laboratory, the time, effort, and resources required for its synthesis can be substantial. It is challenging to make a pure immunogen. Contaminating molecules can serve as secondary immunogens, resulting in antibodies lacking specificity. We decided to avoid this mistake by choosing a novel way to develop antibodies, the so-called Genomic Antibody Technology (GAT) (Fig. 2). The use of this technology is a completely new way of thinking about immunogens. Using GAT technology, a piece of circular DNA (plasmid) containing the DNA sequence encoding the protein of interest (*Nosema* in our case) is injected into the animal. A pure protein is then produced directly in the animal (and by the animal), thereby bypassing the normal lengthy protein production procedure in the laboratory. In-vivo expressed protein is recognized by the animal as a foreign invader which, in turn, triggers production and release of antibodies in the animal's blood.

One difficulty of using GAT technology is that it requires prior knowledge of the protein sequences. That is a serious obstacle unless the pathogen's genome has been sequenced. Fortunately, both *Nosema* genomes are being sequenced by the USDA. We were able to identify a target protein se-

Figure 2. How the antibodies are produced
Using GAT technology, a circular piece of DNA (plasmid) containing the DNA sequence encoding the protein of interest is injected into the animal. A pure protein is then produced directly in the animal (and by the animal), thereby bypassing the normal lengthy protein production procedure in the laboratory. In vivo expressed protein is recognized by the animal as a foreign invader which in turn triggers production and release of antibodies in the animal's blood. Antibodies are then purified and used in the *Nosema* detection tests.

quence located on the *Nosema ceranae* spore wall (the DNA sequence provided courtesy of Dr. Jay Evans, Beltsville Honey Bee Research Laboratory, USDA/ARS). We are now testing our new *Nosema ceranae* antibodies on bee samples. So far our tests show a high Ab sensitivity that can detect *Nosema* spores in crude bee homogenates at a 1 : 5000 dilution, similar to commercially produced Abs. We are also testing the minimal amount of spores that can be detected by the test. Using routine gel-based laboratory methods we determined that our new Abs can detect one infected bee among one thousand non-infected bees. This level of sensitivity will allow for the detection of very low rates of infection in bee colonies.

Who will be able to use this test?

The test is not intended to replace current methods used in research laboratories. There is no need to replace high throughput technology designed for processing large numbers of samples. Instead, it will help beekeepers, hobbyists as well as commercial beekeepers to detect and monitor the progression of the disease in the field. It will help beekeepers make educated decisions about disease management. Most impotently, this new tool will (1) encourage reduced use of antibiotics since it will discourage unnecessary treatments, (2) give regulators new decision-making tools in regard to inter-state and international bee movement, and (3) give producers of queens and package bees a means to detect and monitor Nosema levels in their production colonies.

Disclaimer

"Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture."

References cited

Higes, M., Martín, R. and Meana, A. 2006. *Nosema ceranae*, a new microsporidian parasite in honey bees in Europe. Journal of Invertebrate Pathology 92: 93-95

Higes, M., Raquel Martín-Hernández, R., Garrido-Bailón, LI., González-Porto, AV., Pilar García-Palencia, P., Aranzazu M., del Nozal, MJ., Mayo, R., Bernal, JL. 2009. Honeybee colony collapse due to *Nosema ceranae* in professional apiaries. *Environmental Microbiology Reports* 1(2): 1758-2229

Johnson, R. M., H. S. Pollock, and M. R. Berenbaum. 2009. Synergistic interactions between in-hive miticides in *Apis mellifera*. *Journal of Economic Entomology* 102: 474-479

Murray, K. D. and Aronstein, K. A. 2006. Oxytetracycline-resistance in the honey bee pathogen *Paenibacillus larvae* is encoded on novel plasmid pMA67. *Journal of Apicultural Research* 45: 207-214

The Traveling Beekeeper

Time for Resistant Bees —A Plan for The Individual Beekeeper

by LARRY CONNOR
Wicwas Press
1620 Miller Road, Kalamazoo, MI 49001
LJConnor@aol.com • www.wicwas.com

Every beekeeper must take on the responsibility of intentionally contributing to the level of resistance to mites and diseases in all colonies. They need to start it this year if they have not already done so, since the sooner we all start this process, the sooner we will be finished. This is not a function of operational size, since a single-colony beekeeper can keep resistant bees just as well, if not easier, than a thousand-colony operator. The change that must occur is in the mind of the beekeeper, with each one of us making the decision to keep bees that do not succumb to varroa mites, American foulbrood, chalkbrood, sacbrood, other viral diseases, *Nosema* (both species) and more. Like any trip to a new destination, we first must decide what we want to take with us, and for all of us, we must find queens that already possesses some level of natural resistance, and/or we must set up a selection program to develop such resistance.

Finding resistant queens

Many large-scale queen producers and package bee providers do not select for resistance. Period. They make no effort to work toward a resistant stock. The selection criteria they use are the same as those used in pre-mite selection: productivity, fast buildup, wintering ability (maybe) and low stinging behavior (also maybe). There are many breeder queens selected by large producers who select on just two criteria and two criteria only: brood production and honey yields. Sometimes the system involves the placement of a pushpin on the landing board following colony inspection or honey harvest—at a point where the colony impresses the beekeeper. The colonies that get the most pushpins over the season become the grafting mothers for the next generation. Granted, there may be some non-directed selection for these two characteristics that coincidentally results in lower varroa counts. But the selection method does not discriminate against the colonies with some level of disease, and it certainly does not reflect any selection based on the performance of the queen's daughters in colonies in customer hives. Success or failure of queens in a northern operation does not concern the Sun Belt stock provider since there is little difficulty finding customers for any queens that are produced during the key months of the spring.

So, what does the beekeeper seeking resistant stock do? I have a one-word answer: ASK! *Ask* if the bee stock has been part of any bee-breeding program selecting for mite and disease resistance. *Ask* if previous year customers provided production figures for the colonies and the level of mite population when tested. *Ask* if any of the breeder queens have resistant genetic material in their background. Finally, *ask* if the individual breeder queens are sampled for varroa mite levels, and are one hundred percent clean of American foulbrood, chalkbrood, sacbrood, other viruses and any other pest infestations. It amazes and disgusts me to see queen producers graft from colonies with active chalkbrood infections! How can they be so incompetent! The presence of chalkbrood clearly indicates that the colony is not hygienic, AND it serves as a direct route of infection of the queen and eventually her colony.

Recently, I had a discussion with a large queen bee and package producer and he confirmed that his operation does not have any sort of disease or mite selection program. For large commercial honey-producing operations with a plan to chemically treat the colonies, this works. But for the beekeeper trying to find resistant queens, this is NOT the source! The wide-scale propagation of mite susceptible queens does nothing to help the industry move toward a chemical-free system of raising bees, and as long as these operations continue to produce mite susceptible queens, we will not be able to end the need for chemical treatment.

The smart beekeeper will be at the National meetings this month visiting with queen producers who do have a resistance program in place. They usually advertise this in their journal advertisements, such as the one you are reading this in right now. Look for the key words and phrases: Hygienic stock, tested mite-resistant breeders, Russian bees, VHS breeders, grafted from Minnesota hygienic x VHS breeders; these are examples. If they put it into print, they really should be carrying out the practices they claim. The fact that some of these selection programs began about 20 years ago should provide adequate opportunity for these resistant bees to be made available to the public. Make sure to *ask* for a copy of their data.

Local test survivors

What if you have a regional beekeeper who has colonies that have not been treated for varroa mites with chemicals for the past ten years AND produce good crops of honey and winter well? It is important that you ask for such stocks, since they may already possess the local adaptation factor that large Sun Belt queen producers cannot provide. Seek out and use these queen stocks. Personally, I hope to search Michigan and surrounding state suppliers for chemical-free stocks of queens and nucs. I have a start with the queens I purchased last year from a beekeeper who works with Dr. Greg Hunt at Purdue University and produces queens from stock shown to have some resistance. Using the Purdue stock and new stocks I hope to obtain in 2010, I will start a simple testing program that all beekeepers can duplicate.

Quick stock testing for mite resistance

When we started colonies last year, they all were set up on a screened bottom board, and I recommend that all new beekeepers make this investment for healthy bees. We can leave the insert board in place during the cool spring buildup months and remove it as the colony expands and requires additional ventilation. On a periodic basis we Dust & Count. Each colony will be given a standard powdered sugar treatment of ½ cup of powdered sugar for every deep brood box. This is placed onto a piece of window screen on the top of the hive. A bee brush or large paintbrush is used to spread the powdered sugar over the top of the frames. Then the screen is removed and the sugar on the top bars is brushed between the frames. My objective is to get powdered sugar on the worker bees, but NOT into the brood comb where it may dry out young larvae. (This is why I have not used a bellows or blower system.)

Periodic sugar dusting over the course of the season will provide meaningful comparisons of different stock that are added to your apiaries. (Closely timed dustings—twice a week—also provide excellent varroa control.) An effort must be made to develop some sort of standardization when you do this so you are not comparing new colonies—nuclei or packages—with full sized or over wintered colonies. Colonies can be ranked by their cumulative degree of mite levels. The lowest mite counts are desired, the highest are not. Sampling systems, the wait until you count the mites, should use a standard interval after dusting, from ten minutes to 24 hours. That will provide a useful comparison.

Sort out the colonies with the highest and lowest mite drops based on sugar dusting

The colonies with the lowest overall mite drop are the ones that are supporting the lowest mite population, and theoretically express some sort of resistance or tolerance based on known or unknown mechanisms. Then, evaluate the colonies for other characteristics, such as honey production, late winter population strength (frames of bees) defensiveness (number of stings and/or number of hits on the veil) and other characteristics important to you. This will give you a percentage of your total colony count that can be used to produce new queens either through utilization of swarm cells or from grafting cells.

Colonies that are at the lowest thirty to fifty percent of the ranking—the ones with the highest mite counts—should be systematically taken apart and reassembled to make new colonies with new and hopefully more resistant queens. The new colonies could be made up with three to five frames of brood, one or two frames of stored food, and drawn combs of frames with foundation. With a new queen, virgin queen, queen cell or 48 hr cell from a resistant queen, you can establish new colonies and allow the queens to mate with drones from the local supply. At first this drone population will have low mite resistance, but with periodic stock replacement, some unexpected swarms adding to the environment, and planned drone management, you can build a more resistant supply of drones within your local area.

The goal is simple—reduce the mite count to a minimum and maintain that level by continued testing and selection.

Example

If you have 100 colonies at the first of June (I am using a Northern model, move this to an earlier month if you are in Sun Belt location), select the colonies with the lowest mite drop over the past 12 months. You may use natural queen cells and/or graft from the top ten to twelve colonies. At the same time, take thirty to fifty colonies that have higher mite counts (especially those with the highest counts), and divide each colony into two to four colonies, evenly dividing the brood and honey resources among all new colonies. The old colony will no longer exist. You do not need to find the queen (remove her if you do), but you need to add a queen—mated or virgin—or a queen cell to each new colony. Feed and support the colony with syrup and protein mixtures. Once the colony has expanded to a full depth box, start evaluations with the powdered sugar for the next round of evaluation and selection.

And produce drones

One reason I reprinted G.M. Doolittle's books (*Scientific Queen Rearing* and *A Year in the Out-Apiary*) was the many useful suggestions he made for general colony management. His system used to stimulate drone production from ONLY the best colonies in a location needs to be repeated:

In the group of one hundred colonies (or what is left of them after you make the divisions), select out the very best one-fifth to one-third of the colonies and add drone comb to stimulate drone production. As the brood is sealed, add this to the rest of the remaining colonies. Doolittle showed that the addition of developing drone to these colonies inhibited the development of drones in the colonies. The repeated movement of "desired" drone brood into colonies that you do not want to produce drones will create a good drone population carrying resistant genes.

Goal setting

Over time, in each generation you create, you want to have lower and lower mite drops or counts using the powdered sugar test. New stocks (families of queens) can be added to the study, and separate queen families can be developed as you proceed. The goal is simple—reduce the mite count to a minimum and maintain that level by continued testing and selection. This is not necessarily a complicated process, and the method will result in good colonies with low mite counts.

***Queen Rearing Essentials*, Dr. Connor's newest book, is now available from your local bee supply source or from www.wicwas.com.**

The Economy of the Hive

by RANDY OLIVER
ScientificBeekeeping.com

Inside the hive there functions a vibrant community, with an economy similar to that of any other society. The bee economy is based upon the harvesting and processing of resources, the trade of products, doting care for the youngsters and parents, wise savings, deficit spending, a hierarchy of jobs, national defense, and an exquisite communication that allows democratic decision making.

Colony Collapses

We have an innate desire, or might I say, a demand, to determine the culprit responsible for dying colonies. However, it may well be that the "mystery" of colony collapses is akin to similar previous events such as Disappearing Disease (so named not because the *bees* disappear, but because the *disease* disappears after wrecking havoc for a year or two). Note that previous events occurred prior to the arrival of varroa, or even before the widespread use of synthetic pesticides.

I started this article with the thought of explaining in simple terms the mechanisms that lead to a "sudden" collapse which leaves only an empty hive containing a residual mere handful of young bees and the queen, since many beekeepers seem to think that this is an unusual phenomenon, requiring us to identify some novel villain. In reality, this symptom has been reported for as long as records exist, and is actually a common outcome of infection by any pathogen that severely shortens the life of adult bees—such as *Nosema apis* or some viruses.

As my readers may have noticed, my curiosity gives me no respite, and I found that in order to understand the mechanics that cause a colony to collapse, that I needed to delve deeply into bee behavior, pheromones, nutritional economics, parasites, and immune responses. I find in general, that the more thorough an effort I make to understand the biology of the bee, the less mysterious the phenomena that I observe in the field become, and the better practical management decisions I can make. At the same time, the more that I learn about this "super-organism" that we call a colony of bees, the more amazed I am by the complex dynamics that go on within the hive! (I suggest that every beekeeper read Jürgen Tautz's wonderful 2008 book, subtitled "Biology of a Superorganism).

To truly grasp how a colony "thinks," one must understand the economy of the hive. The bee economy is similar to that of our own in the USA—which is based upon a plentiful supply of food, yet must contend with having its wealth drained off by parasites (Wall Street and credit card companies come to mind), being hammered by drought and storm, war on multiple fronts, and the current skirting of economic collapse. And just as does our own, the bee colony rallies to respond to those challenges—sometimes it is successful, sometimes not.

This article kicks off a series that will begin with a description of the hive economy, to be followed by articles on colony communication and the modeling of its behavior—that is, how a colony "thinks" and adjusts to changing environmental conditions. Then we will deal with parasites, disease and the colony immune response, and then colony collapse. Finally, I hope to make suggestions as to directions that we can take in the breeding of bees for a robust future of beekeeping.

I realize that this is an ambitious undertaking, especially since I am forced to do much of my research and writing while on the road, or pounding on the sticky keyboard after days in the bee yards and honey house. However, these are rough times for beekeepers, and I'm encouraged by the appreciation that I receive for my efforts. I'm heartened by the desire by many to become better beekeepers, and by their hunger for knowledge about this fascinating insect society that so captivates us.

I'd like to make clear that I am no Cassandra predicting the demise of the bee (although bee***keepers*** are certainly having a tough time). It's clear that bees are facing serious challenges from the varroa mite and our associated miticides, viruses, and *Nosema ceranae,* along with climate change, and the "clean farming" of pesticide-laden vast monocultures. But bees have always demonstrated an amazing resiliency, which I fully expect to play out again.

Neither will I proselytize that beekeepers *need* to do this or that. Bees don't ask for much—a dry box and plenty of flowers. But they do benefit from common sense good husbandry. The more that the beekeeper understands about the economy of the hive, the better he or she can make wise management decisions.

So let's begin with...

The Fertilized Egg—two potential paths

In this article, I'm going to restrict the discussion mainly to the females of the colony, since the presence of drones is not necessary for day-to-day colony function. ***The default for any fertilized egg is to develop into a queen*** (except in the rare case of diploid drones, which are immediately eaten). Now that statement may come as a surprise to some, but think of it this way: the ancestral female ***solitary*** bees were by necessity ***all*** "queens"—each performing all functions necessary for a simple life cycle. The queen is actually the "generic" form of bee, since she is similar to the ancestral solitary bee.

