CENTRAL COAST BEEKEEPERS NEWSLETTER

APRIL 2024

NEXT MEETING April 24, 2024

Important Notice: In the second half of the year, WE WILL MEET ON SATURDAYS, in the hope that more of our members with Monday to Friday commitments will be able to attend. Please see updated schedule, p. 3.

PRESIDENT'S MESSAGE

By Jeremy Egolf

"You don't need a weatherman to know which way the wind blows," (so said Bob Dylan) but neither we nor the weatherman knows with any certainty which way it will blow next week. At our place, a flock of barn swallows typically arrives on or very close to April 15th and heads south September 15th. We had reliably a couple dozen but last year the count dropped to about 14-17. So far this year we spotted one on April 14th and four more the next day, raising questions about what's happening down south. Ours are not the cliff swallows who migrate between Argentina and San Juan Capistrano – we are not sure exactly where our flock winters in Central and South America.

We've seen both bumble and honey bees in our small patch of blooming fava beans so we look forward to planting many more to overwinter and help fill in the gap between the early spring alder pollination and the blackberry nectar flow.

The recent unseasonably warm and dry periods of coastal weather may stimulate brood production but the intermingled cooler and drizzly days discourage sufficient foraging to feed the growing colonies, so this is an especially important period to keep an eye on the food stores. Is there still a supply of honey or do they need some supplemental sugar syrup or fondant while awaiting the summer bloom? Consider adding a pollen supplement so the young adults don't need to raid the bee bread for their protein.

It's a good idea to also clear out dead bees which may be blocking the hive entrances and to hang out the yellow jacket traps if you haven't already. If you plan to install a new package or nuc, it could be wise to prepare to do a mite treatment, unless you know for a certainty that the incoming bees have been treated very recently and know beyond any doubt that capped brood (i.e., in nucs) is free of mites – which may be a stretch of imagination. For those comfortable with oxalic acid, the installation of a package installation may be a good opportunity to fumigate the phoretic mites.

This issue of the newsletter has something of an international cast, with stories from Guam and New Zealand, casting some light on attempts to control varroa in the western Pacific. We've also included a fairly long but quite readable article on the use of "pseudoscorpions" to control varroa mites.

At our March meeting, Max Kuhn spoke on swarm control, an important issue for those fortunate beekeepers whose colonies not only survived but thrived. For April, we will have a review of deadouts and a roundtable on lessons learned and war stories, and in May OSU Bee Lab Director Ramesh Sagili will grace us with his presence.

For outreach, we've booked a booth for the Lincoln County Fair over the July 4th weekend, Watch this space as our plans solidify – we'll need volunteers with any level of experience to help staff the event .

And we're counting down the weeks until the April 24th deadline for members to purchase bees through our bulk order.

ANOTHER REMINDER: Please Respond to the PNW Honey Bee Survey!

Click on https://pnwhoneybeesurvey.com It is electronic and should take 5 minutes or less. The survey is for any and all members who had colonies last year they expected to overwinter. The survey covers questions on survivorship (loss) and managements for varroa mite control. Dewey Caron usually receives fewer than 6 Central Coast member responses. This is 15th year and he is hoping for a good response from all OR beekeepers including those in the Central Coast. The Survey is NOW OPEN (through end of April).

The survey is rather interesting in itself, and includes questions on types and longevity of colonies, supplemental feeding, mite testing and treatments used, requeening and suspected causes of hive losses.

The Year's Program

All meetings 1:30 p.m. at the Newport Public Library, except for the June meeting, which is at the OSU Extension office in Newport.

Wed., April 24: Deadout workshop (please bring a frame or two, including any oddities you'd like to share); Lessons Learned and Spring Preparations

Wed., May 22: Dr. Ramesh Sagili (Director of OSU Bee Lab): "Varroa Control and Pollen Supplements"

> Before the presentation, we recommend you read the HoneyBee Health Coalition's new supplemental nutrition pamphlet (posted on our website here

Wed., June 26: Dr. Andony Melathopoulos (OSU Extension Service Master Melittologist): "Take a walk on the wild side: the weird and wonderful world of native bees (for beekeepers)." Note: meeting at the OSU Extension Office, 1211 SE Bay Blvd., Newport.

> Before Dr. Melathopoulos's presentation, we suggest you look into the identifying keys at https://ir.library.oregonstate.edu/concern/technical_reports/xg94hz59f
>
> Better still, print them out and have them available when the bees come bumbling! Learn to distinguish the boys from the girls!

