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Big 3-How Bad?

Bacillus larvae Gone

News Over the Years

Big 3-How Bad?

Over the last decade, U.S. beekeepers have had to learn how to cope with three new beekeeping problems: tracheal mites, Varroa mites, and Africanized honey bees (AHB). Now that they have been here for a while, we can assess what their impact has been.

Tracheal mites - As tracheal mites spread across the country, their arrival meant minor or major losses to colonies in apiaries. Obviously, colonies "depopulated" in regulatory programs were major losses. A number of beekeepers were put out of business. In other operations, as many as 80% of a beekeeper's colonies died, with correspondingly high levels of infestation. Even if tracheal mites were only another stress, they were pathological enough to cause heavy losses around the country.

Climate played and continues to play an important role in the impact of tracheal mites. Tracheal

mites seem to be unable to thrive in hot climates, including parts of Florida and our desert southwest. They seem to be much more detrimental to colonies being overwintered in cold winter climates. In Minnesota, where the wintering losses used to be about 20% (mostly due to Nosema), beekeepers who winter bees in the snow now expect to lose about 40% of their colonies. The harsh winter of 1995-96 just made things worse.

Tracheal mites still flare up in apiaries in California and cause some increased winter losses. These losses are in the ballpark of what Nosema caused in Minnesota. So, some California beekeepers actually monitor colonies and treat when infestation levels climb. Most beekeepers simply rely on extender patties to keep tracheal mite levels subdued.

Varroa mites - It takes a couple years, after Varroa is found in an area, for the parasite to reach its peak of destructiveness.

At its worst, the parasite is active in just about every colony in the region. As the mites overwhelm a colony, the colony dies off. The last few hundred or thousand bees from a colony cannot defend the hive against robbing bees, which pick up mites as they plunder the weakened colonies. Finally, the remaining inhabitants leave, taking with them 10 to 12 mites. The heavily infested workers find other hives to enter, a few feet or several miles away. The new colony winds up with the mites, whether or not the foreign bee makes it past the guards.

This is the point in time at which there are reports of treatment failure. Colonies are loaded with mites only days after treatment. Treated colonies only survive a few months without more treatments. Many beekeepers threw in the towel and took up some other occupation at this point in the mite cycle.

Now, however, the reservoir of unkept, or improperly kept, colonies is gone. It is headline news across the country: "Mites Decimate Honey Bees." Treatments are holding up much better. Two treatments a year, at recommended exposure lengths, should no longer lead to nasty, midseason surprises. Feral bees will be able to persist for more than a few months. But, like tracheal mites, Varroa will be around forever, causing destruction in colonies of those who neglect to treat them.

AHBs - The population expansion of AHBS appears to be pretty much ended. Six years after arriving in Texas, the

number of new county infestations is approaching zero. We don't hear much about AHBS in New Mexico and Arizona, anymore. But, they are still around in substantial numbers. Last year nearly 1,000 AHB swarms were collected from underground water meter boxes in Tucson. News stories about multiple sting incidences, killing pets and people, were on the front pages.

Now, most of the really defensive bees have displayed their behavior and paid the price. AHBS and our EHBs are exchanging genes to a limited extent. But, AHBS are feral bees and, as such, have taken the brunt of the Varroa infestation.

In California, we have found 30 colonies of AHBS. Only two colonies had become established and built combs. The other clusters have all been called in by the general public, and none have been caught in swarm traps (bait hives). All the AHBS have been located in the "colonized" area running from Blythe, at the northeast, to just north of the Salton Sea, then south to the border with Mexico. Although there is no reason to believe that AHBS will expand much beyond their present location, they could become a much greater problem if they worked their way into the San Diego and L.A. basins, where forage is abundant all year and nesting sites are in great supply.

In summary, tracheal and Varroa mites, as well as AHBS, may have caused as much abrupt damage to the beekeeping industry as we are going to encounter. Now, we are just going to have to

remain mindful of them and respond correctly to spikes in their abundance.

Bacillus Larvae Gone

No, I am not saying that American foulbrood is a thing of the past. But, it does appear that taxonomically Bacillus larvae is extinct.

The causative agent of American foulbrood did not seem to fit the Bacillus mold particularly well, in the first place. It's biochemical capabilities were very close to the rest of the Bacillus species, so it was given a temporary home in that group.