In reality, it is the workers who are the "special" bees in the colony, and it is the queen who serves ***them***, by providing eggs when she is given the signal, and the pheromones necessary for colony cohesiveness. In order to form a larger bee society, a versatile "worker" caste was created—the members of which are able to perform all the various functions required in bee society at some stage of their lives, other than that of laying eggs (and in actuality, workers are even able to do that under the right circumstances).

Worker bees are created from potential queen eggs essentially by withholding food, which in turn tweaks the epigenetic expression of their genes, so as to form a very different multipurpose body with specialized structures—larger antennae and eyes, wax glands, special mandibles, pollen rakes, press, and basket, and a barbed sting. (I'll be covering epigenetics at length in an upcoming article).

The development of the worker caste allowed the bee to "grow" in size from that of a single insect into the fifteen- to twenty-pound mammal-like, warm-blooded, superorganism that we call a "colony" of bees. This larger organism was then able to move out of the tropics, and by utilizing tree hollows as homes, has been extremely successful at colonizing the forage-rich temperate regions of Earth.

We can better understand the dynamics of colony sociality by looking at how it evolved from the bees' solitary ancestors. A

The queen is unique in the colony, but she is completely subject to control by the workers! Although the queen lays the eggs, the sisterhood of nurse bees functions in every other aspect as the "mother" in the colony. Photo thanks to (enthusiastic beginner) Kimberley Burch/Sunset Publishing.

typical life cycle began after a long resting phase (as an adult or pupa), then progressed to a foraging/provisioning phase (when food was available) during which the solitary female built and stocked her nest with pollen, which then stimulated the development of her ovaries. She then laid an egg, sealed (and eventually abandoned) the nest, and then repeated the foraging phase again and again until she died (Hunt 2007).

Note that the honey bee colony follows similar phases—a long "rest" when there is no pollen available (during winter in temperate climes), then a frenzied provisioning phase through the spring/summer pollen flow, during which the colony builds up stores of protein in the form of a large body of workers, and creates reproductive forms (drones and swarms). The beauty of the honey bee colony is that it does not die after reproduction (as do bumble bee colonies), but can continue to store enough food to survive over the winter, thus giving it the ability to reproduce again the next season (and to get a jump start on the early spring bloom). The honey bee colony is thus essentially immortal—unless it is killed by a predator, lack of food, or disease, it can live forever, reproducing in most years.

No solitary insect could possibly do this, since adult insects cannot regenerate their worn external appendages, such as wings or legs. But the colony of bees, in which each bee functions analogously to a single "cell" of a larger super-organism, can regenerate its individual cells (even a failing reproductive queen, by the process of supersedure).

The key to the transition from a solitary "queen" performing all the work, to a fully functioning immortal colony, was the development of "alloparental" (other parent) nursing of developing younger sisters by the queen's previous daughters. This led to the development of a "worker" caste of bees—potential queens that by virtue of being raised in smaller cells and on a less nutritious diet, never fully develop their reproductive stature, and remain nominally sterile.

The outcome of this sociality is the fascinating division of labor in the colony by workers as they progress through a series of jobs, dependent upon their developmental "age" and the needs of the colony. Our understanding of the molecular basis of this "age polyethism" (age-dependent changes in behavior) has been greatly expanded by recent research by Drs. Stig Omholt, Gro Amdam, Robert Page, and their coworkers (see References).

One might ask why Joe Beekeeper should care about the molecular basis of polyethism. The answer is that it involves nutrition, pheromones, immune function, and the aging of bees—the understanding of which allows us to grasp how the colony "thinks and decides," why it thrives or gets sick, and how we can better practice good bee husbandry.

For our purposes, let us return to the ancestral model. The main jobs that bees need to do are to forage for food (**forager bees**), then process that collected food and to convert it into new bees (the job of **nurse bees**), and to be able to become long-lived **"resting" bees** that can survive food dearths for extended periods. Of course, there are also a number of other jobs performed (largely by "middle aged" bees), such nectar storage, comb building, cell cleaning, guarding, etc., but those jobs are secondary to the major three.

Nurse Bees

Nurse bees are the protein gatekeepers for the colony. They are specialized to digest pollen, and to convert it into protein-rich jelly, which they then use to feed the three ravenous mouths of the colony—the queen, the brood, and the protein-hungry returning foragers. None of those three groups digest pollen to any extent themselves—they are totally dependent upon the jelly produced by the nurse bees. The jelly can be thought of as the "currency" of protein in the colony (we will return to this later).

Nurse bees are like mother mammals—they are voraciously hungry, and store food reserves in their bodies in order produce sustenance for their young. They live in a sheltered, safe environment, and enjoy an expected long life. They therefore invest in a ramped up immune system, anti-aging free radical scavenging, and cellular repair (please refer to my "Fat Bee" and "Old Bee" articles for details). Their strong investment in immune function is important, as they must produce parasite-free food for the queen and larvae.

Practical Tip: Well-fed nurse bees will keep the young larvae "swimmin' in jelly." Lack of "wet" brood is a sign that the colony is short on protein, and might benefit from being given a pollen supplement.

Forager Bees

Forager bees face a dangerous environment outside the protection of the hive. Their lives are defined by the risks of predation, poisoning, chilling, wind and rain, and the wearing out of their wings. They are considered by the colony to be expendable, and therefore do not devote much energy into immune function or cellular repair. Weather and forage permitting, they simply work themselves to death in a matter of days.

Practical Tip: Anything the decreases the life of the fragile foragers can keep the colony from building up a large population. Such impairments include mites, nosema, viruses, pesticides, and poor nutrition. Check any "lagging" colony for the cause!

Resting Bees

The ancestral honey bees from Africa were likely adapted to food dearths between rain events. They could shut down brood rearing and wait out the drought until rains again brought food, living in the interim off their stores of honey and beebread (or in the case of savannah bees, absconding to go looking for fresh forage). This preadaptation served them well when they invaded the European temperate climate, since they already possessed mechanisms for conserving their energy and stores, and to extend their lives as "resting" bees (Amdam 2005).

"Resting" bees are commonly referred to as "winter" bees. However, ***Mauritzio (1954) found that one could induce the formation of "winter" bees even during the summer by restricting the queen from producing brood.*** This adaptive shift to extended longevity is a response to the cessa-

tion of pollen income into the colony (Mattila and Otis 2007), which "tells" the younger bees in the colony to conserve protein and hunker down for a while. Very unlike the short-lived foragers, they can then live for a considerable period of months. Indeed, Peter Borst points out that in northern climes, a colony of bees spends a larger portion of the year as resting winter bees than they do as nurses or foragers!

This "suspended animation" mechanism is a critical component for colony survival during times of pollen dearth. The technical term for these resting bees is "diutinus" bees. By loading up their bodies with storage proteins, they can then form a resting cluster that does not have to process pollen or leave to defecate. Diutinus bees carefully ration their protein reserves, using them at a fraction of the rate that other workers do. They also invest in immune and detoxification functions, since they must prevent disease from spreading in the resting cluster.

Practical Tip: One should avoid disturbing the winter cluster. Stimulative syrup feeding or the occurrence of unseasonable warm weather without pollen or supplement available can result in "fruitless foraging" that wears out the winter bees.

Nurse bees that haven't raised too much brood can transform into diutinus bees, as can foragers who haven't worn themselves out (they are able to renew their youthful immune function). When conditions get better, diutinus bees can then again transform into either nurse bees or foragers.

Practical Tip: Any time that a colony goes into the resting state, there will be no brood for varroa to hide in. This is a good opportunity to use oxalic acid dribble, or in warm weather, sugar dusting to kill varroa mites.

Coming Next

Colony nutrition, and the importance of royal jelly in the economy of the hive.

Acknowledgments

As always, I am deeply indebted to my collaborator in research, Peter Loring Borst. I also appreciate the generosity of Drs. Zachary Huang, Rob Page, Gro Amdam, Heather Mattila, and Tom Seeley, who took the time to answer my questions and share unpublished research.

References

Amdam, GV and SW Omholt (2002) The Regulatory Anatomy of Honeybee Lifespan. *J. Theor. Biol*. 216: 209–228.

Amdam, GV, et al (2004) Hormonal control of the yolk precursor vitellogenin regulates immune function and longevity in honeybees. *Experimental Gerontology* 39 (2004) 767–773.

Amdam, GV, et al (2005) Higher vitellogenin concentrations in honey bee workers may be an adaptation to life in temperate climates. *Insect. Soc.* 52: 316–319.

Amdam, GV, O Rueppell , MK Fondrk, RE Page, CM Nelson (2009) The nurse's load: Early-life exposure to brood-rearing affects behavior and lifespan in honey bees (*Apis mellifera*). *Experimental Gerontology* 44: 467–471.

Hunt, J (2007) The Evolution of Social Wasps. Oxford Univ. Press.

Li, Z, et al (2009) Vitellogenin is a cidal factor capable of killing bacteria via interaction with lipopolysaccharide and lipoteichoic acid. *Molecular Immunology* 46: 3232–3239.

Mattila HR and GW Otis (2007) Dwindling pollen resources trigger the transition to broodless populations of long-lived honeybees each autumn *Ecological Entomology* 32 (5): 496-505.

Maurizio, A (1950) The influence of pollen feeding and brood rearing on the length of life and physiological condition of the honeybee: preliminary report. *Bee World* 31: 9—12.

Nelson CM, Ihle KE, Fondrk MK, Page RE Jr, Amdam GV (2007) The Gene vitellogenin Has Multiple Coordinating Effects on Social Organization. *PLoS Biol* 5(3): e62.

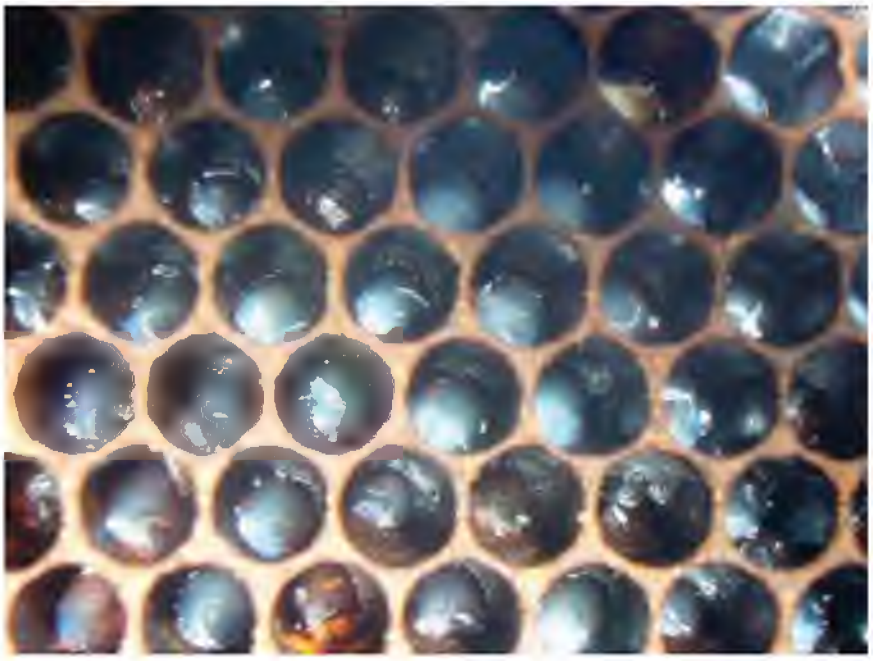
Otis, GW, DE Wheeler, N Buck, HR Mattila (2004) Storage proteins in winter honey bees. *Apiacta* 38: 352-357.

Schmickl, K & K Crailsheim (2004) Inner nest homeostasis in a changing environment with special emphasis on honey bee brood nursing and pollen supply. *Apidologie* 35: 249–263 **This is a "must read" article for the serious beekeeper, which can be downloaded free at** http://www.apidologie.org

Seeley, T.D. (1995) The Wisdom of the Hive. Harvard Univ. Press

Tautz, J (2008) The Buzz about Bees: Biology of a Superorganism. Springer.

Webster, T and Y-S Peng (2002) The evolution of food-producing glands in eusocial bees (Apoidea, Hymenoptera). *Journal of Evolutionary Biology* 1(2): 165-176.



"Wet" brood—young larvae floating on abundant royal jelly. Such abundant jelly indicates that this colony is enjoying a rich protein intake, and is thus well nourished. Photo by the author.

Moriha Yetter
Idaho Commercial Beekeeper

by CECIL HICKS

Several years ago if you'd told Moriha Yetter, a resident of the rural Sagle area in north Idaho, that she would one day be making a career as a commercial beekeeper managing some 650 hives of her own, she might have said you're crazy. But today that's exactly what she's doing.

In a state noted more for raising potatoes than bees, she's taken up an occupation that's quite rare indeed, especially for a woman. While there's a number of women hobbyist beekeepers across the nation and women working for commercial beekeepers, Moriha believes there are very few women owning and operating their own colonies.

With some 90,000 hives in the Gem State and more than 100 commercial beekeepers producing 3.6 million pounds of honey, Moriha believes she's the only woman. When she started working for a beekeeper she was surprised that there weren't more women. While she's met some women who have a hive or two as a hobbyist, she says she's never

Commercial beekeeper Moriha Yetter paints her bee boxes and supers with her business name, "Yetter Hive & Honey."

(l) Only 9,000 more frames to go. Moriha builds frames and bee boxes in her shop. (r) Moriha ships barrels of honey to Sioux Honey Association, plus sells honey locally from her home and at a couple craft fairs. Here she fills a gallon bucket.

Some 150 bee boxes were stacked and waiting to be painted outside her bee shop when a wind storm blew threw the area in early October of 2009.

met another female commercial beekeeper. This includes her home state of Idaho where her bees produce honey during the summer, Washington state in the spring where they pollinate cherry, apple and pear orchards and also in California where she sets her bees in the almond orchards in February and March for pollination.

Besides being a full-time commercial beekeeper, she's a wife and mother of three children Mason, 14, and twins Matteo, 12 and Miranda, 12. Her husband Matt works for the Litehouse Salad Dressing Company in Sandpoint where he's a replenishment specialist.

She was born and raised in the city of Sandpoint (pop. 6,500), and has lived in north Idaho her entire life. At the age of 35 she'd held a variety of different jobs since graduating from high school, including more recently that of a ski lift operator at the local Schweitzer Ski Resort in the Selkirk Mountains. Prior to that she worked as an assistant for a veterinarian. She said she also once worked a data entry computer job where she had a desk in a closet-like space and it was horrible and boring.

About six years ago she started helping extract honey for a local commercial beekeeper. It wasn't long before her interest in bees grew and she started helping him work his bees, build frames and hives, medicate, and add supers. This year she arranged a business deal where she'll assist him with his 1,800 hives and she's allowed to use his equipment at his bee shop to extract her own honey. By the first of October 2009 she had 10 barrels waiting for shipment to Sioux Honey Association in Sioux City, Iowa.

At about the same time several years ago, when she began honey extracting, she also began reading books and magazines and researching beekeeping information on the Internet.

"Eventually, I just fell in love with bees and made a decision to buy some of my own," she said. Last year she plunged into her new chosen career by taking out a business loan through the Idaho Farm Service Agency and she bought 320 hives from an Oregon beekeeper.

The metal shop she uses at their rural residence for bee equipment storage, building of frames and boxes and pouring honey to sell locally was once her husband's shop he built to work on his cars, mainly old VW Beetles. She admits that she's largely converted his car shop into her bee shop, but when I told him I wanted to be a full-time beekeeper he's been very supportive.

When Matt talked about losing his car shop he said, "It went from Beetles to Bees." Although he added, there's still room in the shop for him to work on at least one car.

About the only thing she has trouble doing as a beekeeper, she explained, is pulling heavy honey supers. At five foot two inches tall she'll sometimes be removing deep supers that weigh 60 or 70 pounds and they are stacked above her head. She can only pull supers stacked four high. "If they're five high I have to stand on a box." Usually she calls on her husband to help with the heavy lifting. "Matt will take a day or two off from work, or we'll schedule pulling a yard on a weekend so he can help. Sometimes I'll pull a bee yard by myself when no help is available, but it totally wipes me out physically," she said.