Saturday, July 24: Annie Marion (USDA Natural Resources Conservation Service, Waldport Field Office): "Coastal Pollinator Habitat".

August: Summer party hosted by Pat Wackford (to whom we are grateful!) (date TBD)

September 21: Randy Oliver (Professional Beekeeper and Citizen Scientist, ScientificBeekeeping.com

Saturday, October 19: Dr. Dewey Caron (Emeritus Professor of Entomology and Wildlife Ecology, University of Delaware, and Affiliate Professor, Department of Horticulture, OSU): "Winter Hive Preparations"

Saturday, November 16: Annual Meeting (Election of Officers, Plans for Next Year)

Reminder: 2024 Bulk Package and Nuc Order

For our paid-up members purchasing Henry Storch's bees through CCBA, they are available at $155 for a three pound package, $180 per five frame deep nuc. The nucs include five frames of bees, at least two frames of capped brood, one frame of open brood, and 2 frames of honey/pollen. Henry will mark queens for an additional $10 (each) for those who want this service. The hard date for CCBA member orders is April 24th; May 19th is the nominal delivery date.

Contact Steve Niles at our April 24 meetings or through centralcoastbeekeepers@gmail.com.

Foraging the Internet: Michigan State University

Michigan State University's extensive extension service has a fascinating array of videos on the general subject of bees and beekeeping, including a recently posted one on Tropilaelaps:

https://www.canr.msu.edu/videos/tropilaelaps-samuel-ramsey-hbhc

And here's one on European foulbrood, which you can compare to Carolyn Breece's fine video on OSU's website:

https://www.canr.msu.edu/videos/european-foulbrood-office-hours

There are quite a few on forage for pollinators, including advice on tree cultivation for the bees:

https://www.canr.msu.edu/videos/trees-for-bees-from-planting-to-pruning

Information and helpful links regarding the Michigan State Pollinator Protection Program is here:

https://www.canr.msu.edu/news/managed-pollinator-protection-plan-update-from-michigan-state-university-extension

And there is a dedicated MSU website for postings on bees, including a recent series on winter flowers for gardeners. It's worth poking into:

https://bees.msu.edu/

One post by researcher Zachary Huang that caught my eye covered bee nutrition, paralleling work being done at OSU and elsewhere:

https://bees.msu.edu/honey-bee-nutrition/

USDA Researchers Use an Edible Blue-Green Algae to Protect Honey Bees Against Viruses

BATON ROUGE, La., March 19, 2024 – Scientists at the United States Department of Agriculture (USDA)'s Agricultural Research Service (ARS) developed an edible antiviral treatment that can be used to protect honey bees against Deformed Wing Virus (DWV) and other viruses, according to a recent study published in *Sustainable Agriculture*.

Viruses, including DWV, are linked to the deaths of millions of colonies worldwide. DWV, like other viruses, is most often spread by Varroa mites who carry the disease inside them and infect bee colonies. Infection typically causes deformity and death in bees, especially in the pupae and brood. These colony losses devastate beekeeping industries and pose a major risk to agriculture and the global food supply.

There is currently no treatment available to help reduce viruses in bee colonies. Nearly all colonies have DWV and can often be infected with multiple viruses at any given time. Effective antiviral treatments could help to improve colony health and survival as well as crop pollination efficiency.

"We found that engineered algae diets suppressed DWV infection and improved survival in honey bees," said Vincent Ricigliano, research scientist at the ARS Honey Bee Laboratory in Baton Rouge, Louisiana. "When mixed into bee food, the engineered algae boost the bee's immune system to fight off the targeted virus [and] have the potential to protect bees against a wide variety of pathogens," said Ricigliano.."

According to Ricigliano, blue-green algae is the "bee's knees" of bee food additives. Ricigliano and other ARS researchers previously studied blue-green microscopic algae, also known as microalgae, as a potential food source for honey bees. The algae showed promise since it has a nutritional profile that resembles pollen and is highly sustainable scalable to the level of commercial beekeeping.

Blue-green algae grow via photosynthesis and can remove carbon dioxide from the atmosphere, making it an ecologically friendly approach to improve the health of honey bees. "It can be added directly to supplemental feed without additional processing and easily integrated into beekeepers' existing management practices. However, there are regulatory considerations that must be addressed before these applications can be fully realized."

The researchers filed a patent application for the technology and plan to use variations of it to target additional bee viruses and other pathogens in future studies.

