Varroa attacks!

ERIK OSTERLUND

I've been a beekeeper for 35 years and been interested in making a better bee through breeding and selection almost the whole time. In 1983 I visited Brother Adam for the first time to learn the skill more in depth. When Varroa came to Sweden in 1987 I just knew I had to have bees that could fight the mite by itself to continue really enjoying being a beekeeper. This brought about the trip to Kenya in 1989 to get breeding material.[1]

I had a feeling African bees had something in common that made them more able to deal with the Varroa problem that was growing in the world. They had after all a good test in South America. They are fully the same species as our European type of bees and they had not beforehand dealt with the mite.

The team I traveled with fetched breeding material from the *Apis mellifera monticola* which inhabit the east African mountains. This is a type of bee known to be relatively easy to handle and one of the few African races that don't abscond very easily. We found that this bee actually contributed to lower the swarming tendency in combination with our European bees.

INITIAL BREEDING EFFORTS

Combinations with a Swedish type of Italian bees did show lower susceptibility to Varroa than this Italian type in "pure" form.[2] Also my own investigations with combinations with the Buckfast type of bees confirmed this. My effort in breeding a more resistant type of bees was difficult as I didn't have the mite in my apiaries

1989 breeding material was brought from Mt Elgon in Kenya as eggs and semen. In cooperation with Broder Adam, in the middle, from the left Dr Bert Thrybom, Erik Björklund, Erik Österlund and Michael van der Zee.

when I started. It delayed its arrival 15 more years after this breeding effort begun. All this time I had to rely on cooperation with other beekeepers for my breeding efforts. Maybe what we achieved during these years was in first place a preservation of the initial resistance. Anyway, today I believe the biggest achievement of bringing in this genetic material was broadening the genetic variation to give room for a good selection for resistance.

Some early tests with combinations between Monticola and Buckfast bees, which I call Elgon, did show better resistance, while some did not. In common for the latter tests was that they were made with few colonies during a relatively short time, with controls placed in the same apiary and focusing on mite population increase instead of survival of the bees.

Sven-Olof Ohlsson, to the left, in western Finland has Elgon colonies that hasn't had any drugs, acids or essential oils for many years, or any dronebrood removal. His bees are healthy. He uses small cell size of mostly 5.1 mm, but also some 4.9.

Later on some beekeepers established apiaries with only Elgons at least 2 miles (3 km) away from other bees. In these yards they did not use any treatment or help for the bees at all. Not even dronebrood removal. I know of 5 beekeepers doing so, in Denmark, Finland, Norway and Sweden. They still have these apiaries going. [3], [4]