Moriha said their children have helped with some of the beekeeping duties, but this past summer they had a medical emergency with Miranda and had to rush her to the hospital when she was stung by bees. She said her daughter has been stung in the past with no allergic reaction, but normally she wears a bee suit when they're checking hives at bee yards and there's no problem.

However, on this day, Miranda didn't have a bee suit on and was just picking some flowers near a yard I was working. When she started to take the flowers back to the truck, she was stung five times in the head. She immediately started swelling up and broke out in hives. Then, she started vomiting. I rushed her to the hospital. "I now know what a bad reaction to a bee sting is." Moriha said. Miranda now carries an epi-pen allergy bee kit with her at all times.

During the first week in October of 2009 Moriha was helping another beekeeper pull honey supers from his last two yards then he'd be finished for the season. She was also busy building new frames and boxes from woodenware she purchased. On October fifth she still had 9,000 more frames to make.

She also had 150 new supers built and stacked out back of the shop ready to paint when a wind storm blew threw the area and knocked over most of the stacks. This storm was followed by a rain shower. She said now

(l) Moriha, standing alongside her bee truck parked in front of her bee shop, prepares to head out to pull a bee yard. (r) Moriha checks one of her bee yards near Sagle, Idaho.

(l) Moriha Yetter has eleven bee yards spread across the panhandle country of north Idaho. This yard is located beneath a wooded area near a hay field. (r) The Yetters' main family hobbies are horses and skiing. They own nine appaloosas horses they use for recreation, trail and show riding. Here they are standing with Miranda's gelding, Cappy (in the background) and Jo Jo, Moriha's mare (on the right). The Yetter's are (L to R) Metteo, Matt, Mason, Moriha and Miranda.

she has to restack them and wait until they dry before they can be painted.

She paints her supers a yellow color and paints her business name in black on the side—Yetter Hive & Honey.

She sets her bees in eleven different north Idaho bee yards and this past week (the first of October) she had to remove one bee yard that was located near Baldy Mountain west of Sandpoint. She explained, "If I leave that yard too long the black bears start coming down off the mountain in the fall when the weather turns cooler and cause trouble."

In the summer months I try to check bee yards at least every other week and add supers as needed. Toward the end of August she pulls supers and begins extraction.

During the honey production season her bees forage largely on alfalfa, clover and knapweed. They also collect nectar from wildflowers, backyard gardens and fruit tree blossoms.

Last year was the first time she shipped bees to California for almond pollination. She, along with three other north Idaho beekeepers, gathered their bees in a large yard in a field north of Coeur d'Alene in November. She was the first beekeeper on hand when the first semi arrived to pick up bees. When the driver saw her, he asked, "What are you going to do?"

She replied, "I'm going to load bees."

Again he asked, as if he didn't believe her, "No, really what are you going to do?"

She said she finally just hopped on her Swinger and started loading the pallets of bees on the truck. She said, "Usually once I start working with bees and people realize I know what I'm doing I'm accepted and I don't have any trouble fitting in with my fellow workers."

When she went to California to work bees prior to setting them in almond orchards last year, she said the staff was a little shocked at the small 14 room motel when she checked in. At first she was told they didn't have a vacancy as all the rooms were booked with beekeepers for a couple weeks. After explaining that she was one of the beekeepers, they apologized and said they've never had a female beekeeper staying with them before.

She recalled only one person who was rude. While setting bees in an almond orchard in California, the owner came out and remarked, "Who's girlfriend are you?"

She replied, "I'm not anybody's girlfriend." He got over his initial shock when I explained I was a beekeeper and was there to set my bees in his orchard.

She and her family have two hobbies—horses and skiing. She actually stumbled across her best bee yard that she's quite excited about when she was buying a truckload of alfalfa hay for her horses. Anyway, she said she was picking up a load of hay from a farmer living in the county 30 miles to the north near the town of Naples. He had 5,000 acres of hay fields. She didn't see any beehives, so she asked him if any beekeepers have their bees around his fields. He said not since a beekeeper removed his bees after they had bear problems a few years ago. She explained that she was a commercial beekeeper and asked if she could place a yard on his property.

As the previous beekeeper had his bees set in a remote part of the property near a forested area, she asked if she could put her hives near his driveway which gets quite a bit of daily usage with vehicle traffic and it's quite a ways from wooded areas. He said sure. She returned later with 60 hives and set her bees behind an electric bear fence. She had no bear problems this year with this new yard.

They have nine Appaloosa horses, which they train, show and sell. She rides both English and Western saddle in pleasure riding shows and her daughter Miranda has also gotten into jumping at horse shows.

They enjoy taking the horses on family trail rides. Over Labor Day weekend they went on a camping trail ride on the Idaho side of Lo Lo Pass in the Bitterroot Mountains near the Montana border. While camping they heard a lot of wolves howling every night. Moriha said Matt hunts elk in the fall and planned to return to the area later for a hunting trip, but he doubted if he'd see any elk because of the large number of wolves they heard.

By the end of the third week in October 2009, Matt had indeed gone on an elk hunt and as predicted he had no success.

Besides the horses they have on their five acre mini-farm, they have a small flock of eight sheep, three dogs, six cats, a few egg-laying chickens and there are also a few turkeys wandering loose around the place. Moriha's mom and dad live next door on five acres of land.

The family also skis together on weekends during the winter months.

Her bee equipment includes a one ton flatbed Chevy truck, a Swinger forklift, a small 25 gallon bottling tank and a heated warming box designed to hold several four gallon buckets prior to bottling. In 2008 she bottled 3,000 pounds of honey and this year bottled 9,000 pounds. She sells honey locally out of her house, plus at two craft fairs in gallon, half gallon, quart, and one, two and three pound sizes. The price per gallon is $25.

She said this year was pretty normal with an expected amount of bee losses. Also she hadn't heard of any large bee losses from other Idaho beekeepers. All-in-all she said north Idaho had a good honey season with a proper amount of rain and sun. At the start of the year she bought 150 queens from California and ordered some 250 packages.

Between working bees in California and Washington state she's away from home about two months out of the year. She said, "Matt's very cooperative and understands my beekeeping routine."

She said that most people when they find out what she does for a living find it quite fascinating and ask a lot of questions about bees and beekeeping. "I think CCD problems across the country have grabbed people's attention and they now realize that bees are very important to agriculture and the food industry in our country."

As for her future, Moriha Yetter hopes to expand her bee operations in the next couple years to about 1,000 hives. She's very pleased with her career decision to become a commercial beekeeper. "It's definitely a lot of hard work, but I find it real enjoyable."

HONEY PRODUCTION IN GUINEA

Part I - Learning about Guinea, Its People and Teaching Beekeeping

by CONRAD BÉRUBÉ

The author's trip to the area is indicated by the red circle.

I work as an environmental protection officer with the Ministry of Environment in Nanaimo, British Columbia— having gained the position through a circuitous route. I received a Master's degree in entomology from the University of California, Davis, and specialized in apiculture and integrated pest management (IPM) and spent the early part of my career working in apicultural development, mostly in Latin America and in operating an IPM consulting company. After settling in British Columbia I was hired into the IPM program of the Ministry of Environment. However, over the years, my original job duties have changed and become increasingly administrative, managerial and bureaucratic—and largely unrelated to my principal interests of study. I have found that volunteering in beekeeping development projects stimulates my core interests and keeps my field skills honed. I can make the transition from being a desk jockey playing paper hockey to being a field hand in a strange land— which allows me the opportunity to share innovations I have observed in one locale in another where such practices may be unknown.

Since 2002 I have been privileged to serve on three Farmer-to-Farmer projects in West Africa, specifically two in Ghana and one in Guinea. I have written of my first two excursions in "Beekeeping in Ghana: on the road in Africa doing developmental beekeeping demonstrations" published in the May and June 2003 issues of *American Bee Journal*[1]. My experiences in Guinea were distinct enough to warrant their own account.

Farmer-to-Farmer (FtF) is a program funded by the United States Agency for International Development (USAID). The program offers, as a form of mutual aid, technical assistance to countries in Latin America and Africa. The technical assistance arrives in the form of volunteers with specialized technical skills that would otherwise not be readily available in the rural hinterlands. In exchange, the volunteer has the opportunity to gain a richer worldview, share knowledge and interests, acquire or practice foreign language skills and, not least of all, make new friends. In addition, as a "goodwill ambassador", FtF volunteers can help to engender friendly sentiments towards the U.S.— a commodity that should not to be lightly discounted these days. It was with these guiding principles then that I began preparing for a five-week assignment to Guinea that was to start in November of 2007.

Guinea lies on the tropical west coast of Africa. It is roughly the shape of a croissant— which is perhaps appropriate as it was ruled by the French for many decades. French remains the country's official language and it occurred to me that the recipe for gourmet baked goods may have been one of the few technical benefits that the French left behind them. This, because in 1958, Guinea was the first of the African Francophone countries to seek independence from European colonial interests and,

Above, from left to right: OIC technician, Amadou Petty Diallo, Farmer to Farmer Volunteer Conrad Bérubé and beekeeper Mamadou Bailou Kaby observe (very cautiously) bees at the entrance of a Kenya Top Bar Hive in the village of Bousoura, one of the many communities visited during the author's trip to the area.

Traditional hives in the Ley Miro area are usually made of wicker that is then covered over with daub and straw for insulation. These hives are usually fairly small both because of the nature of the building materials, which would collapse if the hives were scaled up, and because the colonies are not allowed to grow very large before being robbed out. It is a chore to have to reconstruct such hives each season and the crude harvesting practices negate the possibility of maintaining perennial colonies, depending instead on the trapping of new swarms each season. Hollowed palm trunks such as those at upper right are sturdier and can be provided with doors.

in severing this relationship, the country spiralled into an economic chaos from which, in the intervening half century, it has yet to completely recover. Approximately 80 percent of the 10 million inhabitants of the Oregon-sized country live in small agrarian communities— often in materially impoverished conditions. I was to work with two non-governmental development agencies working in the central Fouta Djallon region to increase incomes and improve living conditions in the area. One of them, Opportunities Industrialization Centers' Food and Livelihood Security program in the Pita and Telemele districts has mercifully shortened its designation to OIC FLSPT. Their community outreach representatives live and work in rural postings in a capacity similar to extension agents of government and land-grant university programs in the U.S. Their extensionists work in fields as diverse as family planning and public health to farm improvement and agricultural cooperative management and marketing. The production of honey has a long tradition in the area, but it was believed that FtF volunteer input could improve the production and quality of bee products yielded from the area. The other organization with which I collaborated, the *Fédération des Apiculteurs de Guinée,* was much more specific in scope, as its work is restricted to things apicultural, but hoped for similar outcomes from the efforts of a volunteer. Namely, they were hoping for techniques to improve beekeepers' incomes and promote sustainable practices.

The gracious hospitality (which included some of the aforementioned baked French delicacies) of Leon Sakho, Country Representative, and Sidy Conde, Farmer-to-Farmer Project Coordinator for OIC Guinea, did much to restore my spirits after a long and difficult trip when I met them. Sidy accompanied me on the eight-hour journey to Labé to give me a general orientation on everything from changing money to the national cuisine. The vistas of the Fouta Djallon through which we passed were often quite spectacular. This high, rocky plateau is used for grazing goats and cattle and the resourceful farmers are also able to wrest grains such as dryland rice, maize (corn) and fonio (a cereal crop prepared much like rice, but strongly resembling couscous in texture and flavor), citrus and a few other tropical tree crops such as mangoes and avocados are cultivated in the valleys between the bluffs and mesas of the region.

By early evening we had arrived in the district prefecture at Labe where I was introduced to the staff of the *Federation des Apiculteurs de Guinée*: Mamadou Yaya Diallo, president, and Tanou Diallo, technician, and Oury Sow, a Gambian who had been hired on contract as translator.

During our field visits it became apparent that the level of apicultural development was fairly uniform, and basic, amongst the various communities we visited. Most of the honey produced in the Fouta Djallon region is produced by simple, traditional methods. These methods conform to the characteristics of the native strains of honey bee in Guinea, *Apis mellifera scutellata.* Like the race of honey bee that was imported to Brazil in the 1950's, which has since colonized most of the New World tropics, Guinea's bees are very defensive and prone to swarming. Colonies grow and divide quickly when the rainy season has resuscitated vegetation and floral resources abound. When the landscape begins to dry and brown, colonies may abandon old nest sites in search of richer forage. In harmony with this cycle, Guinean honey producers set out easily made, low-cost hives in the hopes of catching passing colonies looking for a new nest site. Traditional fixed-comb hives share the same general shape: hollow cylinders oriented in the horizontal. The uniformity of shape contrasts with the wide variety of techniques that are used in their manufacture: fire-hollowed palm trunks, wicker frameworks covered with daub, chiseled out hardwood gums all serve as basic hive-building materials. Hives are harvested when floral resources begin to dwindle and honey stores are at their peak. Colonies are usually driven out of the hives or killed outright with smoke, allowing the honey to be more easily harvested with a minimum of protective equipment. Because of this practice colonies are often relatively small when robbed out—and the hives themselves are on the smallish side, saving on the cost of materials per nest box. Although the stores

In Guinea the harvesting of hives is usually done at night when bees are cooler and thus less defensive. Harvesting is then also made more convenient since honey bees do not fly in the dark.

I demonstrated to my colleagues that if one smokes one's skin and bee-suit it is possible to work even nasty African bees without gloves—even though it is a good idea to keep your gauntlets nearby-- just in case. Crushing cassava leaves and rubbing them on the skin also works as an effective bee repellent.

Whether working at night or during the day, good protective equipment can make bee-work much more pleasant; new beekeepers who do not suffer extensively, either from excessive stings or overheating, during their initial forays into bee-keeping are far more likely to continue in the undertaking than those who are ill-equipped. FAPI and OIC promoted the use of very sturdy equipment fashioned locally. Dian Bobo Diallo, at bottom centre, models a lighter bee-jacket of a style which I had tailored in Labe and which I demonstrated could be used quite comfortably in the hot Guinean weather—once it had been given a nice dousing with fumes from a smoker.

are thus less abundant than they might otherwise be for a fully developed colony, the dangers inherent in working with such unruly bees are also proportionately reduced. Because the colonies in the traditional hives are usually killed during harvest, the majority of Guinean honey producers would be classified as bee-havers rather than beekeepers.

Our time in each community was very short—no more than a few hours. Nonetheless, the technicians with whom I worked and I agreed that, following our assessment of current resources and capacity in each location, it was worthwhile to cover key points towards which future extension efforts would be directed. Here are the key topics and principal messages we conveyed in each community:

• medicinal uses of honey in rehydration drink and as a wound dressing

○ Because of ripe honey's low moisture content it prevents the growth of microbes and can be used as a wound dressing—very useful in rural areas where the nearest pharmacy or clinic may be many hours away. In addition, the honey will generate hydrogen peroxide as exudates from the wound dilute it, which will exert an antiseptic effect. The honey will also provide nutrients to the wounded tissue while it repairs itself. We recommended that wounds, after being washed with soap and clean water, should be salved with honey and covered with a clean, dry bandage to keep out dirt— and foraging bees. Honey and clean bandages should be reapplied daily until the wound is healed.

○ Honey is easier to digest than table sugar and can be of benefit in feeding people with intestinal distress or stomach disorders—and disentery still claims many young lives in the developing world. If someone is sick and losing a lot of fluids from vomiting or diarrhoea, honey can be used to make a rehydration drink. In one and one half liters of clean water (we recommended a bottle of a commonly available mineral water or water that has been boiled and cooled) should be mixed

• three tablespoons of honey and
• 3/8 teaspoon of salt and
• 3/8 teaspoon of baking soda (bicarbonated soda)
• [if baking soda is unavailable another 3/8 teaspoon of salt, i.e. 3/4 of a teaspoon in total can be used].

— instead of plain water we also noted that tea made from lemon grass (*Cymbopogon citrates*) could be substituted. Such tea is widely used as a natural remedy for digestive problems.