How One Entomologist Works to Combat Invasive Species and Protect Honey Bees on Guam

From Entomology Today, March 25, 2024, By Jacqueline Serrano, Ph.D.

[CCBA Editor's note: the South Pacific Guam experience bears comparison with last issue's article on the naturalization of *Apis Cerana* in Australia. This article is slightly condensed from the original.]

Christopher Rosario is founder of the Guam Beekeepers' Association. Here, Rosario inspects a frame of bees for the National Honey Bee Survey, led by the U.S. Department of Agriculture's Animal Plant Health Inspection Service and the Bee Informed Partnership, in August 2019. (Photo by Melissa Gabriel)

Christopher Rosario, M.S., works for the Guam Department of Agriculture where he is the state entomologist, state plant regulatory official, and state apiary inspector.

He earned his bachelor's degree at the University of Guam in 2012. During this time, his career goal was to become a veterinarian. However, in 2013, Rosario decided to work part time under Ross Miller, Ph.D., research entomologist at the University of Guam. Miller's projects involved surveying for agricultural pests, which included the National Honey Bee Survey (NHBS) led by the U.S. Department of Agriculture's Animal Plant Health Inspection Service and the Bee Informed Partnership.

After two years of working under the NHBS project, Rosario decided to pursue his master's degree in environmental science with a focus on entomology, which he then received in 2021.

Serrano: Can you describe your path to becoming an entomologist?

Rosario: After I graduated with my bachelor's degree in biology, I found myself with a lot of student debt, and going to vet school would've added more of it. The turning point of my career change started with the National Honey Bee Survey. This survey opened my eyes to research because so little was known about honey bees in Guam. It then made me want to go into graduate school where I used this survey as my research project.

During my time as a graduate student, I was able to find three new insect records for Guam, eradicate a highly invasive parasite, form a beekeeping association, and build the apiculture industry in Guam. Once

I received my master's degree, I applied for the entomologist position and became the first native state entomologist for Guam.

If I had one word to describe my path to being an entomologist, it would be "perseverance."

You have been conducting surveys of honeybees on Guam, assessing colonies for any parasites, diseases, and predators. What are some interesting things that you have discovered by conducting these surveys?

The honey bee survey led me to uncover three new arthropod pests that were never previously recorded on Guam: the mite *Varroa destructor*, the lesser wax moth (*Achroia grisella*), and the hornet *Vespa tropica*, sometimes known as the greater banded hornet.

Despite these new findings, it was difficult to conduct surveys because protocols of the NHBS called for surveying 24 apiaries, whereas Guam only had four established apiaries. To make up for the survey efforts, I contacted the news media and had them put out press releases requesting the general public to report wild bee colonies on Guam. Shortly after, I got phone calls to remove honey bees from people's homes nearly three to four times a week. In addition, I had people calling to ask how they could start keeping bees.

The most interesting thing I found about this was the harmony between people wanting to get rid of bees from their property to people wanting to keep bees on their property. This then led me to extract unwanted wild bee colonies and rehome them to new beekeepers. By doing this, I was able to create a small beekeeping club where we all shared a common interest in rescuing wild bee colonies and relocating them to farms and new apiaries. This small beekeeping has grown into a 501(c)(3) nonprofit association called the Guam Beekeepers Association.

Can you briefly describe the beekeeping industry on Guam?

The beekeeping industry on Guam is continuing to grow at a high rate. Every year, the Guam Beekeepers Association has recruited, on average, 10 beginning beekeepers. The increased interest in beekeeping among the general public resulted in part from the lack of serious predators and diseases, coupled with the year-round availability of nectar-producing plants on Guam. During the COVID-19 pandemic from 2020 to 2022, the increase of beekeepers nearly doubled from 55 to 105. Currently, we have about 115 beekeepers.

What's your favorite part of honey bee research, and what is the most challenging part?

My favorite part of my research was also actually the most challenging part of my research, for several reasons. The first reason was learning the history of beekeeping on Guam. At the time, I had no idea that people were keeping bees on Guam. In order to do my research, I had to learn how to keep and manage honey bee colonies. This then got me into beekeeping ,where I found that keeping bees on Guam was very different from what was described in beekeeping books and YouTube channels. In addition to this challenge, the greater banded hornet was discovered.

What are some entomological challenges that Guam faces? How are you working to solve them?