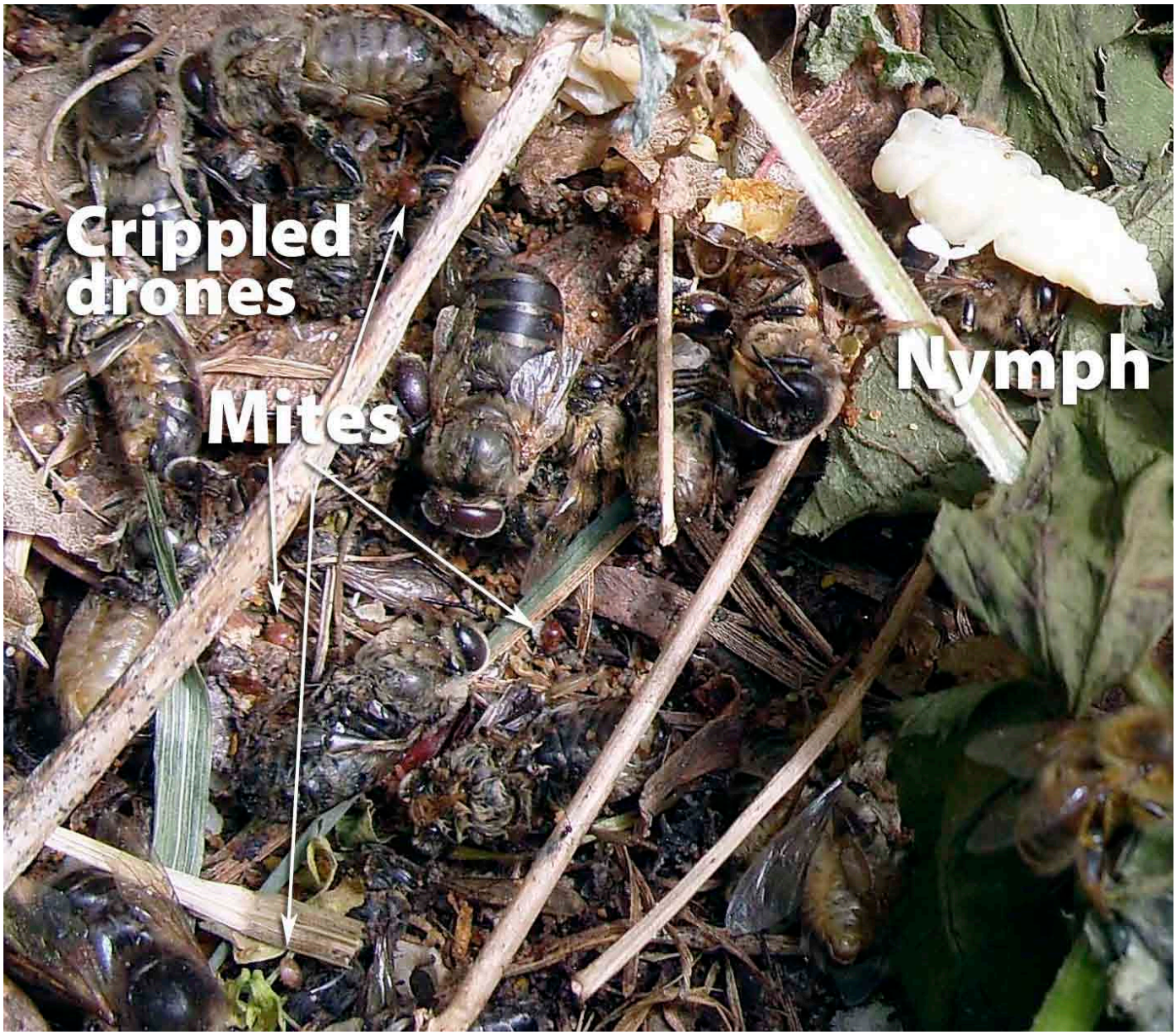
SMALL CELL SIZE

In 1990 I visited Dee and Ed Lusby[5] to learn about their findings about small cell size. I was convinced through studying history that bees had been enlarged through the use of the bigger type of honey storage cells in the brood nest. There ought to be some reason for bees in the wild to make different cell sizes with the smallest in the core of the brood nest. I converted my bees back to a smaller cell size in the brood nest, mainly because this is biologically more correct. Anecdotal stories from different beekeepers tell the same story: It is beneficial for the bees' health. Most scientific tests in this area in my opinion seem to lack quality control concerning test design and test implementation. There are some tests giving inspiring results for further research.[6], [7], [8]

PREPARATIONS FOR THE FIRST ATTACK BY VARROA

I was encouraged by the success of my fellow beekeepers using small size and the Elgon bee. Not only had I myself prepared for the arrival of the Varroa mite, but also my neighbour beekeepers had done that. We were quite many having small cell size and Elgon bees. So I felt quite confident. Come and face me mites! And they did, those lousy bug-grrs!

I was soon to learn that the first attack of the mite always is something special.



In early 2008 the first colonies with DWV-problems were working hard getting rid of virusladend drones, bees and mites. It was normal nectar flow in late spring.

Fortunately we and our bees can only experience this first attack once (if we don't move to or import bees from Australia).

In 2007 mites were officially found in my hives. Which means they arrived a couple of years earlier. I was following their doings closely but decided I didn't want to intervene if I didn't have to. That was a problem for me as I didn't had any personal experience of having mites in my hives. So how was I to know when to intervene and how. I didn't want to disturb the bees' own way of fighting the mites.

BEGINNING OF LOSSES

The winter of 2007/2008 gave normal winterlosses of less than 10%. The season of 2008 was good concerning honey crop. But already in May 2008 I began to see a few colonies with bees with crippled wings, which you can trust is a sign of DWV (Deformed Wing Virus). It's interpreted as meaning there's too many Varroa mites in the colony, carrying and making way for the virus in question.