• possible improvements on traditional hives (hanging and installing access door)

○ In some locations we noted that hives, especially heavier wooden hives, were propped up on wooden stands or stumps. We encouraged the more traditional practice of hanging the hives from tree-limbs to reduce damage caused by ants and bush fires and to prevent knock-down by wind and domestic animals. We suggested that, for larger hives, "stretcher" handles could easily be added. Such handles can facilitate carrying fully loaded hives and provide a handy resting spot for combs removed from the hive during inspections, as well as providing a purchase for ropes.

○ We noticed that in several locales the traditional style of building hives did not include a removable door such that the woven hives had to be destroyed to get at the honeycombs—a messy operation that virtually guaranteed that the colony would be killed or driven away with heavy smoke prior to harvest. We encouraged farmers who were not willing to invest in relatively expensive wooden hives to consider incorporating access doors into their hive designs. The use of access doors would permit farmers to harvest honey from only one side of the hive, leaving some stores and the brood combs intact allowing the colony to persist for further production.

• proper placement of apiaries and hives

Honey badgers and monkeys are mammalian pests which regularly raid hives in certain areas of the Fouta Djallon region. I suggested that beekeepers soak the vines or ropes that they used to secure the lids to their hives with a one to one mix of ground chilli pepper and used axel grease or used motor oil to increase the deterrence against wildlife.

○ Apiaries should be established where hives will receive shade during the hottest portions of the day and where bees will have access to water and nectar and pollen bearing plants. Hives should be arranged so that entrances all face outwards (or all inwards) so to create a safe zone, out of bees flight paths and the sensory periphery of bees, allowing easier apiary maintenance and hive manipulation.

• lighting a smoker

○ Bellows smokers are virtually unknown amongst the Guinean honey producers whom we encountered. Typically the heavy smoke produced by torches or dried cow manure in ceramic vessels or buckets is used to dispatch or drive out bees from their hives before harvesting. We demonstrated how a bellows smoker can be lit and used to disperse enough smoke to control bees but not asphyxiate them, or drive them completely out of the nest, nor taint honey.

• smoking oneself and using cassava leaf juice as a bee repellent

○ Again, because bees are traditionally, more often than not, killed prior to harvest we demonstrated how applying a liberal dose of smoke to skin and hair prior to putting on protective equipment, and afterwards doing the same to one's veil, hat and clothing will mask one's scent and discourage bees from stinging. The leaves of cassava (manioc), commonly grown in the area for its starchy root, can be crushed and rubbed against skin and clothing as a bee repellent. (I have tried this on several occasions and found cassava leaves as effective as smoke, i.e. after treating one hand with smoke and the other with cassava leaves and working a hive, gloveless, for light manipulations, I received no stings—which quite astounded my Guinean colleagues.)

• maintaining beekeeping clothing clean and smelling only of smoke to reduce stings

○ Many beekeepers knew that when honey bees began stinging someone they would continue to do so, but the details of alarm pheromone were new to most. We explained that keeping clothes free of the smell of alarm pheromone and other odors, such as that of sweat, which will incite bees to sting, would make working with bees more comfortable and less dangerous. We again emphasized that smoking one's clothing prior to hive manipulations is as important as smoking the colony.

• removing and smoking a sting

○ We emphasized that removing a sting quickly would reduce the resulting pain and swelling and that the site should be washed off or smoked to mask the scent of alarm pheromone.

• smoking hives prior to inspection

○ We described and demonstrated the appropriate technique for tranquilizing a hive with smoke rather than completely stultifying them.

• basic comb manipulation

○ Using model combs or those removed from hives, as the situation allowed, we demonstrated how Kenya Top-bar Hive combs should be handled so as not to break them.

• identifying brood comb, propolis, and pollen

○ Many of the farmers did not have a clear understanding of the interior structure of the brood nest and its contents so we confirmed or corrected the groups knowledge on the topic.

• recommending harvesting only honeycomb and leaving brood comb in the hive

○ Again, as a way of preserving the means of production, we encouraged honey producers to harvest only honeycomb and preferably to leave some honey for the bees to reduce the incidence of post-harvest absconding.

• cleaning natural enemies from the hive during the swarming season

○ The empty hive bodies, of whatever style, that are used to entice passing swarms to set up shop can also make ideal nesting sites for ants and other pests that will exclude bees from using the box as a nest. We encouraged farmers to ensure that their hives were kept free of inhabitants, other than bees, during the prime swarming season.

• protecting hives from ants and termites by banding access points (tree trunk, legs of the hive-stands) with sheep's wool or used motor oil.

○ Ants, termites and other pests can be discouraged from entering hives by smearing used engine oil or axle grease around the ropes from which hives depend or around the trunks or branches of trees where hives are propped. Ants dislike crossing a band of sheep wool which can be tied around a tree limb or trunk in the same way.

• rubbing a hive down with lemon grass as a hive attractant during the swarm season

○ Lemon grass (*Cymbopogon citrates*), in addition to being an herbal remedy (see medicinal uses above) contains citral which bees themselves produce as a component of the pheromone they use to mark nest entrances to assist returning foragers find their way home. Swarming bees are particularly attracted to the scent of citral such that rubbing the herb inside and around the entrance of empty hives is a good way of luring them into taking up residency. In the past, in Ghana, after treating, in this manner, hives that had remained empty for months were occupied within a day or two—prompting local tribeswomen to inquire if I was a wizard.

• rotating an empty hive in the place of a strong hive (placed in the shade) during manipulations

○ Although Guineans preferred to harvest hives at night, several techniques can be used to reduce stinging incidents if hives must be worked during the day. After smoking an occupied hive, a wet towel or cloth can be placed on top of the hive to keep the box cool and prevent the bees from "leaking" up from any ill-fitting top-bars. The hive is then carried away from the original location and placed in a well-shaded spot. An empty hive is set in the location originally occupied by the colonized box. Bees leaving the hive and returning foragers will return to the original location and enter the empty box. As combs are removed from the occupied box, the wet towel should be draped back over the empty slot left by the removal— thus reducing the number of bees leaving the hive. When revisions are complete the hive is returned to its original position and the empty box is opened and the bees inside smoked or brushed out at a convenient distance from the occupied hive.

• saving and utilizing beeswax

○ Oddly, most beekeepers we encountered were not aware of the variety of uses to which beeswax could be put—and it was often discarded once honey had been removed from the combs. We discussed and demonstrated a variety of methods for utilizing beeswax, from candle-making to the manufacture of moisturizing skin cream.

• basic design of the Kenya Top-bar Hive and the importance of the "bee space" and central guides in the top-bars

○ We encouraged farmers who wanted to significantly increase the production of honey and beeswax to consider supplementing their traditional hives with Kenya Top-bar Hives (KTBH's). These "appropriate technology" hives are much easier and cheaper to produce than the Langstroth Hive familiar to bee-

keepers in industrialized countries where power tools, and the electricity needed to run them, are commonplace. The KTBH can be made from a variety of materials, but is usually fabricated from wood. The trapezoidal cross section of the box allows bees to support the weight of the combs entirely from the top-bar without the need for wax bridge comb along the edges. Guides along the bottom of the top-bars encourage the bees to build their combs along the length of the bars instead of across them. The width of 3.2 cm (slightly smaller than what would be used with the larger European strains of honey bees) gives the bees enough space to build a comb yet still maintain a "bee-space" between successive panels.

Next month: Part II — Bee Product Production, Processing and Marketing in Guinea

HONEY PRODUCTION IN HAITI

by CONRAD BÉRUBÉ

Apiarists of Jacquesyl and Farmer-to-Farmer volunteer Conrad Bérubé with a Kenya top bar hive which they built earlier in the day and into which they have transferred the contents of a fixed-comb hive.

From July 13–30, 2009, I visited the apiaries of beekeepers in the North and South of Haiti to evaluate their hives and make recommendations to improve honey production. Beekeeping is an income-generating activity in Haiti that creates opportunities for Haitians to improve their livelihoods.

The trip was sponsored by Partners of the Americas as part of the *Farmer to Farmer* Program. Founded in 1964, Partners of the Americas links U.S. states with Latin American and Caribbean countries in partnerships that use the energy and skills of citizen volunteers, their institutions and communities to address shared concerns of social, economic and cultural development. Its work covers areas as diverse as emergency preparedness, agriculture, cultural and educational exchange, domestic violence and local government strengthening. Partners is a private, non-profit, non-partisan organization with international offices in Washington, D.C. (for additional information see www.partners.net). The *FtF* Program improves economic opportunities in rural areas of Latin America and the Caribbean by increasing food production and distribution, promoting better farm and marketing operations and conserving natural resources. The program is supported by Congress and the U.S. Agency for International Development (USAID) as part of the United States foreign assistance program. *FtF* brings together agricultural professionals and practitioners from the U.S. and the Caribbean. Volunteers from the U.S. work with farmers and agribusiness owners in Guyana, Haiti, Nicaragua and the Dominican Republic to identify local needs and design projects to address them.

Other volunteers in the Haiti *FtF* Apiculture project and similar programs (see Todd Jameson's article in the May 2009 issue of *American Bee Journal*) have noted some progress in the practice of transferring fixed comb hives to moveable frame hives— although improper frame spacing was a common problem in apiaries— in the identification and treatment of hive maladies and indicated that it seemed likely that the incursion of African(ized) Honey Bees (AHB) was taking place in parts of Haiti. *FtF* volunteers have also worked on packaging and labeling issues and in working wax up into various products such as stamped foundation wax, candles and ornaments.

Many box hives into which frames were, or could be, placed have become fixed comb hives because apiarists cannot afford the time or cost of building frames, or because they do not properly use or space the frames they do have.

Many apiarists in Haiti continue to use rustic, fixed-comb hives of either hollowed logs or boxes which severely limit management options and thereby reduce productivity.

While in Haiti I worked closely with Country Coordinator Benito Migny Jasmin, and Field Officer Gerard Michel (Papy) Joseph.

Apiarists in Haiti face three major hurdles: a lack of technical skills, a lack of economic resources and a lack of general infrastructure. All three dynamics can be addressed to some extent by promoting the (Kenya Top Bar) movable comb hive rather than the (Langstroth) movable frame hive. The KTBH is easier to manage both physically (no stacked boxes to remove) and with respect to beekeeping skills (the brood nest is held within a single box and is more readily conceptualized and manipulated). The hive is easy to build from rough-cut lumber with hand tools and is thus cheaper than frame hives which require relatively high quality lumber and, generally, the use of power tools. Harvesting by cutting out combs can be done without the need to haul heavy supers to an extracting room (since most beekeepers do not have access to a vehicle for such a purpose) and, of course, does not require an extractor or uncapping knives. Honey can be sold in the comb (a proof of authenticity) at a profit since little capital outlay is required rather than requiring transport to distant markets where a greater price might be garnered, but which would require a much greater degree of market preparation, transport costs and marketing savvy. This is still an option to reap greater rewards with honey produced in KTBH's— rather than a necessity, as is true, in order to clear a profit, for the much more capital-intensive frame hive production system.

My trip was relatively short and I was able to make significant contact with only a couple of dozen parties involved in apicultural development in Haiti. I hope that follow-up activities in 2010 will include at least two intensive, five-day short-courses (one in the north and one in the south). It would be very useful to train at least a dozen rural apiarists at each short-course so they could take their learning back to their own communities. Such courses usually involve participants staying in a live-in training center with focus on hands-on training at apiaries established for the purpose.

In 2008 the Haiti *FtF* Apiculture project held the first "Beekeeping Congress" among beekeepers in the North of Haiti assisted by *FtF* Volunteer Don Hopkins. It was well received and the proposed 2010 workshop would involve cooperation between multiple volunteers pooling their resources and expertise and, very likely, sponsorship from parties both within and outside of Haiti. If you or your bee club would be interested in sponsoring a participant at the short-course please contact the author (250 751-3167 or **conrad.berube@gov.bc.ca**) or Meghan Olivier at Partners of the Americas (202-637-6223 or **molivier@partners.net**).

James, an apiarist in the town of Jacquesyl in the north west of Haiti, participates in the construction of a Kenya top bar hive.

Educational beekeeping videos shown on a laptop computer became a "mini-cine" as the townspeople in Jacquesyl dubbed it

At the shop of the Apiculture Association of Aquin local carpenters constructed a Kenya top bar hive using hand tools.

The Other Side of BEEKEEPING

George S. Ayers
Department of Entomology
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824-1115

Family Lythraceae—the Loosestrife family

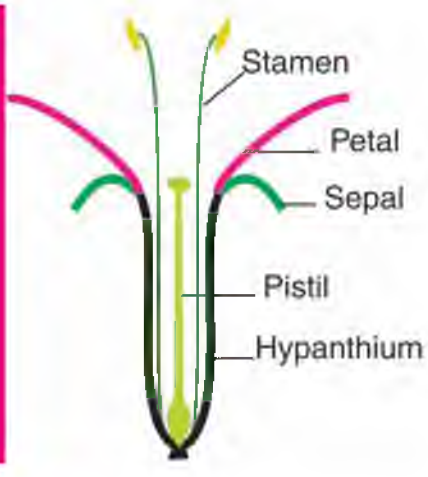
The Lythraceae consists of herbs, shrubs, and trees, containing about 25 or 26 genera, and depending on the reference, somewhere between 550 and 580 species. While the family is widely distributed, it is largely tropical, but its members can be found in all but the very coldest parts of the world, and there are seven genera native to the U.S.

The leaves are generally attached oppositely to their branches, but sometimes alternately in the upper parts of the plant. Frequently stipules are lacking, and when they exist, are small. The branches to which the leaves are attached are frequently four-sided.

The flowers can be solitary, in that case are found in the upper angles between paired leaves and stems (upper axils), or they can be arranged in various types of floral clusters (racemes, panicles or cymes).

The individual flowers are bisexual and generally at least roughly radially symmetrical, but occasionally might be considered bilaterally symmetrical. They are strongly perigynous, that is, they have a cup-like structure (hypanthium) around the ovary that appears to be formed by the lower parts of the calyx, petals and stamens (see diagram). They generally have 4 or 6 sepals (sometimes 8) and either an equal number of petals or no petals. Where petals occur, they are often crepe-like. In this family, while the petals and sepals appear to arise from the upper edge of the hypanthium, the stamens arise from deeper within the structure[1]. Generally there are twice as many stamens as sepals, but occasionally there can be many or as few as one or two.

Hypanthium diagram



The stamens are frequently quite variable in length, often in the same flower. The pistil is compound, made up of 2 to 6 carpels[2] with a single style and a stigma that usually is shaped like the head of a pin (capitate), but occasionally is two-lobed. It is sometimes buried deep in the hypanthium. Like the stamens the stiles vary considerably in length between plants, and according to one author[4], even on the same plant. The ovary is placed above the base of the hypanthium (superior). The fruits are capsules[3].

Some members of the family make good garden and greenhouse ornamentals. In the past some have found medical applications, some have been used in the perfume industry, and some in the dye industry. In the tropics, members of the genus *Lagerstroemia* are used for timber. Other members of this genus, grown in more temperate regions, make exceptional ornamental shrubs or small trees (example crape-myrtle). [4, 8, 9 & 24].