Work by bacteriologists in New Zealand, I believe, determined that a subcellular structure (16S ribosome) of the bee pathogen was not the same as that of other Bacillus species, so it was moved into a brand new genus: Paenibacillus. So that it wouldn't be lonely, a second bacterium, that causes powdery scale disease of larval honey bees, was moved to the new genus, also. It seems to be so similar to the foulbrood causing organism, that it shares the same specific name as well. Thus, it has to be differentiated at the subspecific level. Confused? Well, here's the final:

Paenibacillus larvae larvae - causes AFB disease

Paenibacillus larvae pulvifaciens - causes powdery scale disease.

If you see Paenibacillus larvae, only, without the sub-species designated, it refers to the AFB organism. (From the dark ages: The causative agent of

European foulbrood used to be Streptococcus pluton. It is now Melissococcus pluton.)

News Over the Years

This month marks the beginning of my 20th year as Extension Apiculturist at UC Davis. Many interesting and important happenings have occurred over that two decade span. I thought it might be interesting to review those years to remember what was news at the time.

1976 - Dr. Laidlaw supplied a five-page review of queen rearing. Larry Atkins submitted a report on visitation times for foraging bees on 10 agricultural crops and the best times to apply insecticides to avoid killing bees. New Extension Apiculturist, Eric Mussen, arrived. "Insect Pollination of Cultivated Crop Plants" by S.E. McGregor became available.

1977 - I solicited hobby beekeepers for their opinions about starting a statewide non-commercial bee-keepers' association. The industry tried to obtain a bee feed subsidy from the federal government to deal with lack of forage for CA bees during a prolonged drought. U.S. honey stats showed increasing imports since 1974. Norm Gary and Eric Mussen decided to hold an organizational meeting for a proposed new organization, the Western Apicultural Society. The meeting was successful and WAS is.

1978 - CA beekeepers decided to no longer hold "Beekeeping Industry Conferences." Senate Bill 1049, proposed by CDFA to

help alleviate bees losses in CA citrus, was examined in public. Eric Mussen explained laws related to pesticide use and bees, called "General Guidelines..." They were later reprinted in the American Bee Journal. CSBA resurrected its Honey Queen Program. Second WAS conference very successful. An Environmental Assessment Team drafted a "Report on the Environmental Assessment of Pesticide Regulatory Programs." The three volume report contained information on bees and their value to society in three different chapters. At the CSBA convention Dr. Ross Nielsen described wax moth control through liberating moths with lethal mutations induced by irradiation and Dr. Howell Daly spoke on his early work on AHB identification.

1979 - The American Beekeeping Federation met in San Diego. Dr. Harvey Cromroy reviewed the Varroa problem in Europe. Dr. Harry Kohl shared his work concerning blooming times of plants in the UC arboretum that are attractive to honey bees. President Carter stated his intention to end the "indemnity program" for pesticide-induced bee losses. "Bee protection" regulations tightened up by mandating CA beekeepers to specify a two hour period, Monday through Friday, when they will accept "pesticide calls." Cotton producers given emergency registra-tion of Bolstar® and Pydrin®. I reported on CA beekeeping statistics 1974-78. Beekeepers doubled their pollination rental income during that five year period (to about 1/3 of what it is, now). Mike

Rosso described the "Unit System" for pollination payment at the CSBA convention.

1980 - Varroa mites, found in an alcohol vial containing drone collected in Maryland, led to extensive hunt for mites in local colonies. None were found. California Bee Breeders held 2nd annual Queen Breeder Auction. WAS went to Canada for the first time. EPA solicited samples of bees killed by field applications of pesticides because, "At present no hard data to indicate the magnitude of the problem concerning the association of pesticides with bee kills are available." (Some things never change!) CDFA introduced the idea of a \$10 annual county registration fee, plus a \$0.50 per colony assessment, to run the state apiary program.

1981 - UC Davis Agricultural Economists published "Economic Trends in the US Honey Industry." They did not predict a doubling in price in the mid 1990's. A new revision of the USDA publication, "Beekeeping in the United States," was released for purchase. Certan®, a strain of Bacillus thuringensis, was marketed by Sandoz for controlling wax moths in stored combs. Fluon AD-1® paint was said to be so slippery that it could keep ants out of bee hives. Larry Atkins' last edition of "Reducing Pesticide Hazards to Honey Bees" became available. (Best data now in 1992 Hive and the Honey Bee, but we need a newer data set.) WAS invited Dr. Warwick Kerr to speak at the conference. Attendance was much lower than anticipated. Beekeepers complained about bee

losses brought on by sprays applied for Medfly control. Dr. Martha Gilliam, Research Luncheon speaker at CSBA convention, provided recipes for mixing and using Terramycin® for foulbrood control.