Those first few colonies with crippled bees were small and couldn't be saved in any other way than by treating them. But I treated those 4 colonies, which were distributed in three yards, at the end of April (out of 200 colonies in 20 yards). I

When I observed more than a couple of crippled bees outside the entrance or/and when looking on at least three brood frames, I treated with one piece of cloth with about 12 g of thymol. I know some would say I treated too soon and others too late. I used this criteria due to my experiences from the year before, but of course I could have made a mistake. The excluder was not used on weak colonies where smaller pieces of dishcloths were used.

treated them in first place not to save them, but to stop them from spreading mites to the other hives. At the end of 2008 about 10% of all colonies had been treated with thymol. I hoped that would help the total of my bees enough. But it didn't.

There is also another main virus making a lot of damage, APV (Acute Paralysis Virus), and its varieties (for example IAPV). Most probably that's the one that late in summer/early autumn gave CCD-like symptoms with some of my bees. After feeding in late summer preparing for winter some colonies surprised me with hives empty of bees, in one case also empty of all food. The wasps and bees from other colonies had shared it.

TREATMENT AND MORE LOSSES

I had prepared for eventual treating 2009 and with a lot of hesitance gone through what kind of treatment, as a last resort, I could accept. My motivation for treatment was not in first place to save a colony, but to hinder it during crashing, to give a domino effect sharing a lot of mites with other colonies causing further crashing. I wanted my hives to show their potential in a fair fight with the mites, so I could sort out good ones for breeding.

No hard chemicals for me for different reasons. Acids I found to dangerous for the beekeeper as well as they gave me bad feelings due to their burning effects on bees and queens. Just imagine what happens with the breathing tubes, the pheromone glands and the pH-sensitive microbes in thir guts essential for their life. Powdered sugar caused too much labor for me, as cutting dronebrood.

From August 2008 to May 2009 I lost 50% of my bees. In late April 2009 when temperature was appropriate I started using Thymol again. I realized I had to, as I wasn't prepared to loose most of my colonies.

THYMOL

Thymol can be harmful for the beekeeper if and when you are making pieces of dishcloth, drenching them in liquid thymol (crystals melt at 120°F), not otherwise. You then need a charcoal filter mask and gloves. But the 2"x 6" inch big thin pieces of dishcloth are easy to use. I stored them in tripple plastic bags in a plastic toolbox. As long as they are stiff they have enough thymol in them for effective use. Api

A quite typical apiary in beginning of June 2009

life VAR is the most similar ready to use product in US I think. Thymol is relatively mild to the bees, but still it affects the microbes too, which is bad. But if used early in season the bees will have tie to gather nectar and build up the microbes in the gut till winter comes. Actually it affects different kinds of pathogens too, including nosema. But thymol should not be overdosed. Bees and brood are visibly damaged if thymol is overdosed. Population is diminishing and brood is thrown out. I used it only for three weeks and no more (in 95 % of the cases) and no more than one piece (10-15 g of thymol), mostly early in season. On weak colonies half a piece and on very weak even smaller. This is less than normally recomended.

Thymol is very volatile and as soon as you stop using it, what has moved into wax, hive parts and food starts moving out again if air is allowed to move freely. What's in wax and honey when you take out the rests of the torn apart piece of cloth is harmless. Thymol is naturally found in some types of honey, for example thyme and lime honey. Anyway I'm aiming at phasing out the use of it as soon as possible, hopefully already this season of 2010, at least using a lower quantity than 2009.

WHEN DID I TREAT

I had to find a way of deciding when to treat. I know counting mites is proposed by many. But for me it's too laborious. And it's not actually the mites that kill the colonies but viruses (and other pathogens like nosema). More easily with bad chemicals in the colony. The virus affecting the colonies most frequently in connection with Varroa is DWV (visible effects being crippled wings and abdomens). Also it's the virus most easily seen the effects of early enough to take action upon seeing.

I knew I was going to have some APV effects by not counting mites. And loose some hives due to that. I hoped not more than I could live with. So I concentrated on DWV and due to my experiences during 2008 I decided to ignore when seeing just a few crippled bees in a hive when checking.