Purple loosestrife, spiked loosestrife, spiked lythrum, the purple plague, spiked salicaire, bouquet violet

Scientific name: *Lythrum salicaria*[4]

Origin: Eurasia

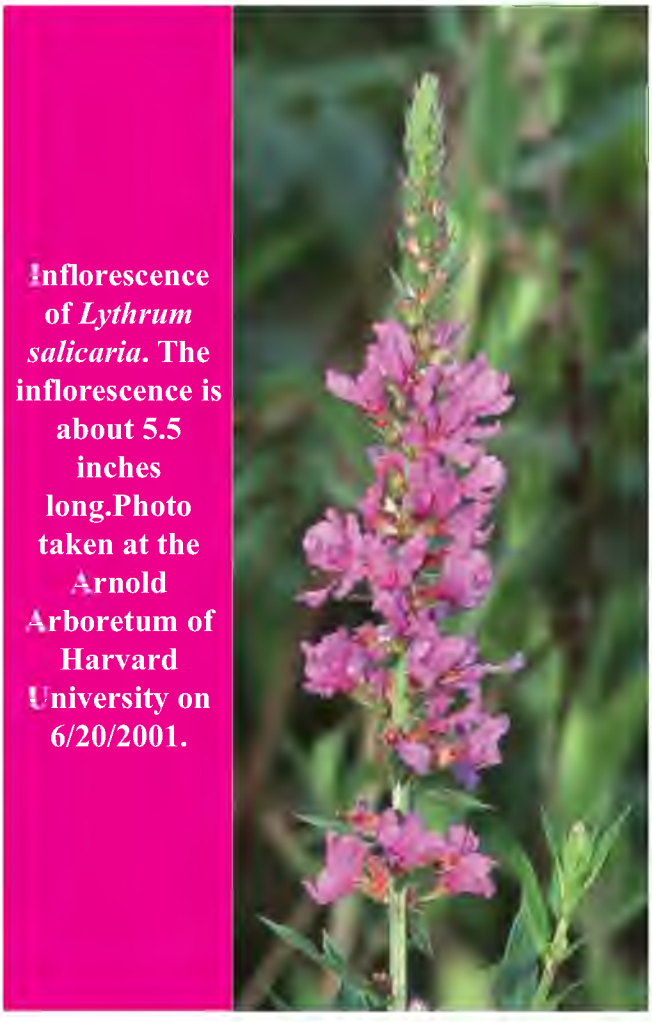
Plant description: Purple loosestrife is a perennial herb that can grow to slightly over 8 ft in height. Up to 50 four-angled (squarish in cross section), almost woody stems can emanate from its strong taproot.

The spearhead-shaped (lanceolate) leaves are placed oppositely on the stems or are whorled about it, or, in the upper parts of the plant, can be alternately placed. They range in length from about 0.8 to nearly 4 inches and are about 0.2 to 0.6 inches in width, and can be either rounded or indented at the stem end (cordate).

Generally there are many spike-like floral groupings. The calyx

1 **The diagram of the hypanthium depicts the stamens as arising from deep within the hypanthium. While this is generally the case in the Lythraceae, in other families, the stamens can arise from higher up, even from the top rim of the structure.**
2 **Carpel: The basic female unit. In compound pistils there are two or more carpels.**
3 **Capsule: a dry fruit composed of more than one carpel that opens at maturity.**
4 **Apparently because of the flower color (reddish purple), the name *Lythrum* is derived from a Greek word meaning blood or the gore of blood in battle. Salicaria is derived from the name of the botanical family to which the willows belong (Salicaceae) because the leaves of the two groups have a similar shape.**

Certainly scenes like this have delighted many a traveler's eye and it is easy to understand why purple loosestrife was once a popular flower garden plant. Photo taken near New Hudson, Michigan 6/28/1984.



Inflorescence of *Lythrum salicaria*. The inflorescence is about 5.5 inches long.Photo taken at the Arnold Arboretum of Harvard University on 6/20/2001.

and petals (corolla) are fused to form an elongated conical tube (hypanthium) that is 0.16 to 0.24 inches long. The six small, narrow, pointy sepals are less than half the length of the hypanthium. The showy flower is rose-purple and consists of 5 to 7 petals (generally 6) that range in length from 0.28 to 0.47 inches (7 to 12 mm). There are typically 12 stamens. The flowers on different plants have three forms based on pistil and stamen length (see Additional Information below).

The fruits are capsules[5] about 0.12 to 0.16 inches (3-4 mm) long and about 0.08 inch (2 mm) in diameter. It is estimated that a mature plant can produce as many as 2.7 million seeds[26].

The plant superficially resembles fireweed (*Epilobium*) and blazing star (*Liatris*).[12 & 26]

Distribution: While purple loosestrife prefers moist, high organic soils, it can survive under many conditions: acidic to calcareous soils, soils of low fertility, shallow flooding to relatively dry soils (example flower gardens), and can tolerate 50% shade[26]. It is most commonly seen in ditches, marshes, bogs, swamps and along streams.

Apparently, purple loosestrife was relatively obscure from the time of its introduction in the early 1800s until about 1930 when its invasive nature was documented. The reasons for its sudden spread appear mainly to be attributed to the disturbance of natural systems by man that include construction of canals and highways and also agriculture settlements which, among other things provided nutrient-rich environments. More recently, irrigation systems in western states have aided in its spread. Because it is quite attractive, for many years it was frequently offered as an eye-catching garden plant. The spread of the species may also have been facilitated by immigrants who were familiar with its medicinal values. Its spread was undoubtedly also facilitated by the beekeeping industry. Frank Pellett[23] after describing the spread of the species states "It is a tall plant of vigorous growth, but as it confines itself largely to wet places, it is not likely to be any more of a nuisance than the usual coarse weeds growing in such situations." Pellett Gardens in Atlantic, Iowa (long out of business) offered purple loosestrife seeds as late as 1981 to beekeepers as "An ideal honey plant for your flower border" and as "A honey plant of major potential for wet land."[6] Harvey Lovell 1n 1964 made the comment "Beekeepers living near large swamps would do well to plant loosestrife to increase their crop[17]. In the same article he quotes a Massachusetts beekeeper as "I have spread over 20 gallons of seed myself." In their time, both Pellett and Lovell would have been considered ecologically quite astute, which indicates just how much our collective feelings of ecological correctness have changed over the past several decades.

Blooming period: Milum[20] provides the blooming period for Illinois as June to late summer. Pammel and King[22] reported bee sight-

[5] **Capsule. A generally many-seeded fruit that is derived from a compound pistil that nearly always has a means of releasing its seed (pores, slits or lines of separation, or by simply splitting open irregularly).**

[6] **From the 1981 and last Pellett Gardens catalog.**

Table 1. Characteristics of Purple Loosestrife (*Lythrum salicaria*) honey[28]		
	Average of 2 samples	3rd sample*
Color	Light to dark halves of extra light amber (Pfund 34-50mm)	Dark half of water white (Pfund 4.8 mm)
Granulation	Between a few scattered Crystals and layer on bottom 1/4 to 1/2 inch	No granulation
Moisture (%)	17.85	19.1
Age (months)	7.5	21
Fructose (%)	38.22	36.82
Glucose (%)	31.08	27.54
Sucrose (%)	0.51	0.84
Maltose (%)	6.94	10.51
Higher sugars (%)	1.92	3.21
* I have separated out the data from the third sample because it appeared to crystallize differently		
than the other two samples.		

ings at Ames, IA between the years 1927 to 1929 with dates that range from June 27 to August 2 and in Blairstown (about 260 miles east of Ames) on September 28. Gleason and Cronquist[12] which covers northeastern U.S. west to MN and South to KY as well as contiguous parts of Canada, provides a blooming date range of July to Sept. Larson and Shuel[14],writing about Ontario bee plants, state that the species is a "potential source of nectar during July and August."

Importance as a honey plant: Purple loosestrife probably came to North America in the soil used for ship ballast early in the 1800s. J. Lovell[15] (1926) says nothing about the species. Oertel[21] (1939), from his questionnaires, found the species to be of at least some importance in MA. Pellett [23] (essentially last edited in 1947) describes the spread of this potential bee forage from Nova Scotia to Delaware westward to Lake Erie and Michigan. Ayers and Harman[1] (1992) from their questionnaires, found the species to be of at least some importance in CT, ME, NC, NH, NJ, NY, OH, SC, WI,WV and the Canadian province of PE. They found it to be quite important in MA and MI and the province of ON. Reports in the beekeeping literature apparently chronicled the spread of the species.

Pellett[23] relates how William Sumnick with apiaries in Orange and Ulster Counties, NY moved an apiary into a 100 acre bog of purple loosestrife and claimed a blooming period of five weeks, but that the honey yield was disappointing, providing at best only about a super per colony. My files containing the questionnaires prepared for the 1992 edition of "The Hive and the Honey Bee"[1] contain a comment from a Massachusetts respondent that he considered the species to be an overrated honey plant, but that it was viewed by beekeepers in parts of Massachusetts as a nectar and pollen source during the dearth period between clover and goldenrod. On the other hand, Rex Ballard, from Augusta, Michigan, again reported by Pellett[23], claimed a substantial portion of his 1944 crop of 16,000 lbs, from 120 colonies, came from purple loosestrife.

Larson and Shuel[14], writing about bee forage of Ontario, give the species a 4, the highest score on their 4-point scale for attractiveness to bees, and for nectar secretion give it a 2 on their 3-point scale indicating that it is a "good nectar producer sometimes, giving surplus."

Milum[20] places it in his Tertiary or minor honey plant list for Illinois indicating that while bees visit the plant for nectar and pollen, the quantity of nectar is either small or the plant is not generally abundant.

Honey potential: Crane et al.[7] provides the following information:
Nectar Secretion: 0.27-0.64 mg/flower/day (from Sweden) Sugar Concentration: 28.9-72%
Sugar value: 0.19-0.36 mg/flower/day
Honey Flow: 23 kg/colony/season (50.6 lbs/colony/season); from H. Lovell but also see below.
Honey Potential 13.4 to 265 kg/ha (11.9 to 236 lbs/acre).

Harvey Lovell[17] reports the sugar content of the nectar ranges between 27.9-36.0 % with an average of 31.8%. In addition to the reference found in Crane et al.[7], he also reports yields of 260 lbs/colony with a top yield of 750 lbs/colony from an Ontario beekeeper who had an apiary near a 500 acre swamp covered with purple loosestrife, but he seems to have chosen to report only the 260 lbs. figure in his honey plants manual[18].

Honey: There seems to be a considerable difference of opinion about the quality of purple loosestrife honey. Frank Pellett[23] tells us a beekeeper from New York states, "The honey is very dark and of strong flavor, having a slight tobacco-like taste as it gets older." From the Sumnick report mentioned above, Pellett reports that the honey is strong tasting, and the comb looks green, and was drawn while the bees are working the plant is a golden yellow. Sumnick regarded it at best as a fall stimulant whose presence insured good overwintering. Apparently, however, Massachusetts beekeepers questioned the New York reports of poor quality and indicated that they regarded loosestrife honey as having a light color and good flavor.

Milum[20], from Illinois, describes the honey as variable in color ranging from light and clear to dark and greenish with a flavor that ranged from mild to strong. I am not sure whether this is from actual Illinois reports, or is a recounting of what Pellett had to say.

Larsson and Shuel[14], from Ontario, describe the honey as "ill-tasting, greenish, mixed with other honeys its bad taste is diluted."

In their survey of the literature, Crane et al.[7] describe honey color reports (exclusive of H. Lovell and Pellett reviewed here) as ranging from light to dark and dark yellow.

H. Lovell[17] reports a description from Massachusetts as yellow-green and because of the greenish cast, Lovell likens it to fresh lubricating oil. In a report from a Connecticut beekeeper[16] he reports the taste as being like that of molasses. In his 'Honey Plants Manual'[18] he states that it "Produces a greenish honey resembling motor oil with a fair to good flavor." White et al.[28] provide a set of descriptors of loosestrife honey (see Table 1).

Because of the variable descriptions provided above, in 1986 I asked John Blaker, a beekeeper and honey packer in southeastern Michigan, and at that time a 16 year producer of loosestrife honey, to provide me with a sample of what he thought was nearly pure loosestrife honey. He went to some trouble to collect for me what he thought was nearly 100% pure loosestrife honey that had not

been strained or heated. Well, the honey was a bit dark (he describes loosestrife honey in general as having a Pfund rating of 45-60mm[7]), and up on the top edge where it "crawls" up a little onto the glass jar, there was a greenish cast. Yes!, it did resemble some of the motor oils of the time. In his words, it is "super sweet". I'm not sure that I would use that terminology, but I'm at a loss for a better description (maybe bittersweet) and the flavor stayed with me for some time after first tasting it. He considered it a "good (not excellent) table grade honey". Among its good attributes he felt that it blended with white honeys better than any other honey he knew of, and that it "improves the darker fall honey in moisture, flavor, color and smoothness and because it has a low dextrose (glucose) content "It is always the last honey to crystallize so (it) can be taken off the hives last in sub zero weather, and still be in a liquid state. I am sure it also has a extended shelf life in the store."[8] He considered loosestrife to be a consistent producer with few complete failures. To this I add that I know of other beekeepers in the southeastern Michigan who consider the honey blend that comes in with purple loosestrife to be among their best honeys.

Do the different qualities of purple loosestrife honey that are reported represent real differences that result from different environmental conditions, or are they the result of different honey blends obtained by beekeepers in different parts of the world? I don't know!

Pollen: Crane et al.[7] state that purple loosestrife is a major source of pollen in Italy. They report variable colors of pollen loads: yellow to green, and violet and what I interpret as the pollen still on the plant as green to yellow and greenish yellow. Howes[13] reports that the pollen grains from the stamens of different lengths vary in both color (yellow to greenish) and size.

Additional Information:

Purple loosestrife seems to have become a plant we either love, or love to hate. As I see it, there are two inescapable facts. First, the plant is invasive and has the potential of doing great harm to native wetland communities, including both the plants and the animals within these communities. The distribution map above clearly demonstrates how it has spread since its introduction into North America in the early 1800s. To verify its disruptive nature one has only to Google "purple loosestrife". I also recommend a article by Kim Flottum[11] who has to be considered an important advocate for the American beekeeping industry, that discusses among other things, the ecological problems caused by purple loosestrife. The second fact is that the USDA, APHIS has given permission to import biological control agents to help curtail purple loosestrife spread and the harm it causes wetland habitats, and whether you like it or not, it's a done deal—biological control agents have been imported and distributed in both the U.S. and Canada. After a screening of many phytophagous insects, the three most promising appear to be, a root mining weevil (*Hylobius transversovittatus*, which attacks the plant's main resource storage tissue, and two leaf-feeding beetles, (*Galerucella calmariensis* and *G. pusilla*) that are capable of completely defoliating small purple loosestrife plants. The logic seems to me to be to deliver a 1-2 knockout punch; destruction of both the root storage tissue and also the leaf tissues that can replenish that resource. In 1992 all three species were approved by the USDA, APHIS, for introduction into the United States and were released in New York, Pennsylvania, Maryland Virginia, Minnesota, Oregon and Washington. Releases have also been approved in Canada[26]. Since that time, at least some of this threesome has been released into other states, Michigan for example. I expect that there either have been or will be more releases to follow, quite possibly some of them, other species than the three mentioned above.

To me there is little doubt that the incidence of purple loosestrife will diminish, but I'll not hazard a guess how low populations will be driven, but the species almost certainly will not be driven to extinction. The estimated losses to the beekeeping industry in 19 states made in 1987, over the then following 20 years, was estimated at $1.3 million[25]. That 20 year period has now ended. I have no idea how close this estimation has mirrored reality. Perhaps no one does.

The three main released beetles are not absolutely host specific. Tests indicate that the native species *Lythrum alatum* and perhaps to a lesser extent *Decodon verticillatus* are possibly slight potential hosts for the both the two leaf feeding beetles and the weevil [5 & 6]. These were, however, "static tests" done at a single point in time and so far as I can tell, no tests were done to investigate the evolutionary potential of these beetles for changes in host specificity. Both *L. alatum* and *D. verticillatus* are apparently quite attractive to honey bees, but based on their frequency of mention in the beekeeping literature, do not compare in importance with *L. salicaria*. I suspect that this is partly because a cadre of native herbivores and possibly plant pathogens are keeping them from running rampant as did purple loosestrife, which had no such counteracting force when it was imported into North America.