Invasive species incursions are the biggest challenge Guam faces today. The volume of maritime cargo carrying agricultural commodities that enter the seaports from various parts of the world augments the opportunity for agricultural pests to be introduced into Guam. Nearly 90 percent of Guam's agricultural

commodities are imported from various countries. Guam's rate of introduced species is high, with an estimated one new species per day and an average of at least three successful species established per year.

Trying to solve this invasive species problem alone is an impossible task. Forming collaborations with federal and local government agencies and stakeholders is the best way to solve this problem. These collaborations involve training each other for detection, eradication, and mitigation of invasive species. As a regulatory official, I have to ensure agricultural state laws are being enforced. As an entomologist, I cover every invasive insect, from agricultural pests to apicultural pests. Currently, I am writing federal grants to address established insect pests such as *Vespa tropica* and the little fire ant (*Wasmannia auropunctata.*.

What advice would you give to budding entomologists or scientists from smaller communities?

Stay open to unexpected opportunities. In smaller communities, opportunities don't come as often as in other places. Sometimes those opportunities are not the most attractive as others that you may want. These unexpected opportunities may open many more doors for you to choose from. More importantly, embrace the challenges that come with these opportunities, because it eventually builds resilience to more difficult tasks that lie ahead.

Finally, if you could be any arthropod, what would you pick and why?

I know it sounds cliché, but I would pick a honey bee because of its ability to adapt. Honey bees are the most widespread insect in the world because of their ability to pollinate over hundreds of plants. Honey bees are a mix of good and bad things in this world. They've been moved across oceans for pollination, out-competing native species by pollinating native flora, built a reputation as killers, and gone through so much diversification adapting to new places in the world.

Thank you, Chris, for letting us know about your work and giving us a glimpse of entomology on Guam.

***Jacqueline Serrano, Ph.D.**, is a research entomologist at the U.S. Department of Agriculture's Agricultural Research Service in the Temperate Tree Fruit and Vegetable Research Unit, in Wapato, Washington, and Pacific Branch Representative to the ESA Early Career Professionals Committee. Email: jacqueline.serrano@usda.gov.*

CHELIFERS OR PSEUDOSCORPIONS AS VARROA CONTROL AGENTS: Pseudoscorpions May Be The Answer.

By: Hans-Jürgen Ratsch[1], Jens Clausen[2], Bernhard Huchzermeyer[3], Johannes Leng[4], Laurin Mathes[4], Petra Hoppe[1], From Bee Culture (8/28/2018)

[CBBA editor's note: This older article is still intriguing in light of varroa mites developing some tolerance to the standard chemical treatments. The subject spurred a spate of articles in the 2015-2018 period, but apparently the wide use of pseudoscorpions is awaiting further research plus the development of adequate breeding stock. Unfortunately, the photos of these arthropods could not be included in the newsletter. This brief piece from the Australian Beekeepers Community of Practice highlights efforts to locate pseudoscorpions to combat Varroa Destructor on that continent and includes a video link showing the mite killers in action:

https://extensionaus.com.au/professionalbeekeepers/does-australia-have-varroa-mite-predators/

Some recent work by Dr. Ronald van Toor of New Zealand is profiled here:

https://www.apiaristsadvocate.com/post/harnessing-the-feeding-power-of-pseudoscorpions]

ABSTRACT

Due to the use of pesticides in agriculture, but also due to *Varroa* mites, the pressure on bee colonies has steadily increased in the last decades. The application of organic acids against *Varroa* mites increases the pressure on the bees. The project tried to use chelifer cancroides as *Varroa* control agents and collected data on the number of fallen *Varroa* mites during eight months in 2017. It compared colonies in wooden hives equipped with chelifers with control colonies in wooden hives and in Styrofoam hives in 13 test stands around the city of Hanover, Germany. The number of fallen *Varroa* mites in the wooden hives with chelifers was found to be significantly lower than in the wooden hives without chelifers.

The approach taken by Torben Schiffer in Hamburg to control the *Varroa* mites by symbiotic coexistence of chelifers (*Chelifer cancroides, Arthropoda, Arachnida, Pseudoscorpionida*) and bees seemed promising to us. Meikle mentions the possible use of pseudoscorpion to reduce the number of *Varroa* mites, but points out that there is still no field research available. Donovan and Paul point out that chelifers historically used to live in hives. Only by the introduction of hives made of sawn and therefore smooth wood or later Styrofoam hives, any space in the beehive in which chelifers could have retreated or nest disappeared. As long as bees were kept in straw baskets or hives made of coarse wood, this was still possible. The type of hives that are used is therefore crucial for the ability to work with chelifers.