When seeing at least three-four crippled bees on brood combs when lifting at least three such combs during a check of the broodnest, or when seeing the same number in front of the hive crawling on the ground, then I decided I would give the hive one piece of dishcloth with thymol on top of the frames of the uppermost brood

box. When no super was above the brood I put a queen excluder with a wooden rim on top of the thymol to help it evaporate. I treated with a piece of Thymol cloth whenever it was needed during the season and the temperature reached at least 60°F. The treatment period was only three weeks. I did not give another piece (or two pieces at once) for another three weeks and not twice during the season (a very few number of colonies actually got it twice). The taste of the honey was never affected except for a short period immediately after treatment.

MAKING SPLITS

During 2009 I concentrated on making splits to make up for the losses. But I got a small crop as well. The strongest colonies I managed to make three big splits each from. These splits were allowed to raise their own queens to multiply survivor genes. Those splits I made from the 10% weakest colonies got queencells ready to hatch, which were bred from the best survivors I didn't treat.

There are always splits that fail to get themselves a laying queen. Those got a ripe queencell as well and a couple of brood frames with hatching brood. During the whole season the splits were fed with sugarcandy, which the bees choose to take when there was little or no flow. That was to ensure getting strong colonies going into winter.

I ended up the season with almost 200 colonies again. 20 of these were made from colonies that had never been treated (with thymol or anything else) and some of them were old colonies that never had been treated with anything eather. These old colonies were of course potential breeders for 2010.

Nucs could feed on sugarcandy in plastic "bags" during summer. Insulating "dummies" of combs were used to fill up the box when appropriate. As the nuc grew in strength foundation or drawn comb were inserted to fill up the box with combs.

A queenless split that had failed to get themselves a laying queen fanning of "happiness" when they received a couple of brood frames and a ripe queencell.

NEIGHBOUR BEEKEEPERS

Beekeepers in the neighbourhood with Elgon bees and small cellsize have been affected differently. A tendency is that apiaries half a mile to a mile apart have been affected harder than when the distance have been bigger between them. Gosta Persson had his 60 colonies more "isolated" from the rest of us (and also had most of his yards more spaced apart). He lost "only" 35% of his colonies 2008-09 in spite of using no treatment (drugs, oils, acids or powdered sugar). But he cut drone brood during a couple of months. In May 2010 he had 20 % winterlosses for the season of 2009-10. This spring the surviving colonies also were in better shape. Selection has made his "stock" of bees healthier and more tolerant to the mites. Anyway that's a conclusion easily made. Gosta persson in the beekeeper among us Elgon and small cell beekeepers that has had least troubles with this initial attack by the mites.