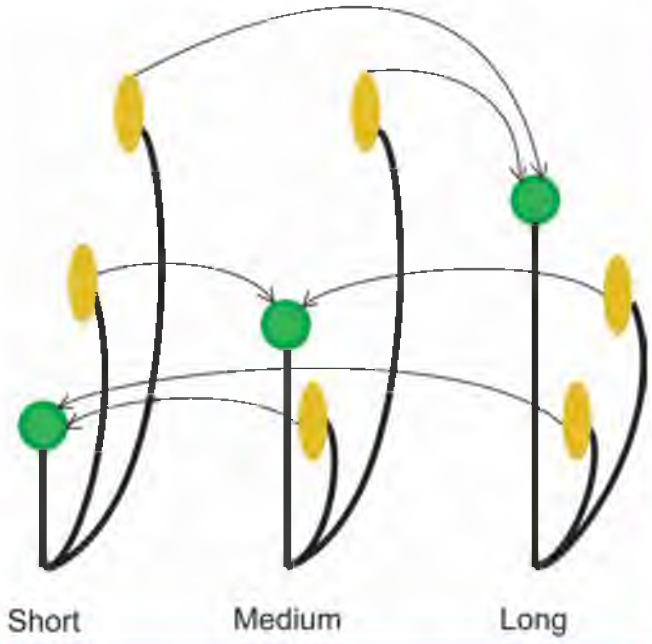
As mentioned above, the flowers of purple loosestrife come in three different forms with all the flowers of a given plant being the same. The styles[9] of the pistils come in three lengths (heterostyly or tristyly), short, medium and long. The stamens also come in three lengths with two of the stamen types being associated with each of the three floral types that are based on style length. The stamens of the flowers with short pistils are long and medium length, the flowers with medium length pistils have long and short stamens, and those

The three forms of *Lythrum salicaria* flowers based on style length. The white pointer indicates the stigma. Notice the red lines on the petals which are seen especially well on the short styled form of the flower. They are thought to be nectar guides that point to the nectaries.

[7] A Pfund rating of 45 to 60 mm evaluates in the dark half of extra light amber to the light half of light amber[28].

[8] This comment seems to be in disagreement with a statement of how Harvey Lovell found three jars of purple loosestrife honey sent to him from Massachusetts which promptly crystallized upon arrival[17]. Also the dextrose (glucose) concentrations found by White et al.[28] (Table 1) seem to me to be at most just a little lower than average.

[9] Style: The elongated part of the pistil located between the ovary and the stigma.



Generalized reproductive system of a tristylous species according to Wheeler[27]. Following Darwin's nomenclature, the arrows represent "legitimate pollinations". Other pollinations would be "illegitimate" and usually set little or no seed. Following this scheme, notice that self-pollinations are all illegitimate. Also notice, using the short styled type as an example, one stamen can pollinate the medium styled flower type but that the long stamen cannot pollinate that type of flower, but can pollinate the long styled type, which cannot be pollinated by short stamen. This type of situation applies to each of the floral types. There are numerous tristylous species that do not strictly follow these rules. As explained in the text, it is not clear to me from Darwin's experiments how closely *Lythrum salicaria* follows them, but it is apparently is not exactly.

with long pistils have medium and short stamens. Notice that these arrangements keep the anthers away from the stigma, thus helping to prevent self pollination, but the system is more complex. The pollen from the three stamen lengths generally can only fertilize flowers with a corresponding pistil length. This is illustrated in the accompanying diagram. Think about it—it's a little foreign at least to my way of thinking about pollination. The plants are self-sterile, but in addition, pollen from one stamen type of a given flower can pollinate a second floral type, but pollen from the second stamen type of that same flower cannot pollinate the second floral type, but can pollinate the third floral type. It is estimated that approximately 25 flowering plant families have members with behaviors reminiscent to varying extents to the above description[2]. I use the language "reminiscent to varying extents", because there seems to me to be a bewildering amount of variation. Based on early experiments with purple loosestrife by Charles Darwin[10], I judge that the behavior of purple loosestrife doesn't exactly follow the behavior described above, but tends in that direction. Darwin admits to possibly making two mistakes in his experiments, but it is not clear to me whether this was in fact the case, or whether the results simply ran counter to his original expectations. Nevertheless, even excluding the possible mistakes, the results did not perfectly mirror the model presented in

***Lythrum alatum* flower. While this native species seems to be a good bee forage, it is not mentioned as often in the beekeeping literature as the introduced *L. salicaria*, perhaps because it isn't as common as its introduced cousin. Because this species was grown in a pot explicitly for this column, the date that the picture was taken is not as significant as it would have been if it had been growing in the wild. I do, however, have flowering pictures of the same plant on both 6/22/2004 and 8/15/2004, so it must bloom over a fairly long period as does purple loosestrife.**

the accompanying diagram. I recognize that I have treated the subject of heterostyly rather cavalierly. For those interested in pursuing the subject further, I recommend the book 'Evolution and Function of Heterostyly'[3].

Winged loosestrife, winged lythrum

Scientific name: *Lythrum alatum*

Synonyms:*Lythrum dacotanum, Lythrum lanceolatum*

Origin: Native to North America

Plant description: Winged loosestrife a slender perennial herb that grows to a height of about 1 to 3 ft (occasionally to 4 ft) and generally branches in its upper parts. The up to 1.6 inch long leaves are without stems, and range in shape from spearhead-shape (lanceolate) to narrow and long with nearly parallel sides (linear). Those in the lower portion of the plant are arranged oppositely on the stem and become alternately placed in higher parts of the plant. The purplish flowers are usually placed singly in the upper leaf axils and are of two forms (distyly) with either the pistils or the stamens extending beyond the petals. There are generally 6 stamens and 6 petals, the petals ranging in length from 0.08 to 0.24 inches.[12 &19]

Distribution: Pammel and King describe its distribution in Iowa as being common in "swamps, bogs and low grounds, in sandy or gravelly moist places and on shores of lakes."

Blooming period: Pellett[23] reports in OK the species blooms with

sweet clover and lasts till frost. Pammel and King[22] report it blooming on July 17, 1914 and July 25, 1924 near Ames, IA.

Importance as a honey plant: Oertel[21], from his questionnaires, under the synonym *Lythrum lanceolatum*, found the species to be important in LA. Pellett[23] reports that the species is worked from daylight till dark in either wet or dry weather. Milum[20] writing about Illinois honey plants, places it in his Tertiary Honey and Pollen Plants list, indicating that it either produces little nectar, or that it is not very abundant.

Additional Information: The seed source for the pictured *Lythrum alatum* was: **Prairie Moon Nursery,** 32115 Prairie Lane, Winona, MN 55987, Phone: (866) 417-8156

They have an online catalog at: *www.*prairiemoon.com Over the years I have found this to be an exceptional company with which to deal and the information in their catalog is outstanding.

Swamp loosestrife, water willow, grass-poly, wild oleander, peat-weed, stinkweed, willow herb

Scientific name: *Decodon verticillatus*

Origin: Native to North America

Plant description: *Decodon verticillatus* is a perennial with arching slender stems 3.3 ft to almost 10 ft in length that root at their ends. The base of the plant tends to be woody near the ground. The short-stemmed, spearhead-shaped (lanceolate) leaves are either oppositely placed on their stem or more commonly in whorls around the stem and range in length from about 2 to nearly 8 inches in length and about 0.4 to 1.6 inches in width. The five narrow 0.5 to 1 inch long petals are purple-pink and the flowers are arranged in dense cymes[10] in the upper axles[11] of the plant[12 & 19].

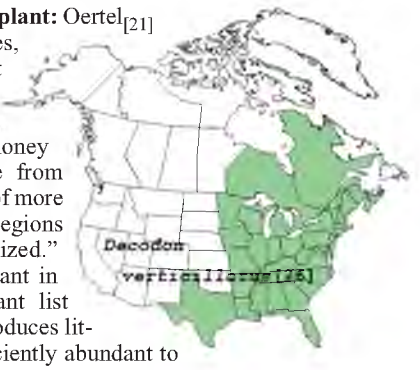
***Decodon verticillatus* flowers. This native species also seems to be a good bee forage, but probably is not as common as purple loosestrife. Photo taken at The Morton Arboretum a little west of Chicago on 7/19/2004.**

Distribution: swamps and still water courses[12].

Blooming period: Gleason and Cronquist writing about northeastern U. S. and contiguous parts of southern Canada, state that the blooming period ranges from July to September.

[10] **Cyme: a branching flat or round topped inflorescence in which the terminal flower blooms first. The flowers that I had the occasion to photograph certainly aren't in densely packed cymes. Pictures in the literature, and specimens in the Michigan State University herbarium suggest that such cymes are common.**

[11] **Axil: The upper angle between a stem and a leaf.**



Importance as a honey plant: Oertel[21] from his questionnaires, found it to be of at least some importance in Illinois. Pellett[23] says, "Reports of surplus honey from this source come from Michigan and it may be of more importance in swampy regions than has been recognized." Milum[20] places the plant in his Tertiary Honey Plant list meaning that it either produces little nectar or is not sufficiently abundant to be rated higher.

Honey: Milum[20] writing about Illinois honey plants, describes the honey as "Variable; dark".

References

1. **Ayers, G. S. and J. R. Harman. 1992.** Bee Forage of North America and the Potential for Planting for Bees. In The Hive and the Honey Bee (J. M. Graham, Ed.) Dadant and Sons. Hamilton IL.
2. **Barrett, S., C. 1992.** Heterostylous Genetic Polymorphisms: Model systems for Evolutionary Analysis. In: Barrett, S.C.H. (Ed.). 1992. Monographs on Theoretical and Applied Genetics 15, Evolution and Function of Heterostyly. Springer-Verlag. Berlin.
3. **Barrett,S.C. H (Ed.) . 1992.** Monographs on Theoretical and Applied Genetics 15, Evolution and Function of Heterostyly. Springer-Verlag. Berlin.
4. **Baumgardt, J. P. 1982.** How to Identify Flowering Plant Families. A Practical Guide for Horticulturists and Plant Lovers. Timber Press Inc. Portland OR.
5. **Blossey, B. , D. Schroeder, S. D. Hight. And R. A. Malecki. 1994.** Host Specificity and Environment Impact of two Leaf Beetles (*Galerucella calmarienis* and *G. pusilla*) for Biological Control of Purple Loosestrife (*Lythrum salicaria*). *Weed Science* 42:134-140.
6. **Blossey, B. , D. Schroeder, S. D. Hight. And R. A. Malecki. 1994.** Host Specificity and Environment Impact of the Weevil *Hylobius transversovittatus,* a Biological Control Agent of Purple Loosestrife (*Lythrum salicaria*). *Weed Science* 42:128-133.
7. **Crane, E., P. Walker and R. Day.** 1984. Directory of Important World Honey Sources. International Bee Research Association. London.
8. **Cronquist, A. 1979.** How to Know the Seed Plants. Wm. C. Brown Company. Dubuque, IA.
9. **Cullen, J. 1997.** The Identification of Flowering Plant Families including a key to those native and cultivated in North Temperate Regions. Cambridge University Press. Cambridge, UK.
10. **Darwin, C. 1877. The Different Forms of Flowers on Plants of the Same Species.** John Murray. London. While this is the first edition, there were several copies made later that are considerably more common.
11. **Flottum, K. 1993.** Loosing Loosestrife. *Bee Culture* 121:374-378.
12. **Gleason, H. A. and A. Cronquist. 1991.** Manual of Vascular Plants of Northeastern United States (2nd edition). The New York Botanical Garden Press. Bronx, NY.
13. **Howes, F. N. 1979.** Plants and Beekeeping. Faber and Faber. London.
14. **Larsson, H. C. and R. Shuel. 1992. Nectar Trees, Shrubs and Herbs of Ontario. (C. D. Scott-Dupree, Ed.)** Ontario Ministry of Agriculture and Food Publication 82. Queens Printer for Ontario.
15. **Lovell, J. 1926.** Honey Plants of North America. A. I. Root Co. Medina, OH.
16. **Lovell, H. B. 1957.** Let's Talk About Honey Plants. *Gleanings in Bee Culture* 85:742, 759.
17. **Lovell, H. B. 1964.** Let's Talk About Honey Plants. *Gleanings*

in Bee Culture 92:675, 697.
18. **Lovell, H. B. 1966.** Honey Plants Manual A Practical Field Handbook for Identifying Honey Flora. A. I. Root Co. Medina, OH.
19. **Mathews, F. S. 1902.** Fieldbook of American Wild Flowers. (2001 Facsimile Edition) Sterling Publishing Co. Inc. New York.
20. **Milum, V. G. 1957.** Illinois Honey and Pollen Plants. Contributions from the Department of Horticulture, University of Illinois. Urbana, IL.
21. **Oertel, E. 1939.** Honey and Pollen Plants of the United States. (U. S. D. A. Circular 554) U. S. Government Printing Office. Washington D.C.
22. **Pammel, L. H. and C. M. King. 1930.** Honey Plants of Iowa. Iowa Geological Survey Bulletin No. 7. Iowa Geological Survey. Des Moines, IA.
23. **Pellett, F. C. 1978.** American Honey Plants. Dadant and Sons, Hamilton, IL.
24. **Smith, J. P. 1977.** Vascular Plant Families. An Introduction to the Vascular Plants Native to North America and Selected Families of Ornamental or Economic Importance. Mad River Press, Inc. Eureka, CA.
25. **Thompson, D. Q. , R. L. Stuckey, E. B. Thompson. 1987 .** Spread, Impact and Control of Purple Loosestrife (*Lythrum salicaria*) In North American Wetlands. United States Fish and Wildlife Service, Fish and Wildlife Research No. 2. United States Department of Interior, Washington, D. C. This can most easily be viewed by Googling (in quotes) "Spread, Impact and Control of Purple Loosestrife". This report does seem, however, to be upgraded a little periodically. However, in the section entitled "A case for Biological Control", you will find the basis of the $1.3 million loss to the beekeeping industry estimate (Table 5).
26. **USDA, NRCS.** The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA
27. **Weller, S. G. Evolutionary Modifications of Tristylous Breeding Systems. 1992.** In Barrett, S.C. H (Ed.). Monographs on Theoretical and Applied Genetics 15, Evolution and Function of Heterostyly. Springer-Verlag. Berlin.
28. **White, J. W., M. L. Riethof, M. H. Subers and I. Kushnir. 1962.** Composition of American Honeys. Technical Bulletin No. 1261. Agricultural Research Service, United States Department of Agriculture. U. S. Government Printing Office. Washington D. C.

MarketPlace

FOR SALE

CALIFORNIA HONEY BEES & QUEENS – QUEEN CELLS – Bee Genetics your choice. Choose the perfect queen bee that fits your operation. From March thru June. **PACKAGES** 2-3 lbs. From March thru June. Shamrock "S" Pollination, Inc. – Cell (209) 605-3932 – FAX (209) 358-5989.

LIQUIDATION - boiler, forklifts, melters, tanks, woodshop, more. Joe Holt (509) 943-6033.

1000 hives 10-frame two-story on 4-way pallets, new outfit & queens, excellent condition, available in May in California. (530) 671-6188.

For Sale: New Hummerbee Turbo and XL model beekeeper forklifts with more performance enhancements. Used beekeeper forklifts. Our full time knowledgeable staff offers more to you in parts, service, and advice. View our website: **www.hummerbeeforklift.com** or call A & O Forklift at 800-943-8677 (remember we are eastern time zone) or leave a message.

Heavy Duty Clear View Masts for 'Bobcats – 12' lift - double action cylinders - 42" forks (48" optional) - all roller bearings/no sliders - fits Bobcat 743 - 763 & S130 - S160. Call A & 0 Forklift, Inc. (800) 943-8677.

1000+ hives for sale in California after almonds. 4 or 6 hives on a pallet as singles or 1 ½ story. All equipment in good shape. Please order early to get what you want. 4.9 small cell hives available also. Call Dave Mendes (239) 340-0625.

Get the CCD Solution NOW! Why wait? $99 intro kit treats 100 hives and 1.5 acres. Guaranteed to improve your hives. No poisons. No chemicals. No toxins. Explains CCD. From GW Agriculture: the inventors of Ultra High Technology for Agriculture. Go to: **theccdsolution.com**, email: **gwagriculture@yahoo.com** or call (214) 592-9800.

Cut Comb Honey Trays—"The Best" Cut Comb Honey Trays (12oz/340g) Tight Snap-On Clear Plastic Lid – Cream Coloured Base. Sold Coast to Coast by Mail. 2008 Prices: $55.00/100 - $262.50/500 Contact NOD Apiary Products Tel: 866 483 2929 Email: Info@NODApiaryProducts.com

The Bee Cozy - Winter Hive Wraps!—Light, quick and easy to use. Fits like a glove! Constructed of UV resistant poly and fibreglass insulation. Give your bees the ability to manage their own environment. Your bees will come out of the winter stronger and use less feed. Faster start-up - more honey. No more bundling! No more binder twine! Contact NOD Apiary Products Tel: 866 483 2929 Email: **Info@NODApiaryProducts.com**

Mite-AwayII, The Bee Brief, The Bee Cozy—The best prices available for NOD Apiary Products. Direct to you from the web. Check out **www.SaveYourBees.com** or contact us at **Info@SaveYourBees.com**. Lowest beekeeping supply prices on the net.