If chelifers are successfully located in beehives, they will hunt for *Varroa* mites and other prey and they will stab it, poison it and suck it out. Each pseudoscorpion can consume one to nine *Varroa* mites per day. Van Toor demonstrated by DNA analysis that pseudoscorpions (*Chelifer cancroides*) actually do consume *Varroa* mites in beehives.

However, it is also important to offer suitable places for the chelifers to retreat and build nests. Chelifers prefer dry environments. Schiffer therefore recommends hives made from wood instead of Styrofoam

because relative humidity in Styrofoam hives has been found to be very high. He has converted frames into shelters for chelifers. These frames are filled with rough wood, behind which the chelifers live.

Van Toor, who has also been researching the symbiosis of chelifers and bees is also using frames filled with wood as dwellings for the chelifers. Initial experiments with New Zealand pseudoscorpions (*Nesochernes gracilis*) showed that although these pseudoscorpions ate *Varroa* mites under laboratory conditions and could be successfully bred, they were quickly extracted from the hives by the bees. Even in new trials with *Chelifer cancroides*, van Toor has not yet been able to significantly reduce the number of *Varroa*. However, his findings indicate that a more precise understanding of the hunting behavior and feed preferences of the chelifers might be important, and the choice of the right prey, as well as the correct design of the housing of the chelifers, seem to be critical for the success of the symbiosis to control *Varroa*.

In the context of temperature and humidity in the hive Tautz and Heidinger point to the large moisture-regulating effect of deadwood, which bees would naturally find in their habitat. Also the results of Schiffer (2013b) suggest clear advantages of wooden hives.

Material and Methods

The objective of the project was to measure the impact of chelifers on the development of *Varroa* mite populations in bee colonies. To achieve statistical power it was decided to place three hives on each of 13 locations in the Region of Hanover. One of these hives would be made of wood and equipped with 150 chelifers, one other would also be of wood and the third one would be a standard Styrofoam hive.

In order to measure the intensity of *Varroa* infestation of the bee colonies, the number of mites dropped from each hive on drawers below the hive was recorded weekly. The number of mites falling in this way is related to the actual infestation of the respective hive and was repeatedly used as an indicator of the *Varroa* infestation (Spivak 1996, Ostiguy and Sammataro 2000, Guzman-Novoa et al. 2012).The number of *Varroa* mites falling out of each hive was measured from week 34 in 2016 up to and including week three in 2018.

Chelifers

To equip 13 hives with 150 pseudoscorpions each it was necessary to get hold of about 2.000 chelifers. Since chelifers are not a marketable product, they were collected on farms in the region. The most promising places for the collection of chelifers were found on farms with animal husbandry, e. g. below hay and straw stocks above stables. Particular success was achieved in a sheep pen. Hay or straw was cleared out of the attics. Especially under boards lying around there, the chelifers were found in very similar situations to those described by Schiffer (2013 a) in the description of his catching method.

The chelifers were transported in jars or small buckets with lids. The collected chelifers were kept in four terrariums in an attic until they were brought into the bee colonies. Together with the animals themselves, substrate (hay, straw, brittle wood) was brought along and filled into the terrariums. From the organisms contained in this substrate, the chelifers have also continued to feed. In addition, potential feed (e. g. silverfish, dust lice and mites) were swept off boards with a feather and put into the terrariums. Potential predators (e. g. larger arachnids, centipedes, mealworms and meal beetles) were sorted out as far as possible.

In addition, the chelifers were fed with flightless fruit flies, wax moths and wax moths-larvae from pet shops. Old honeycombs were put into the terrarium, so that the wax moths in the terrarium of the chelifers could propagate and did not have to be bought permanently. This worked very well and so the chelifers had permanent wax moths-larvae available as feed. The overpopulation of wax moths and their larvae, which we observed in earlier attempts to breed wax moth-larvae as feeding animals in the school, did not build up.

A disadvantage in keeping chelifers “on stock” in terrariums can be cannibalistic behavior, especially when there is a lack of food. De Andrade and Gnaspini (2002, p. 615) described the extent of cannibalism among chelifers in captivity as small; they indicated a cannibalism rate of 1%. Within the scope of the project, however, up to 2,000 chelifers were kept in four 40 x 100 cm terrariums, which were thickly filled with substrate. According to the project team member’s impression, and without accurate counts and balance sheets, the number of chelifers ultimately recaptured from the terrariums was noticeably smaller than the number of chelifers inserted into the terrariums.