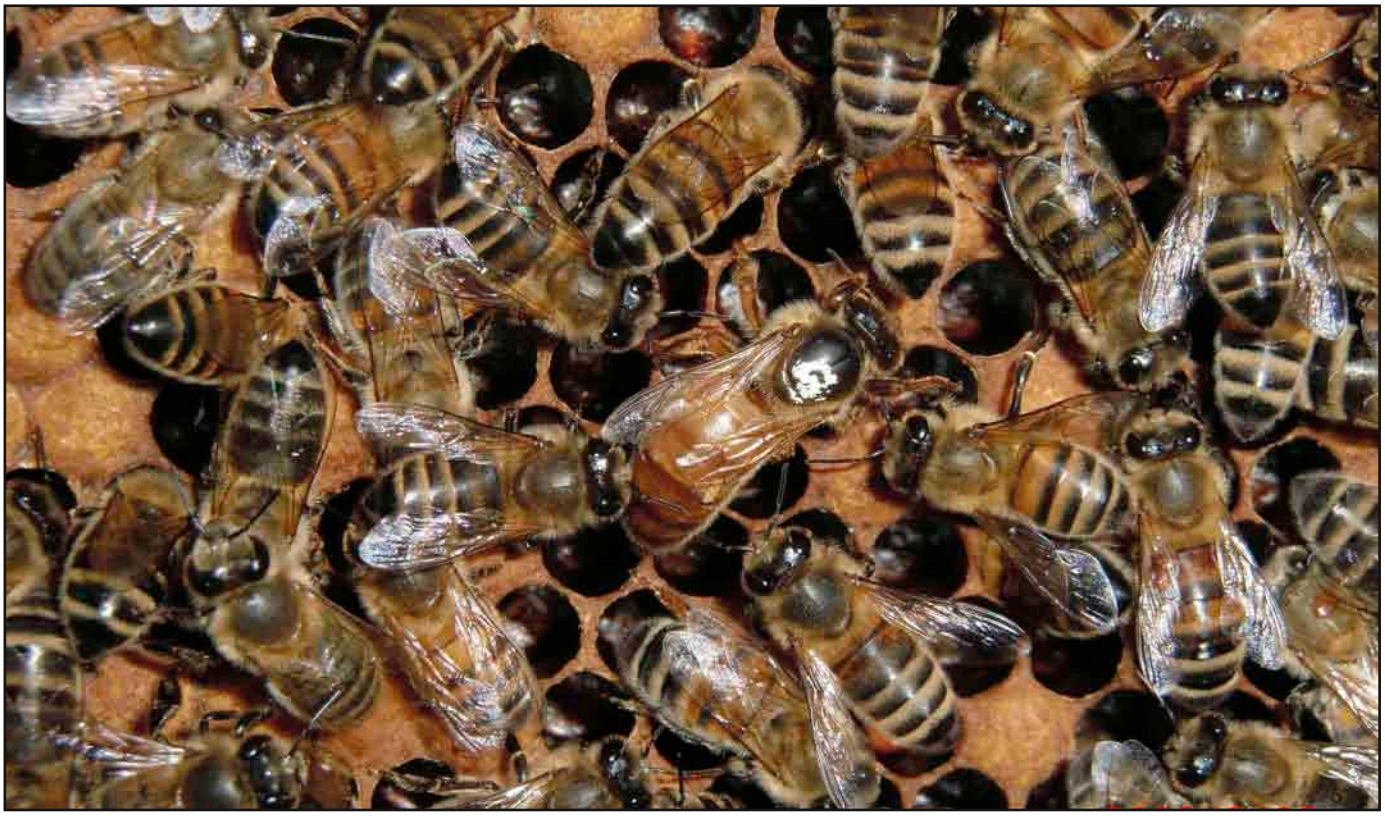
Where I have my apiaries, in most places the distance to other bees are relatively short, sometimes just half a mile. Domino effects could play its game making the attack harder. I estimated I would have lost 80-90% of my colonies during 2009 if I hadn't treated. It would have made me a hobby beekeeper.

BACK TO NORMAL HEALTH

The autumn of 2009 my bees were back to normal concerning health compared to one year earlier. No dead colonies in summer 2009, in late summer, in autumn or in winter, except one dead in late January 2010. And this winter 2009-10, in spite of global warming, is the coldest and worst winter where I live since 1942.
In May 2010 the winter losses were summed up to about 15 %. A few of the colonies were weak but overall they were strong and healthy. Though a got a thymol cloth. Interestingly those are the ones, or descendants to them (splits that made their own queen) that got most help from thymol in 2009. Of course these colonies will have teir queens taken out and given a ripe queen cell from a selected breeder.

POLAR WINTER IN SOUTHERN SWEDEN

For the first time in 35 year as a beekeeper I had to go skiing the winter of 2009-10 to see my bees in wintertime. In late January they had problems with condensation ice in the entrances, in spite of some screen in the bottoms. In February the snow covered most of the hives, which made good insulation. In late March I made a tour again with the skis to dig them out so the bees had free flight when they wanted to have their cleasning flight after winter, which came the first week in April. My hives are single walled wood with no upper entrance, but a lot of ventilation through the bottom with the help of some netting. But two inches of insulation on top. These four colonies were all strong and healthy when dug out of the snow, as well as the other six in this apiary.



En Elgon queen with a beekeeper using large cell size (5.4 mm). The size of the workers differs more then when using small cell size.

UNDERSTANDING THE FIRST ATTACK

What might help to understand why my bees were affected so hard while others with Elgon bees on small cell is doing fine without treatment of any kind is that the first attack of the mites for them is history.

In 2006 and 2007 I each year sold 100 splits to an Elgon small cell beekeeper in Norway, Hans-Otto Johnsen. He has normally low mite populations in his colonies and hasn't treated with anything (or used drone brood cutting) for many years. The splits sold 2006 did well with him with no big winterlosses. Of the 2007 batch he lost many the winter of 2008-09. They were managed the same way as the 2006 batch and his other bees. The winter 2008-09 was the same winter I lost 50%. The bees in the 2006 and the 2007 batches sold to him were of the same kind of heritage.