HONEY PRICE UPDATES. Call Honey Hot Line. (763) 658-4193.

BROKER OF BEES AND BEE EQUIPMENT: Find out what is for sale or request a listing agreement at **www.morrisweaver.com**. Morris Weaver Enterprises, 1118 Neal St., Navasota, TX 77868-2511, Phone (936) 825-3083, Fax (936) 825-7714.

Top Bar Hive – handmade, plans, info, pictures, video, community: **www.NetShed.com**

FOR SALE: Large Montana beekeeping operation. Includes: registered locations, warehouse, extracting equipment, trucks, forklifts, related equipment, some acreage with option on other acreage. Serious inquires only. Phone 406-683-4973 or 406-683-5736 prior to 7PM Mountain time.

Singles and nucs available now in Florida. New queens. Call (772) 633-1134.

4000 hive operation. Western MN east SD. Turnkey operation. East TX locations if needed. Call for all the info.–forklifts, trucks, bldgs., etc. Health reasons for sale. 888-273-2300. Cell 320-760-6769.

Three and five frame nucs. New frames & queens made to order. Call Ed (239) 214-1467 **jagoes@comcast.net** SW Florida.

FOR SALE: Singles and 1 1/2 story hives for sale. 1000 available. Call Jon@(208) 412-1092 or Golden@(208) 250-8420. **www.goldenbeeinc.com**

Nucs - $96. Deep or Medium single beehives. Buckets of Honey - $125. Pollen - $300.John Pluta Milledgeville Georgia (478)452-2337 **www.georgiabees.com**

800+ doubles on 4-way pallets. '09 queens. Call (715) 347-4995. Ready in September.

Strong singles for sale out of South Florida. Available January 1st. Call (231) 735-1203.

Have dead hives? I can rebuild them on my South Florida locations with bees, brood, and new queens. Limited space available, so please call early. (231) 735-1203.

4 and 9-frame nucs for sale, available for pick-up in Lovelady, TX, and Winthrop MN, in the spring of 2010. For more info, please call (507) 327-5388, or (936) 636-2384.

PARSONS' GOLD SOLUTION - The Only Solution For Keeping Your Honey Bees Healthy! Herbal Treatment Oil & Jelly - Bee Grooming Stimulant - Train The Bees To Do The Work - Healthy Bees Year Round. No Negative Effects On Bees, Queen, Wax or Honey. Business (419) 273-3066; Cell (419) 235-7037. www.parsonsgold-honeybees.com #33 Treatment Loaded Syringe - $11.00 plus $5.95 S/H. Checks, Money Orders, Credit Cards. Parsons' Gold Apiaries, c/o Robert B. Parsons, 2092 Twp. Rd., 195, Forest, OH 45843.

For Sale: 12 or more deep hives. 10-frame and 24 medium supers, lids and bottoms. Also, some never used. (217) 563-2898.

For Sale: full singles in your equipment. Available April in Texas. Call for info. (507) 327-7808. Minimum order: 50.

200 hives, double deeps, '09 queens, 4-way pallets. Will be available before or after almond pollination. Call for prices. (530) 474-3511.

For sale: 250 1 ½ story colonies on 4-way pallets. Available after almonds. Priced to sell @$100.00 each. Call Michael at (520) 730-8884.

Five frame NUCS for sale mid-April through Fall. Price dependent on season and quantity of order. Minimum order of 24 NUCS. For frame trade, only return of our boxes. Call early to secure your order. FOB Lewistown PA or Dade City , FL. Please call W. Fisher Bee Farm for more information. 1-800-736-6205. Ask for Aaron.

For Sale: 500 8-frame colonies of bees, 6 5/8 supers with and without comb. Right out of almonds. Bakersfield, CA (661) 331-9048, (402) 337-0534.

For Sale: Essential-B, lemongrass and spearmint honeybee stimulant. Compare to Honey-B-Healthy or Pro-Health, same strength. Beekeeper approved. Winter Special Pricing - $250.00 for 5 gallons plus freight, 5 buckets or more - $240.00 each. Bee Bread, LLC, Kevin and Pratima Jester (870) 931-8700, (870) 243-1596.

500 story and a half colonies - $125.00, 100 one-story colonies - $95. All palletized on 4-way clips. New queens. Disease free. Northern CA. Serious inquiries only. Retiring. (209) 368-0887.

Singles for sale in California. Call Pat (701) 260-0641.

EIGHT-FRAME DOUBLES, '09 queens. Strong, heavy. 50 before almonds. 100 after almonds. Reasonable price. Sam & Joyce VanVleet, Cottonwood, CA (530) 347-1987.

For Sale: 408 DD hives after almonds, good equipment, 4-way clip pallets, 90% '09 queens, $130. Call (208) 878-9263 or bel@pmt.org

BROOD, BULK BEES, AND 9-FRAME NUCS IN YOUR BOXES. MARCH 2010. (507) 635-5745 OR (507) 273-4359.

Kelley 33-frame extractor with metal stand - $1500. Hanna color digital grader to grade honey only used a few times - $300. Arkansas – (870) 931-8647 honeyfarm@bscn.com

For Sale: Eight double hives, new equipment/ queens. Hobby beekeeper must sell. Los Angeles suburb. Available mid-January. $130. (775) 623-6702. Ask for Kent, call evenings.

500 hives on 4-way pallets for sale in California - $200 each. (805) 929-1772.

Queen cells available in east, central Florida. Any quantities, call for pricing and to reserve dates for pickup. Pratima Jester (870) 243-1596.

1999 New Holland Skidsteer, LX 485, low hours, good condition, new tires, forks and bucket. $9800.00. Heavy duty tilt bed trailer, $3800.00. Kevin Jester (870) 931-8700. Located in Florida.

500 strong beehives for sale after almonds in CA; 1 ½ story on 4-way clip pallets, you choose; sb ready 3/20/10 - $120.00 each. (559) 930-1476.

CLASSIFIED ADVERTISING-Net price 80 cents per word per insertion. Initials, letters as in street address, counted as individual words. No advertisement accepted for less than 10 words. Payable cash in advance. Blind Classified 10% additional. (A blind ad is one in which responses are addressed to the ABJ and then forwarded to the advertiser.) Extreme care always is exercised in establishing the reliability of all advertisers, but the publishers do not guarantee advertisements. Orders close the 20th of the second month preceding cover date. Send typed copy to : Advertising Dept., American Bee Journal, 51 S. 2nd St., Hamilton, IL 62341 or FAX to 217-847-3660 or e-mail to: **abjads@dadant.com**.

1,000 strong 8-frames plus, one and a half and two-story ten-frame hives on four-way pallets in southern California. Call Ray, (909) 709-9192.

500 strong, ready for almonds, two-story, ten-frame hives on four-way pallets. Call Steve, (951) 551-7150.

1985 Freightliner 22' 6" flatbed and 1988 Freuhauf pup trailer 30' bee nets for both. Call for info. 450 - 7 5/8 medium supers 9 frames - $12 each. (406) 489-1360.

BURLAP BAGS BY THE TRUCKLOAD – one-time used coffee bags, approx. 40,000 lbs./truck (half-loads available), low, low pricing. Contact Kyle Lehner at (912) 272-2674 or j.kyle.lehner@gmail.com

Two 1600 swingers and one 1999 GMC truck with 21 foot bed, set up to move bees. Call (909) 709-9192.

2001 Freightliner FL 70, CAT motor, 6 sp., 22' flat bed, set up for bees, 25,500 GVW, 90,000 mi., good truck. (307) 643-2162 WY.

HONEY FOR SALE

CLOVER—Buckwheat, Orange, Tupelo, and Wildflower—pails or drums. PURE SWEET HONEY FARMS, Verona, Wisconsin 53593. (608) 845-9601.

Excellent clover honey in drums and light beeswax available. Mark Gilberts Apiaries, (608) 968-3500.

U.S. sweet clover, thistle mix, alfalfa, thistle mix, black locust, white honey - black raspberry, filtered, new drums, excellent honey - f.o.b. several loads available. Produced by Baldwin Apiaries, Darlington, WI (608) 776-3700.

Oregon raspberry or meadowfoam honey, drum lots only, F.O.B Albany, Oregon. Olsen Honey Farms (541) 926-0443.

Tupelo honey for sale in drums or buckets. Top grade. Also Michigan white Star Thistle honey in drums or buckets. **www.sleepingbearfarms.com** (888) 912-0017.

HONEY FOR SALE. Call Honey Hot Line. (763) 658-4193.

Premium Honeys - Michigan Blueberry, Knapweed (Star-Thistle)—excellent for creamed honeys, and Florida Citrus and Brazilian Pepper (October). Call Ed (231-408-7485) or Steve (239-896-0777). Fax: 863-674-1969. Email: **edeisele@gmail.com; seisele007@gmail.com.**

30 drums honey, buckets possible, white – light amber. Delivery possible. SW Michigan (269) 313-5698.

QUALITY HONEY, SORRY WE'RE OUT OF IT. HOLLENBECKS, KIRKSVILLE, MISSOURI.

For Sale: Great tasting WI clover/basswood honey. (262) 689-1000.

Goldenrod and Japanese Knotwood (Bamboo) in 5 gallon pails. $125.00 each. Gowanda, NY. (716) 713-1646.

Clover, w/f mix, 33 mm, nice flavor, 66 drums, (605) 310-3248.

HONEY AND BEESWAX WANTED

HONEY WANTED—Extracted or comb. LEIGHTON'S HONEY, INC., 1203 Commerce Ave. Haines City, Florida 33844. (863) 422-1773. FAX (863) 421-2299.

HONEY WANTED—all grades. Contact Pure Sweet Honey Farm, Inc., Verona, WI. (608) 845-9601. M-F.

Beeswax and Cappings Wanted. Cappings rendered. Call for details. (209) 667-8255, Stevinson, CA.

Need Sage honey and Sage comb honey. Also need Certified Organic Honey from any flower source. Will pay top dollars. Call (818) 355-3339.

ROYAL JELLY

BEST 100% PURE FRESH ROYAL JELLY. $55.00 per kilo plus shipping. HIGHEST POTENCY. LOWEST PRICES guaranteed on larger orders. CERTIFIED TOP QUALITY. Stakich, Inc., 1155 Vaughan Rd., Bloomfield Hills, MI 48304. (248) 642-7023. Stakich@Stakich.com

Highest Quality, 100% Pure, Fresh Royal Jelly - $45.95 per kilo plus shipping (please mention this ad when ordering). Quantity discounts available. Potency tested, certificate of analysis shipped with each order. Lyopholized (freeze dried) royal jelly also available. GloryBee Foods, Inc., PO Box 2744, Eugene, OR 97402. Call toll free, (800) 456-7923, fax (541) 762-7173 or email **Sales@GloryBeeFoods.com**.

POLLEN

QUALITY, CLEAN, LOW MOISTURE POLLEN - $3.90/lb. Min. 10 lbs. Shipping $9.00. LOWEST PRICES guaranteed for large orders. STAKICH, INC, 1155 Vaughan Rd., Bloomfield Hills, MI 48304. Phone (248) 642-7023. Stakich@Stakich.com.

Highest Quality, Clean Wildflower Bee Pollen – As low as $3.57 per lb. (packed in 25 lb. containers, please mention this ad when ordering). Smaller sizes available. Glorybee Foods, Inc., PO Box 2744, Eugene, OR 97402. Call toll free (800) 456-7923 or email **Sales@GloryBeeFoods.com**

Pollen supplement and pollen substitute patties made to your specifications and delivered anywhere. Fast service. Visit www.globalpatties.com or call. Toll free (866) 948-6084.

POLLINATION

Bee's wanted for the almonds. Art Harris, P.O. Box 82194, Bakersfield, CA 93380. (661) 444-1470.

Bees wanted for 2010 Almond Pollination. Call (559) 277-8456, Newton Apiaries.

Bee colonies wanted for almonds in Modesto area. Must be 8-frame average Price $120, negotiable. Alan Buckley, 35 Granada Court, Portola Valley, CA 94028, (650) 851-3304.

BEES AND QUEENS

JERRY FOSTER QUEENS-quality Carniolan and hybrid Italian queens at competitive prices. Nucs and packages also. Jerry Foster Apiaries, 937 9th St., Colusa, CA 95932. Phone (530) 458-4234.

COMA APIARIES - Italian queens, packages and nucs. Small orders welcome. Order: 8057 Bass Pond Road, Millville, CA 96062. Phone (530) 547-5773. Online: **www.damoc.com**

Pacific Northwest mated queens. Orders of 50 or more. Treasure Valley Idaho. Call Jon@(208) 412-1092. **www.goldenbeeinc.com**

Package bees in Ohio. Taking orders now for spring 2010. Waldo Ohio Apiaries, George Taylor, P.O. Box 122, Kilbourne, OH 43032. (740) 524-6241. Email: **WALDOBEE@MSN.com** Website: **www.waldobees.com**

For Sale: 5-frame east Texas nucs - $70, no frame exchange. (402) 305-0268.

Italian package bees and 5-frame nucs in North Carolina. Available April 1-15. 1000 cardboard 5-frame nucs full of bees. $80.00 each – no frame exchange. 3 lb. Package with queen - $55.00 each pick-up only. Timmy Holt, 132 Holts Lane, Siloam, NC 27047. (336) 710-4904.

Do you need bees?? Will fill your equipment, March in East Texas. MN Hygienic stock. Ready early May. Also, brood, March. Rufer's Apiaries, Inc. (612) 325-1203.

Queens for sale, spring '10 central CA. Also, 5-frame nucs, packages, bulk bees and we can fill dead outs. Allen Bee Co. (559) 674-1144.

Hawaii packages for 2010. 2, 3 and 4 lbs. of bees with queen. E-mail or call for pricing. **beehivehawaii@gmail.com** (808) 285-6677.

PACKAGE BEES with Italian queens. Pick up only at our warehouse. Since 1978. Sam & Joyce Van Vleet, 21770 Black Lane, Cottonwood, CA 96022. Phone (530) 347-1987.

ZIA QUEENBEE CO. – P. O. Box 317, Truchas, New Mexico 87578 USA. Tel: (505) 689-1287. **www.ziaqueenbees.com** **To Bee, or not to BEE….that is the question!** VIVA LAS ABEJAS

HELP WANTED

EXPERIENCED BEEKEEPERS WANTED for seasonal or permanent positions in Hawaii. Reasonable pay based on experience, housing, medical, bonuses, profit sharing. MUST HAVE U.S. SOCIAL SECURITY NUMBER. References Required. Contact Gus Rouse, Kona Queen Hawaii, P.O. Box 768, Captain Cook, HI 96704. Phone (808) 328-9016, FAX (808) 328- 9460, Email: **queenbee@aloha.net**.

NOW HIRING! We are looking for experienced beekeepers and mgrs to join our progressive growing business. Permanent and seasonal positions available with advancement opportunities. Hiring for Hawaii, California/Montana. Salary based on experience. Excellent benefits package. US Social Security # and references required. Submit resume to **info@ohbees.com** or Olivarez Honey Bees, Inc./Big Island Queens, Administrative Office: 1750 Dayton Road, Chico, CA 95928. Phone (530) 865-0298, FAX (530) 865-5570.

Experienced and interested beekeepers required to work in Australia in honey production, queen/package bee production. Long term employment and permanent residence a possibility for those wishing to make a career in Apiculture. Bio-data should be sent to: Australian Queen Bee Exporters P/L, Tel: 61-2-63683788/FAX: 61-2-63683799/Email: **aqbe@bigpond.com.au**

Immediate opening winter/spring North Dakota/Texas bee operation. Opportunity to learn about migratory beekeeping pollination, queen rearing. Call Mackrill Honey @ (701) 984-2696.

WANTED

Round Comb, Fresh good tasting **Pollen, Varietal Honey**. 800-678-1226. **mstco@moonshinetrading.com**

Bees to lease for the 2010 honey season in North Dakota. Write: American Bee Journal, Box 137, Hamilton, IL 62341.