Following the initiative of two schoolgirls, who wanted to work on breeding of chelifers, we accommodated 10 animals each in a terrarium of approx. 30 x 60 cm in the school in September 2016. In the Spring of 2017 nests and nymphs were first observed in the terrarium. In March 2018, a census was carried out, which resulted in a stock of 24 chelifers. With the considerably lower stocking density compared to terrariums with up to 500 chelifers, it is clear that the propagation rate did exceed the rate of cannibalism in the long term.

Hives

Our goal in designing hives for the project was to create a breeding area that is as suitable as possible for the common life of bees and chelifers, but to leave space for frames and bees as far as possible unchanged. The aim was to ensure that, in the event of success of the project, beekeepers wishing to work with chelifers would only have to procure or change part of their material. This would reduce the costs of the switchover and thus reduce the barriers to the application of the idea.

For the reason of more favorable humidity (Mathes & Wiegand 2017) wooden hives have been chosen to house the chelifers. In addition, results of Schiffer (2013a) indicate that the electrostatic charge of Styrofoam restricts the orientation sense of chelifers and thus Styrofoam hives do not represent a good habitat for them.

In addition to the space for the honeycombs of the bees, retreat and incubation areas for the chelifers had to be created. Since chelifers live hidden under wood or straw, it seemed expedient to create areas within the hives and to fill them with a “nesting mixture” of straw and brittle, but dry and not too rotten wood, partly also with tree bark. Frames were additionally placed close to the sides of the hive body, which were tensioned with wire mesh (6×6 mm) and filled with the nesting mixture.

The hive body was converted in such a way that the front and rear sides of the body were partially sawn out. Afterwards, a new wall was placed further outwards and any gaps were closed with strips. The cavity, which is now accessible from the inside, was filled with the nesting mixture described above and closed from the inside by wire mesh to prevent the nesting material from being discharged by the bees. Additionally, alterations were made to make the hives watertight and to improve the insulation. Since

the hives for the chelifers were specially prepared the treatment of hives with chelifers was not randomized but was restricted to the prepared hives.

Test stands and measurement

The 13 test stations were located in and around the city of Hanover in different ecosystems: gardens (3), city park (2), meadow (1), flowering strips (2), fallow land (2), forest (2) as well as in the city of Hanover at the location of the school (1). In each test stand, all three types of hives were placed side by side.

The mites and other material in the drawer was collected weekly by a research assistant, put in a sample jar, labeled with the respective number of location and hive number and counted by the research class at school. The counting was always supervised by the teacher Hans-Jürgen Ratsch, who helped the students with insecure cases and checked the plausibility of the results. The class was specifically trained by Prof. Bernd Huchzermeyer. During the counting process, several special features such as dead bees or dead chelifers were detected.

In the course of the second half of 2016, numerous changes were made to the test stands. In spring 2017 bee colonies who died in the Winter were replaced and chelifers were collected and put into the hives. From week 22 in 2017 onwards valuable data was continuously available.

Results

Finally, the number of fallen *Varroa* mites could be successfully determined for nine remaining stands with two wooden and one polystyrene hive each for weeks 22 to 52. From week 33 to week 52 the colonies at the location M (Negenborner Wald) were added. Six data points were excluded after a treatment of two colonies with formic acid.

The following figure 1 shows the average values and standard deviation of the fallen *Varroa* mites by type of hive counted in the calendar weeks 22 to 52 per bee colony. Figure 2 shows the enlarged section of the time from the beginning of August (week 32) to mid-October (week 41).

Discussion

The data collected appear plausible in the light of other sources. Oliver (2018), for example, publishes values of mite fall per colony in 24 hours and during a full year. The data refers to a temperate climate of medium latitude. The highest numbers of mite fall in September, offset the highest numbers of bee brood and bees in early Summer. All our mite counts remain in the range of mite counts as documented by Oliver (2018).

Based on the basically plausible results, it can be concluded that the statistically significant result, that the *Varroa* infestation in the hives with chelifers is lower, is neither a coincidence nor a measurement error. This holds true at least for a comparison with the wooden hive. Rather, with the necessary statistical power, it has been proven that the intensity of the *Varroa* infection can be effectively reduced by introducing chelifers into appropriately prepared wooden hives.

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Sources – See original article for numerous references.

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