

# Certification Options for Dealing with Africanized Bees

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## INTRODUCTION

There are several options for regulatory certification to deal with Africanized honey bees (AHBs). When choosing among these options, it is important that members of the beekeeping industry be involved in developing regulations, rather than allowing these regulations to be solely reactions to perceptions by the general public. The effectiveness of regulations imposed without such involvement would be reduced, especially if they were economically unrealistic. For example, each one of the 50 states could produce its own unique set of regulations, making interstate beekeeping difficult.

Industry involvement may have the benefit of helping to reduce liability. For example, beekeepers who manage bees according to regulations or industry recommendations would have a reasonable basis for saying that they are not negligent. Beekeepers can also advertise that they are following the industry recommended procedures for production of queens and therefore that their queens meet or exceed specifications for quality stock.

Predictably, there will be regulation of the beekeeping industry due to AHBs. We foresee that the components of the industry, particularly those producing queens will be exposed to different levels of regulation. The bee breeders who are producing the breeder queens, both for their own use and for queen producers will probably be more carefully regulated. This is because mismatings and problems with breeder queens will have

more of an effect on the industry than problems with production queens that are going out into the field colonies. However, there probably will be some level of regulation of all beekeepers.

## CERTIFICATION OPTIONS

Certification is going to have a significant impact on beekeepers. The impact will vary depending on the beekeeper's location, the type of beekeeping operation, and which options for certification are chosen.

Most of the possible certification procedures are also identification procedures. Certification procedures have more critical requirements than those used strictly for identification. The important thing to consider in evaluating procedures is the economic impact of a misidentification. If you misidentify a swarm or a feral colony in a survey, this has no significant economic impact. At most, it may slightly change your overall results. But, if you misidentify a possible breeder queen or misidentify a colony which is being examined because of a charge of negligence, this could have substantial economic impact on beekeepers. Therefore, it is important to have procedures for certification that have been evaluated and have a history of working properly.

## Location

For many beekeepers, location can be the primary certification procedure. However, for most areas location is not suitable unless there is a monitoring quarantine. If there is a quarantine with monitoring, then areas can be specified as free of AHBs and producers in that area can be certified as producing Africanized-bee-free stock. Similarly, beekeepers in areas with AHBs, but obtaining breeder queens produced in locations free

of AHBs and following production methods that produce satisfactory stock, can be certified as producing satisfactory stock for production purposes.

## Management

Several procedures will help beekeepers in areas with AHBs to produce both certifiable breeder and production queens. One is drone flooding - producing a large number of drones of the desirable type in the area. That is something many queen producers already do and is well within the capabilities of the industry. Feral colony destruction will become important in areas with AHBs, to reduce the number of competing drones in the area and also to avoid colony takeovers as much as possible. Swarm trapping and destruction will also be important to further minimize the number of wild colonies.

When discussing candidate management procedures, scientists will quote a large number of measurements that they have made on these procedures. These are important in determining accuracy and in choosing the most suitable procedure. But, in most cases, these numbers are unnecessary for beekeepers when they apply these procedures. The beekeeper will just need to know that the procedure is suitable. A beekeeper will not need to count drones or place swarm traps in a carefully organized grid, the way a scientist does when evaluating these procedures. However, it may be important to put out some swarm traps, both to reduce the number of feral colonies and to monitor what is going on in the mating area.

## Morphometrics

At present, morphometrics is the most appropriate identification procedure that

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will also be a suitable certification procedure. As a certification procedure, this technique has the important advantage of measuring a large number of genetic characteristics, so that stocks that are Africanized or European based on morphometrics, are so because there are large numbers of differences between the stocks, not very few differences dependent upon single genes. This procedure has been used in several laboratories and has a very extensive baseline of analyzed samples to support decisions. It is also a cost-effective procedure. Even the newly developed Universal System for Detecting Africanized bees through Identification based on morphology (USDA-ID) can be done in about 2 1/2 hours per colony. Morphometrics also allows beekeepers to self-test using the abbreviated field procedure FABIS (Fast Africanized Bee Identification System), where colonies can be evaluated in 10 minutes or less using simple equipment. Beekeepers can evaluate their own colonies and study whether their selection procedures are working to produce acceptable stock. Because morphometrics is a cost-effective and fairly simple procedure, it lends itself to commercial laboratories doing economical certification and identification procedures for beekeepers.

Only morphology has been shown to be correlated with economically important characteristics of honey bees, such

as stinging, swarming, absconding, and honey production. This correlation probably results from morphology and the behavioral traits of interest all being dependent upon numerous genes. Characters that are determined by only a few genes are far less likely to be correlated with behavior.