1982 - Dr. Peng reported on her feeding experiments that showed fall feeding was more effective than spring feeding in producing larger colony populations in spring. Coincidentally, there was quite a bit of "autumn collapse" and "spring dwindling" in CA bees. Stringy sugar syrup is caused by dextran-producing bacterium, Leuconostoc mesenteroides, in some well water. Senate Bill 1635 proposed a new assessment rate structure for California bee-keepers. Data from a statewide AFB survey showed the disease to be quite common (42%) in CA apiaries. University of British Columbia researcher, W. T. Chalmers, suggested fish meal be added to pollen substitutes for better brood production.

1983 - Beekeepers to pay \$10 registration fee counties, annually, and \$0.30 per hive assessment to CDFA annually. About \$20,000 should be available each year to fund research. Beltsville Bee Diet, based on lactalbumin and Torula yeast, recipe was released. Beekeepers persuaded CDFA to cancel adoption of \$0.30 per colony assessment. U.S. Customs Service reports that any foreign, imported honey must be labeled by point of origin until it reaches the final consumer. Paraffin and gum rosin dip proposed for protecting wooden hive equipment. Finish beekeeper explained how he uncaps

honey using propane blowtorch. After two years' work, new bee laws were put into place in CA, but assessment still unresolved. Some suggestions for honey house sanitation and handling honey provided. Guide-lines for using antibiotics in bee disease control printed. Told by administrators that days of free newsletters are over. Subscription becomes \$5.00 per year. Beekeepers still mulling over assessment rate.

1984 - Assessment set at \$0.15 per colony annually as suggested by the CSBA. Cut backs in Sacramento were necessitated by lack of sufficient funds to cover whole program. Effects of irradiation study on foulbrood contaminated honey combs described. Effective May 1st, it is illegal to use ethylene dibromide for comb fumigation. WAS comes back to UC Davis. Diamond Apiary, in Chico, closed its doors and the bee breeders lost their local equipment supplier. Acarine mite (tracheal mite) found in the U.S. CDFA enacted an emergency regulation requiring bees coming into CA to be certified as not coming from or having been in an area of known infestation in the last two years. At \$0.15 per colony, beekeepers taxed themselves about \$88,500. That figure was about \$33,500 more than the "match" that the state had budgeted at \$50,000. The Division Pest Study Team of CDFA changed the ratings of Varroa mites and Africanized honey bees from "Q" to "A", making them, as the tracheal mites, as important (quarantine and abatement) as Medflies to state regulatory personnel. Canadian researchers

put additional efforts into overwintering studies. USDA ran mite detection workshops. Eastern states wanted whole country declared infested with tracheal mites so that migratory operations could keep on truckin'! CA loosens restrictions on colony imports, a little.

1985 - Tracheal mites not discovered in early months. Samples were taken from 2,937 CA apiaries. Canada still accepting queens and bees from states doing large surveys and finding no mites. Proposed action plan for tracheal mites found in CA included "depopulation" of colonies within a half mile. Other colonies, within two miles would be quarantined and sampled periodically until eradication was declared (could be up to three years). Bees sampled by the state, following pesticide loss complaints, showed nearly 90% had residues if the bees were fresh (nearly 100% normal weight). As they dried, residues dropped rapidly. The federal tracheal mite quarantine was ended and bees were mixing close to "normally." CA Senate Bill 866 intended to mandate placing a warning label on honey jars to not feed honey to children less than one year of age (failed). USDA announced its goal of reducing honey bee research funding from \$3.2 million to \$2.5 million over five years. CDFA decided to institute the "Apiary Protection Act" (new bee laws). The Citrus/Bee Protection regulations were revised to define "bloom." This allowed use of insecticides on citrus bloom, at both ends of the bloom period, without being in violation of