There are studies presented in early 1990s that show substantial drifting between colonies, especially in the same or close apiaries.[9] The Apimondia conference in France 2009 had many lectures on the learning behaviour of bees.[10] It's a relevant speculation that bees that never before have had mites have to learn how to deal with them, in addition to other defense and resistance phenomena. The 2006 batch had a low mite population. Bees and mites from Johnsen's other colonies drifted into the new ones. His bees "taught" the newcomers some skill in dealing with the mites. The 2007 batch brought with them a substantial mite population which increased faster than the bees could learn to handle, through the drifting from Johnsen's "old" colonies.

Before the bees have learnt how to fight the mites and when very susceptible bees are present in the area, especially in the apiary, the mite populaton will rise quickly and start domino waves of crashing colonies and heavy reinfestation of mites. Until these waves have settled the colonies with highest virus resistance and best mite fighting abilities have to survive in some way to make it possible to continue beekeeping and pollinating of important crops.

Also what has been discussed lately are so called epigenetic effects, genes that are being turned off and turned on due to environmental impact. In this case the

precense of mites. A very important defense system against varroa found in both Cerana and Mellifera bees is called VSH (Varroa Sensitive Hygiene). Bees identify and clean out capped brood with varroa mites, especially with offspring (fertile mites). After some removals and re-entering into brood cells, mites become infertile.

LOOKING FORWARD

Anyway, a low dose of thymol in most of my colonies (not all) in 2009 helped getting my bees back to which seems to be normal. The future perspective for me is to drop all treatments, like others have done, for example John Kefuss, which by the way is not a small cell beekeeper.[11] I don't like to kill microbes in the bee colonies. They are necessary for the health of the bees.

Of course the die off of the most varroa- and virussusceptible colonies is a necessary help to get a healthy resistant stock that can deal efficiently on their own with mites and viruses.

Fortunately we don't have high residue pesticide loads in waxcombs in bee colonies in Sweden. I believe such can lower or destroy the effects of defense efforts by the bees.

References

1 http://www.beesource.com/point-of-view/erik-osterlund/

2 **Thrybom, B. & I. Fries**, 1991. Development of infestations by Varroa jacobsoni in hybrid colonies of Apis mellifera monticola and Apis mellifera ligustica. Journal of Apicultural Research [1992] 30(4): 151-155

Thrybom, Bert, 1992. Monticolaförsöken på Gotland. Bitidningen [1992] 91(5]:163-165. Translation from Swedish of some quotations: "… testgroup that was establishen in May 1990… Every colony [test and control] got 6.8 oz of bees from a heavily infested colony. Thereby every colony in the test groups was ingested with aproximately 280 mites… The result showed that the number of infertile female mites is higher among the Monticola crosses… another observation was that in colonies with Monticola hybrids the worker brood hatched on the 19th day. Normal for European bees is that worker brood hatch after 21 days… At the end of the test [that summer] all the colonies were killed… in the Monticola crosses there were 390±98 mites per colony, in the control colonies [Italians] 1354±91 mites per colony." My comment (Erik O): The weather during spring 1992 was unfavourable and the test colonies (75% Monticola – first crosses with Italians crossed back to Monticola) produced less brood and these colonies became thus smaller, but this was at least partly counteracted throught 10% shorter development time of the worker brood. Also the result was also counteracted partly through drifting as the control colonies were placed in the same apiary. Interestingly a few of the test colonies had about the same amount of mites at the end of the test as at the beginning. Also the increase of mites in the controls were about 400% compared to about 40% with the Monticola crosses, 10 times higher!

3 http://www.beeculture.com/storycms/index.cfm?cat=Story&recordID=590

4 http://www.elgon.se/story3/sven-olof_ohlsson02.htm and http://www.elgon.se/story4/sven-olof_ohlsson04.htm

5 http://www.beesource.com/point-of-view/ed-dee-lusby/

6 http://www.funpecrp.com.br/gmr/year2003/vol1-2/gmr0057_full_text.htm

7 http://www.beesource.com/point-of-view/hans-otto-johnsen/

8 http://www.scientificbeekeeping.com/index.php?option=com_content&task=view&id=51

9 http://www.actahort.org/members/showpdf?booknrarnr=288_12

10 http://www.apimondia.org/2009/proceedings.htm

11 http://www.apimondia.org/2009/bee-health/symposia/Practical%20varroa%20resistance%20selection%20for%20beekeepers%20-%20KEFUSS%20John.pdf