#### **Behavioral tests**

Behavioral tests have several major problems. They suffer from a great amount of variability in the responses of the same colony at different times, the same colony when examined by different beekeepers and the same colony in different locations. It is very difficult to get a reliable, quantified estimate of the defensive behavior of a colony. Another problem is that there are no extensive base line data on the colonies in the U.S. Beekeepers are taking a real risk that if their colonies are surveyed for behavior, this might produce unacceptable results, that is, misidentifications of European stock as Africanized. This is because U.S. honey bees have not been extensively examined and received verification that a behavioral test produces acceptable results. Also, the primary characteristic the behavioral test measures is stinging behavior, but as a sole certification of honey bee stock, this is too specific.

Behavioral tests do have an important "non-certification" use. They would definitely be useful as one tool for selecting

breeder queens.

#### **Enzymes and chemicals**

Enzymes and chemicals (cuticular hydrocarbons, proteins, etc.) have been suggested for identification procedures, but we do not consider them suitable as certification procedures. In fact, at this time, they are not really even identification procedures for single colonies. No enzyme or chemical characteristics have been identified at this time, that allow one to say that a specific colony is Africanized. They tend to examine a limited number of characteristics, such as specific enzymes, proteins, chemicals or chemical relationships. Thus at present, they are primarily research procedures that give an estimated colony identification that is statistically less reliable than morphometrics, which has been much more carefully evaluated. Hybridization and backcrossing of AHBs to European bees also will produce a significant fraction of hybrid bees with acceptable management characteristics, but which carry these specific chemical markers of AHBs. These are also costly procedures that require expensive chemicals, expensive equipment and the time of trained people. They are limited to being used in a well-equipped, specialized laboratory.

#### **DNA**

Present procedures using DNA markers suffer from some of those same dis-

advantages for use in identification. There are two primary types of DNA that are examined. The mitochondrial DNA, which is a small circle of DNA outside of the nucleus in the cells, and the nuclear DNA, which contains most of the basic genetic material of the cell. They are also expensive procedures because of the cost of the chemicals, equipment and the training of the people that conduct them. They lack adequate base line data to provide acceptable statistical treatment for identification. In population genetics research, DNA can be quite useful for studying gene flow among populations. Unfortunately, for a certification procedure, these specialized techniques are quite difficult to teach and do not yet lend themselves to inexpensive commercial laboratory analysis.

#### Timing

Many beekeepers may be afraid that stock certification is going to be one more chore to do during the time of the year when they are already trying to do too many things as it is. If beekeepers become involved in the development of the certification procedure regulations, they can guide these regulations to include procedures acceptable in their yearly schedule. Many of these procedures that apply primarily to the breeder queens, for example, can be done during the fall

and winter of the year. Other requirements can be simply that certain procedures (drone flooding and swarm trapping) are followed. One possibility is to save a small sample of the production queens, for example 30-50, and evaluate them by one of the detailed procedures. The next year, beekeepers would be able to say that they are using breeder queens of certified stock, that they are following the industry recommended procedures for stock production, and that in the previous year they successfully produced quality stock, as measured by the certification procedure.

#### Benefits

Certification procedures provide an opportunity for the industry to improve mating control and thereby produce better stock. Feral colony destruction and swarm trapping and destruction may be important components of improving mating control. This will lead to greater uniformity of a beekeeper's stock and give the industry better stocks and improved quality control to advertise and sell.

#### QUARANTINE

A quarantine will have benefits for the industry. If there is a quarantine which allows the designation of AHB-free areas,

there will be no need for certification in non-Africanized areas until they become Africanized. Otherwise, if there is no way for the beekeepers to verify that they have AHB-free areas, certification would need to be imposed immediately in order to ship bees to other areas.

If the quarantine is led by the industry, one of the characteristics of that quarantine will be that it won't be an absolute barrier, but rather a regulated area. That is, it can be organized so that beekeepers in areas with AHBs, who follow industry recommended procedures for producing AHB-free stock, will be allowed to ship bees of certified stock interstate. If there is no quarantine and no certification procedure, local quarantines will probably be put into place that will be barriers to interstate shipment. This also will be important in shipments to other countries which would be likely to recognize certification procedures.

One thing a quarantine does not do is stop the natural spread of AHBs. If it is effective, it will greatly reduce the spread of AHBs by beekeepers. But, it is not a way to keep feral populations of AHBs out of areas where they would spread naturally, or even entirely keep them out of commercial beehives. However, it would reduce the presence of AHBs in commercial operations to a manageable and tolerable level. ●