Quality beehives wanted for 2010. California almond pollination season. Call (510) 885-1014 or email **denise@pollinationconnection.com**.

Wanted: 4000 Series Maxant 20-frame Electro-Vari Speed Extractor. Contact: #320-333-1085.

LABELS

Custom Labels. FREE BROCHURE. (319) 759-0161 leave message or **amysbeelabels@hotmail.com**

MISCELLANEOUS

HONEY BEE INSEMINATION SERVICE Equipment*Training*Consultation* Custom Service. S. Cobey, PO Box 73581, Davis, CA 95617. (530) 554-2527, **honeybee@breeding.com**. Website: **www.honeybee.breeding.com**.

The **AMERICAN BEEKEEPING FEDERATION** has many benefits to offer its members. Send for a membership packet of information today! We also offer a free Beginning Beekeeping Packet. Contact the **AMERICAN BEEKEEPING FEDERATION**, 3525 Piedmont Rd. NE, Bld. 5. Suite 300, Atlanta, GA 30305-1509, Phone (404) 760-2875, Fax 404-240-0998, or email **info@abfnet.org**.

SUPPLIES

LAPP'S BEE SUPPLY CENTER - commercial pricing along with top quality. Fast and friendly service. Check with us before you buy. FREE CATALOG. Box 278, 500 South Main Street, Reeseville, Wisconsin 53579. 1-800-321-1960.

VIDEOS/DVDS

BEGINNING BEEKEEPING DVD—2 hrs! All survival essentials: building hive; installing, feeding, medicating, inspecting, managing bees; harvesting; diseases & parasites; behavior. $35 Dr. Iacobucci, 172-BJ Washington, Pembroke, MA 02359 **http://www.roctronics.com/bee. htm**.

TRANSPORTATION

We love bugs! 48 state step deck and flat-bed operation looking to haul your bugs. We are a company with years of experience transporting your bees. For more info, call SPIERING TRUCKING at (605) 690-5671.

BEE HAULER – western US. Your bees will ride on air with us. We care about your bees. WHEAT TRUCKING. (406) 871-1824.

PERIODICALS

L'ABEILLE DE FRANCE—The most important of the monthly publications in France - for all beekeepers, from the amateurs to the professional. Each month: an article for beginners, reports from specialists, a review of the latest information all over the world. Ask for a sample Annual subscription: 40$ US. ABEILLE DE FRANCE- 5, rue du Copenhague-F 75008 PARIS.

APIACTA—An international magazine of technical and economic information on beekeeping, Quarterly issues in four versions: English, French, German and Spanish. Current year (surface mail): US $24.00; back years: US $28.00; Air mail surcharge: US $4.00. For subscriptions and list of publications: APIMONDIA, Corso VittorioEmanuele II, 101, I-00186 Rome, Italy. Tel. +39-6-6852286 - Telex 623254 - Fax +39-6-6852286/6852265. Postgiro account no. 57499006.

THE AUSTRALASIAN BEEKEEPER—Senior Beekeeping Journal of the Southern Hemisphere. Complete coverage of all beekeeping topics in one of the world's largest beekeeping countries. Published by Pender Beekeeping Supplies Pty. Ltd., PMB 19, MAITLAND, N.S.W. 2320, Australia. Subscription by Bank Draft. Annual subscription paid in advance US $36.00. Free sample copy on request.

THE AUSTRALIAN BEE JOURNAL—Caters to both amateur and commercial apiarists. Subscription $35.00 Australian currently for all subscribers per annum seamail and $50.00 airmail. Published monthly. Single copy $3. Victorian Apiarists' Association, Inc., Editor, Mrs. Eileen McDonald, RSD McKenzies Hill, Castlemaine.Vic, Australia 3450 Ph: 03 5472 2161, Fax 03 5472 3472.

BEECRAFT The UK's leading monthly beekeeping magazine. View a digital copy and subscribe on line at **www.bee-craft.com**.

BEE CULTURE—The Magazine of American Beekeeping. FREE sample copy. 1 year $25.00, 2 years $48.00. Foreign postage add $15.00 for 1 year and $30.00 for 2 years. A. I. Root CO., POB 706, Medina, OH 44258. Visit our website: **www.beeculture.com**. All subscriptions must be prepaid. Please allow 6-8 weeks for delivery. MASTERCARD, VISA and DISCOVER. All checks or money orders must be in U.S. CURRENCY.

DIE BIENE—The Bee magazine with special publications in bee science and management. Agencies in the regions: Hessen, Nassau, Rheinland, Saarland, Mecklenburg - Vorpommern, Thueringen. This magazine is a monthly publication with 64 pages. Subscription U.S. $28 per year. die biene, GürtelstraBe 29 a-30 • 10247 Berlin, Tel: 030/293974-87 • Fax 030/293974-59.

HIVELIGHTS, National magazine of the Canadian Honey Council. Published quarterly. Free sample on request, write to Canadian Honey Council, Suite 236, 234-5149 Country Hills Blvd. NW, Calgary AB T3A 5K8, CANADA. Subscription information available at **www.honeycouncil.ca**.

HONEYBEE NEWS, The Journal of the New South Wales Apiarists' Association, Inc., International Subscription AUS$50.00 (Airmail) Bank Draft, Visa or MasterCard payable to NSW AA. Published bi-monthly—For more information contact: The Editor, PO Box 352, Leichhardt NSW 2040 Australia. E-mail: **honeybee@accsoft.com.au**

IBRA is the information service for beekeepers, extension workers and scientists. Our members support this service and enjoy the benefits of belonging to IBRA, which includes Bee World. We need your involvement - join IBRA - support this important information network and extend your beekeeping horizons. For more information contact: IBRA, 18 North Road, Cardiff CF1 3DY, UK. Telephone (+44) 1222 372409. Fax (+44) 1222 665522.

INDIAN BEE JOURNAL—International in appeal; keeps you updated with beekeeping developments in India and the world. Issued quarterly. Publishes research on Asiatic honey bees, tropical apiculture and pollination. Solicits your support and welcomes your subscriptions. Annual Subscription (foreign: including surface mail): US $20 for individuals and US $40 for institutions by Bank Draft payable in Pune (India) draw in favour of India Bee Journal, Pune and set to Dr. K.K. Kshirasagar, Editor, 1294 Shukrawar Pet, Pune 411 002, India.

IRISH BEEKEEPING—Read An Beachaire (The Irish Beekeeper). Published monthly. Subscription $40.00 per annum post free. David Lee, Scart, Kildorrery, Co. Cork, Ireland.

ATTENTION LIVESTOCK PRODUCERS—Ranch Magazine is your monthly information guide for Angora, Cashmere and meat goats, as well as sheep and cattle,. Comprehensive Breeder Directory. 1-Yr $24, 2-Yrs $44. Foreign & Canada add $15 per yr. postage. Subscribe today! Box 2678-ABJ, San Angelo, TX 76902. Call for free sample.

THE SCOTTISH BEEKEEPER—Monthly Magazine of the Scottish Beekeeper's Association. International in appeal, Scottish in character. Subscription rates from: ENID BROWN, MILTON HOUSE, MAIN STREET, SCOTLANDWELL, KINROSS-SHIRE KY13 9JA SCOTLAND, U.K.

SOUTH AFRICAN BEE JOURNAL—The official organ of the S.A. Federation of Bee Farmers' Associations. Published Bimonthly in English and Afrikaans, primarily devoted to the African and Cape Bee races. Subscriptions incl. postage (six copies). All subscribers outside of South Africa R100-00 surface mail, payment to be made in S.A. Rands. NB. Sample copies only available on receipt of a donation. P.O. Box 41 Modderfontein, 1645, South Africa

THE SPEEDY BEE—Quarterly beekeeper's newspaper. The happenings of the beekeeping industry, plus how-to articles. $17.25 per year (4 issues) in U.S. Canada and Mexico add $12.00 postage. Others please contact us for pricing. Air mail rates on request. Sample copy free. The Speedy Bee, P.O. Box 998, Jesup, GA 31545.

Advertising Index

Australian Package Bees & Queens

"Brown's Bees Australia Pty. Ltd."

LEAVE NO HIVES BEHIND

INVEST NOW FOR A HASSLE-FREE SPRING WITH YOUNG CLEAN SUMMER AUSTRALIAN BEES

THESE PACKAGES OF BEES WILL PAY FOR THEMSELVES

2009 / 2010 Package Bees and Queens from October thru February

Please contact Jerry or Shad Sullivan to place your order and arrange delivery date.

Mr. Brown's crew in Australia weigh and fill packages of bees

Order filled — crew members boom filled bee packages on truck

Bees are delivered to the airport from the rolling hills of Australia, get their custom passes and are ready for the long flight to San Francisco, CA

Package Bee Price - No Price Change

4 Lbs. Packages - $135.00
5 Lbs. Packages - PLEASE CALL

AUSTRALIA

BROWN'S BEES AUSTRALIA

OWNER: TERRY BROWN

Phone: + 61-428-686700 - Mobile
+ 61-2 6886-1446 - Office
E-mail: Brownsbees@gmail.com
www.Brownsbees.com.au

CALIFORNIA

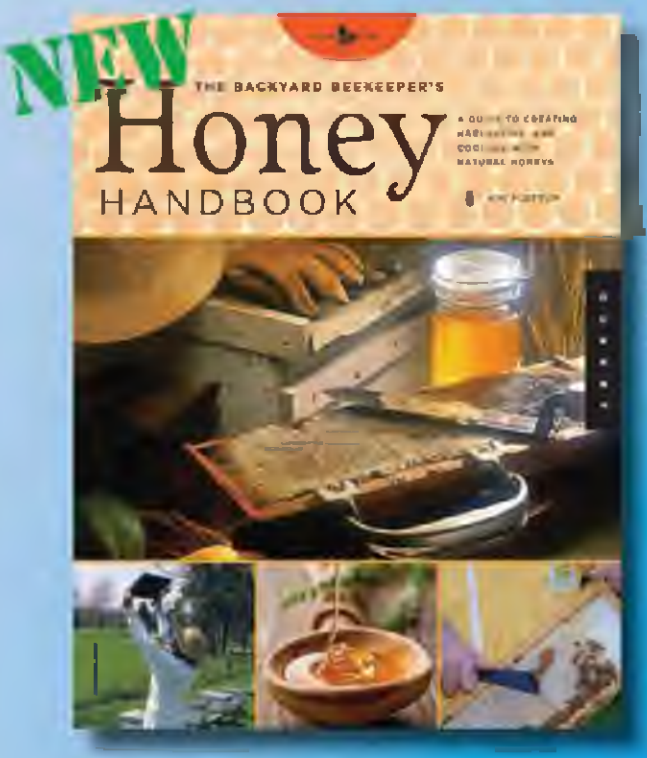
SHAMROCK "S" POLLINATION, INC.
ATWATER, CA

OWNERS: SHAD & JERRY SULLIVAN

Phone: (209) 605-3932 - Cell
(209) 358-5989 - Office
E-mail: bees4you@aol.com

PICK-UP ONLY: ATWATER, CA LOCATION

Good Reading From Bee Culture –



The Backyard Beekeeper's Honey Handbook
The ONLY book of its kind. This book covers the next level in honey marketing. Production, harvesting and processing of varietal and artisan honey.
X175

- 168 Pages
- Soft Cover
- Color Throughout
- Extensive Honey Plant Data
- Growing Degree Day Info
- More Honey Harvesting Equipment

ONLY $25

The Backyard Beekeeper
The best choice for Beginning Beekeepers. Use 8-frame hives and assembled equipment for ease and efficiency! Kim Flottum, 168 pages, beautiful color, soft cover.
X141

$25

The 41st Edition

ABC & XYZ of Bee Culture

$59.95

- Over 900 Pages
- 1600+ Photos, Most In Color
- Pests, Predators & Diseases
- Honey Plants in Color
- Extensive Glossary
- All About Beeswax
- 13 Page Index
- The People, Places And History Of U.S. Beekeeping - Find More Than Anywhere Else!
- Updated Honey Bee Anatomy & Physiology

Uncle Buzzy's Big Fat Book O' Bee Cartoons
84 pages, soft cover, color throughout, 6" x 9" format. A really big collection of Lela Dowling's honey bee cartoons, including color covers and some not-so-far published cartoons.
X166

ONLY $15

Prices include shipping in the U.S. For foreign postage please contact Bee Culture Magazine.

Root Publications (a division of The Root Candle Company)
623 W. Liberty St., Medina, OH 44256

800.289.7668

Or Order directly from our online bookstore
www.beeculture.com/store

ROOT PUBLICATIONS


B Weaver
Apiaries
Inc.
Mite & Disease Resistant Queens, Package Bees & Nucs.
Chemical Free Since 2001
BeeWeaver Queens are a combination of our very best All Star and Buckfast and BeeSMaRt colonies. After selecting for mite resistance, high honey production and healthy populations in all our queen lines for over a decade we found our breeds became similar. Our choice now to combine the breeds should bring you (and us) the best all around bees possible and better customer service.
This decision may have been an obvious one to make, but it was not an easy one. We hope as the beekeeping world evolves you will find that our own evolution is the best path to overcome today's challenges in beekeeping.
ORDER ONLINE AT BEEWEAVER.COM
DELIVERY: ZONE 1
April 7
OK-1 Seminole, OK
OK-2 Collinsville, OK
MO-1 Joplin, MO
MO-2 Ofallon, MO
KS-1 Spring Hill, KS
KS-2 Haysville, KS
NM-1 Santa Fe, NM
NM-2 Bosque Farms, NM
NM-3 Roswell, NM
CO-5 Durango, CO (add $15 haul fee per order)
April 14
AR-1 Little Rock, AR
TN-1 Carthage, TN
IL-1 Urbana, IL
CH-1 Chicago, IL
IL-2 Sterling, IL
May 5
CO-1 Canon City, CO
CO-2 Littleton, CO
CO-3 Colorado Springs, CO
CO-4 Longmont or Boulder
DELIVERY: ZONE 2
April 21
PA-1 Finleyville, PA
NY, CT TBA (See Website)
NJ-1 Hackettstown, NJ
VA-1 Bowling Green, VA
April 28
IA-1 Ames, IA
MN-1 Elk River, MN
WI-2 Waupaca, WI
VISIT WWW.BEEWEAVER.COM FOR PRICES. DELIVERY SCHEDULES ARE SUBJECT TO CHANGE. ALL BEES AND QUEENS MUST BE PAID IN FULL 2 WEEKS PRIOR TO THE SCHEDULED SHIP DATE.

2009 PRICING
Order Now and Save

The calendar changed and the celebration came and went, but we still have 2009 pricing through the end of January.

ALL YOUR BEEKEEPING NEEDS

Manufacturers and Distributors of:

•Quality Woodenware•
•Protective Clothing•
•Honey Extracting Equipment•
•Bottling Supplies•
•Soap and Candle Making•
•Complete Mead Making Line•
•Gifts•

TWO GREAT LOCATIONS TO SERVE YOU

Brushy Mountain North

Expanding Our Facilities to Better Serve You!

Come see for yourself

620 Old Route 15
New Columbia, PA 17856

Brushy Mountain Bee Farm

www.brushymountainbeefarm.com | 1-800-233-7929

• BEST QUALITY • BEST SERVICE • BEST SUPPORT •

DADANT FRAMES

Glue & Side Staple

3/4" Top Bar

The Standard of The Industry!

Preferred by Professional Beekeepers for Generations, and the Frame Others Strive to Duplicate!

Available Unassembled and Assembled as shown

1/2" Bottom Bar

Dadant

51 S. 2nd Street
Hamilton, IL 62341
1-888-922-1293 ▪ www.dadant.com

▪ Chico, CA (877) 332-3268 ▪ Fresno, CA (877) 432-3268 ▪ Paris, TX (877) 632-3268 ▪
▪ Sioux City, IA (877) 732-3268 ▪ Watertown, WI (877) 232-3268 ▪ Albion, MI (877) 932-3288 ▪
▪ Waverly, NY (877) 532-3268 ▪ Chatham, VA (800) 220-8325 ▪ Frankfort, KY (888) 932-3268 ▪ High Springs, FL (877) 832-3268 ▪