cautionary, bee kill statements on the labels. Field tests were conducted on AFB-contaminated combs following gamma irradiation. Water was shown to be important in increasing bee visitation to alfalfa bloom. CA believed to have its first Africanized honey bee invasion near Bakersfield. Big votes concerning honey - CA voted to terminate CA Honey Advisory Board and US voted to start up National Honey Board. AHB Action Plan given plenty of "heat" by beekeepers. Dr. Leslie Bailey, from England, stated that tracheal mites were not responsible for the devastating losses of the Isle of Wight disease and are not a threat to US beekeeping. University was pressured into becoming more involved in AHB research. AHB's considered eradicated from CA and tracheal mites show up. An extremely well attended special meeting (397 voting members) of the CSBA was held in Fresno to advise CDFA what to do. Following lecture presentations and a question and answer period, votes were taken in which more than 2/3 of the members desired not to end the depopulation program, but to provide beekeepers with more options. Nearly every voter wanted beekeepers who lost bees to be indemnified with state or federal funds. A request was made for more funding to increase research on exotic bee pests.

1986 - California Honey Queen, Caroline Comport, is crowned American Honey Princess. By mid-February over 400,000 colonies of bees had crossed the California border for almond pollination - about 230,000 from states

infested with tracheal mites. The American Mead Association formed. UC Administrators felt the pressure of not dealing with the AHB problem. They offered a five-year academic position, if the researcher would be funded by outside sources. Statewide tracheal mite program discontinued. Counties take over to deal with the infestation, locally. National Honey Board instituted. Horton hive heater/cooler idea explained. The report of the Honey Bee Tracheal Mite Symposium suggested much more research was needed and that "appropriate action be taken to contain (its) spread." CA Assembly Bill 3435 would provide \$50,000 for the first year of AHB research if industry could match it. First American Bee Research Conference held in Baton Rouge, LA. CA tracheal mite quarantines become "regional," to protect interests of bee breeders. After the beekeepers relented to increase their assessment by \$0.03 a hive to collect their portion of the AHB research support, Governor Deuknejian line item vetoed the state's \$50,000 from the budget. The State Legislature funded the start of the UC Sustainable Agriculture program at \$300,000 for the first year. The "repellency" of certain pyrethroids was explained.

1987 - Mexicans put supreme effort into educating citizens about AHBs, which have just arrived in Chiapas. Speakers from USDA Weed Laboratory lamented the failure of biological control agents to control yellow starthistle. Dr. Larry Teuber was completing alfalfa nectar studies and

changing emphasis to alfalfa pollen. Dr. Tom Webster described repellency in alfalfa field water barrels that had been oversprayed with Monitor[®]. I reported on Mark Goodwin's (New Zealand) observations on pollen forgers' behavior on kiwi fruit. Almond prices were eclipsing \$0.60 per pound and more trees were being planted. Dr. Robbin Thorp described his results with staggering delivery of colonies over time in kiwi fruit pollination. Organic raspberries were being "sucked dry" by honey bees in Shingle Springs (Sierra foothills). A British beekeeper explained how to process newspaper into solid smoker fuel [Editor's comment: On our recent trip to Hawaii, Gus Rouse of Kona Queens described the use of pelletized wood stove fuel in smokers. Hard to light, but burns all day.] Reactions to bee stings described in two issues. First Varroa mites found in the U.S. The CSBA Board of Directors recommended: rely on quarantine and certification to keep mites out of California, but no colony destruction without state or federal indemnification. More on AHBs. Unrestricted movement of Varroa-infested colonies was spreading mites around the country. Impacts of drones on colonies discussed by Clarence Collison.

1988 - CDFA mandated that honey bee colonies entering California must come through a border station. Work by Larry Atkins and David Kellum distinguished insecticides especially toxic to honey bee brood. Varroa infested colonies not allowed to move within or out of Florida. Fluvalinate treatment may release

infested colonies. A list of 30 honey bee videos was submitted by Dr. Larry Connor, Beekeeping Education Service in Cheshire, Connecticut. Many California beekeepers suffered significant overwintering losses of colonies, that did not appear to be related to tracheal mite. Samples analyzed at UC Davis showed signs of extreme nutritional stress. Newly edited copy of Beekeeping in California became available in county Cooperative Extension offices. Report was given on state requirements for tracheal and Varroa mite quarantine and certification programs. Dr. Anita Collins described her work on AHBS in Mexico. Stephen Adjare described migratory swarming of AHBS in Africa. First reports of recommended doses of menthol for

tracheal mite control. California adopted an exterior quarantine against Varroa mite, including stipulated ways of bringing colonies into California. (Cont. next issue)

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